Revascularization for Left Main Disease: Updated Data, Global Guideline and Beyond

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Revascularization for Left Main Disease:
(PCI vs. CABG)

Updated Data,

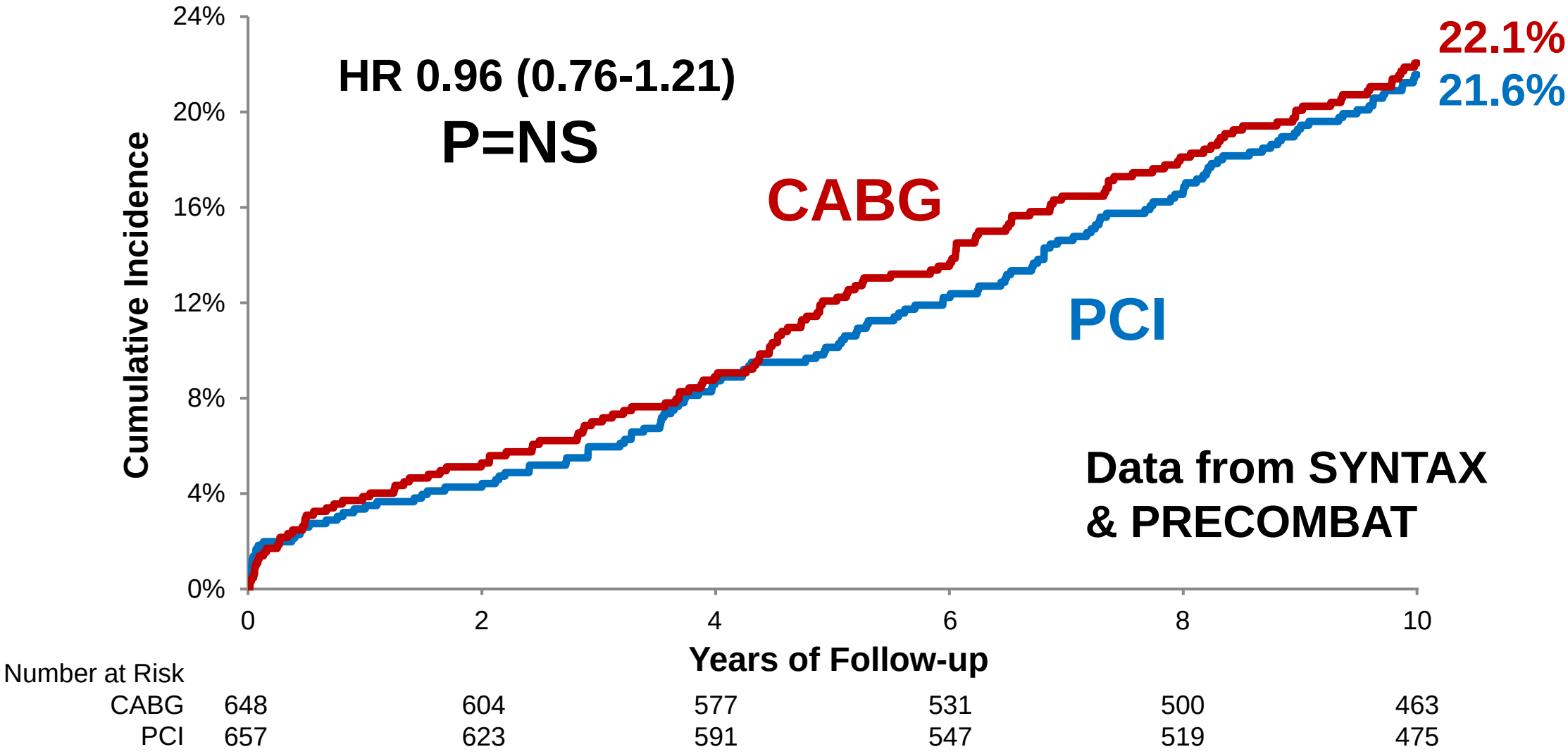
Meta-Analysis of 4 Randomized Trials
SYNTAX, PRECOMBAT, NOBLE, and EXCEL

4394 patients, PCI (n=2197) or CABG (n=2197)

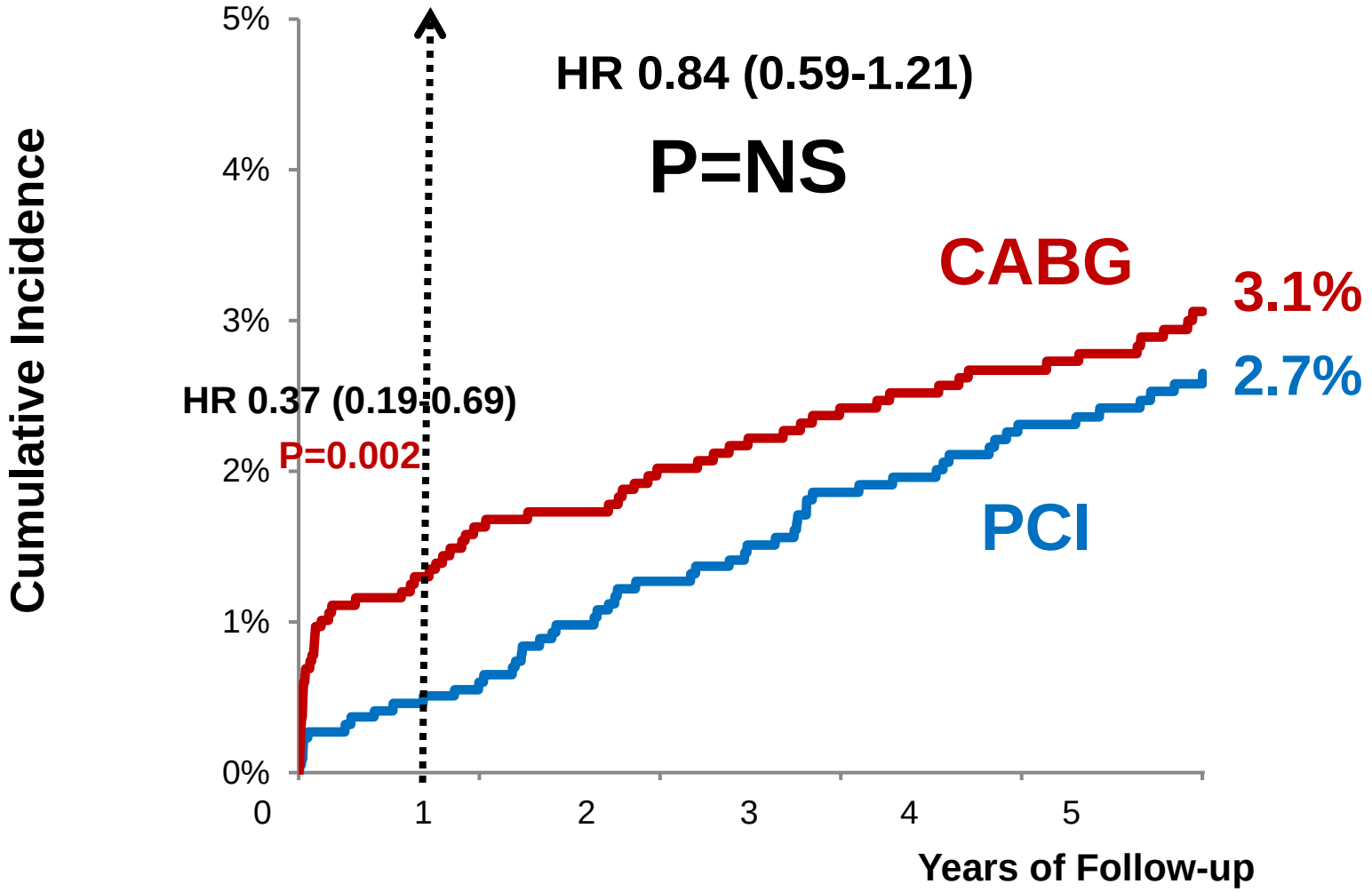
Median SYNTAX score of 25·0 (IQR 18·0-31·0)

Sabatine MS et al. Lancet 2021;398:2247-57

All Death at 10-Year (2 trials)

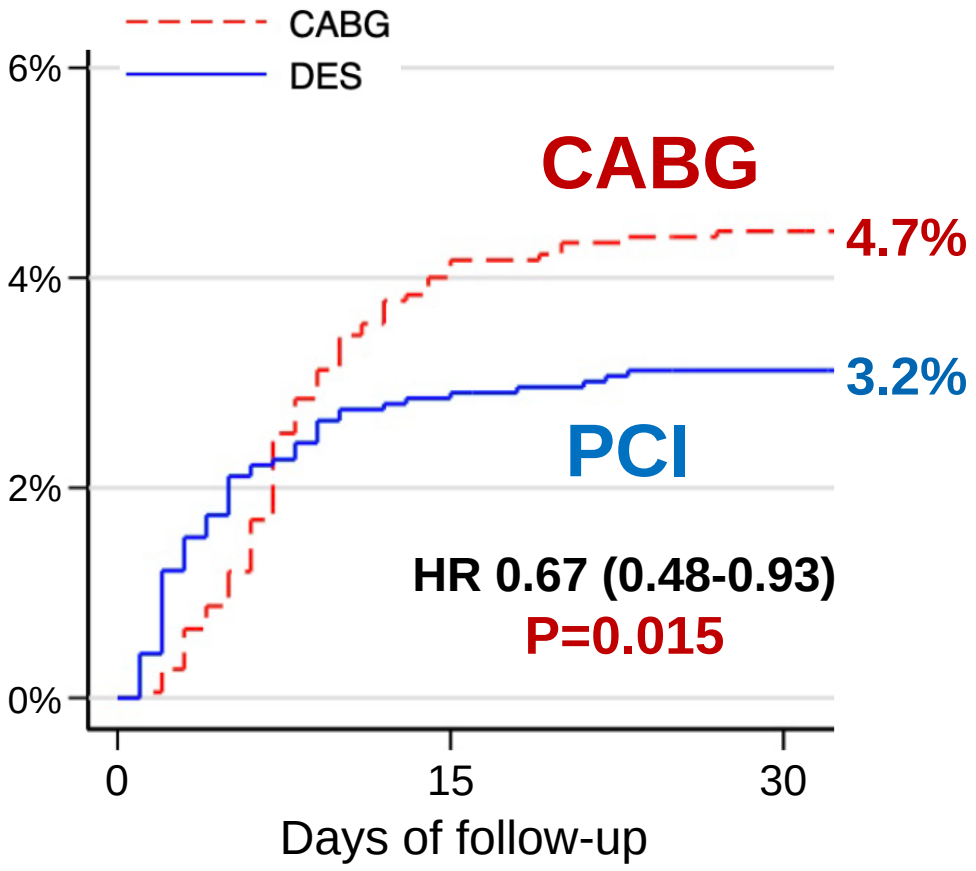


Stroke at 5-year

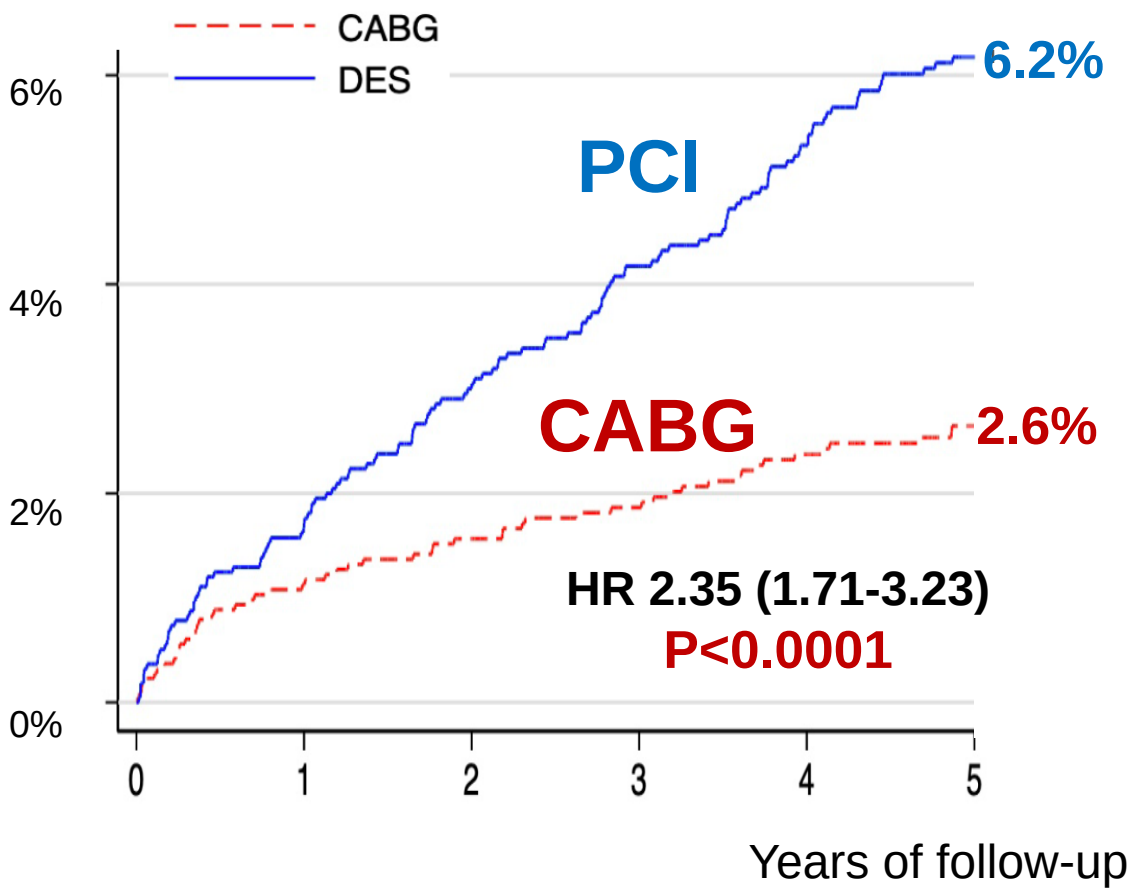


Sabatine MS et al. Lancet 2021;398:2247-57

Procedural MI
Higher in CABG at 5 year



Spontaneous MI
Higher in PCI at 5 year



Sabatine MS et al. Lancet 2021;398:2247-57

Revascularization for Left Main Disease:
(PCI vs. CABG)

Global Guideline,

2021 ACC/AHA/SCAI Guideline

Revascularization for Left Main Disease

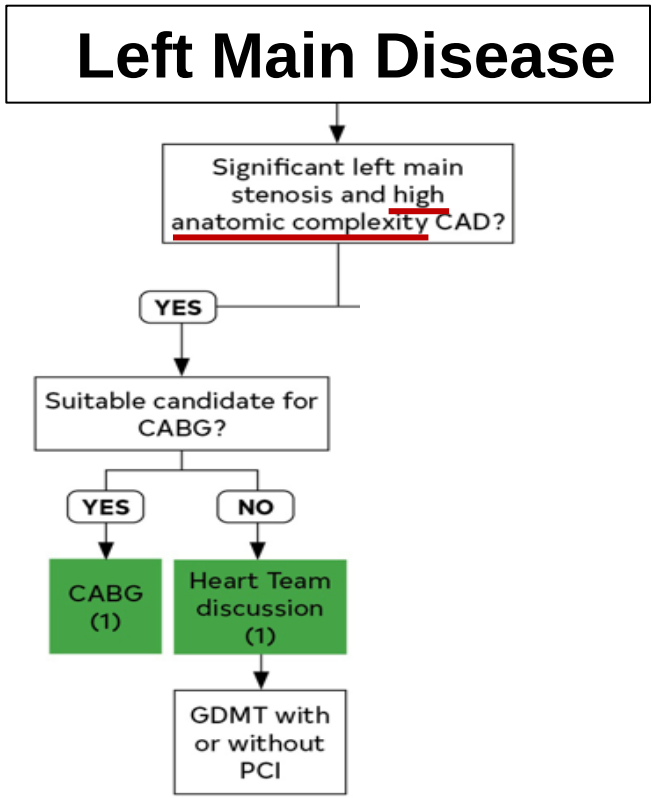
High Anatomic Complexity

⇩

Suitable candidate for CABG

⇩

CABG



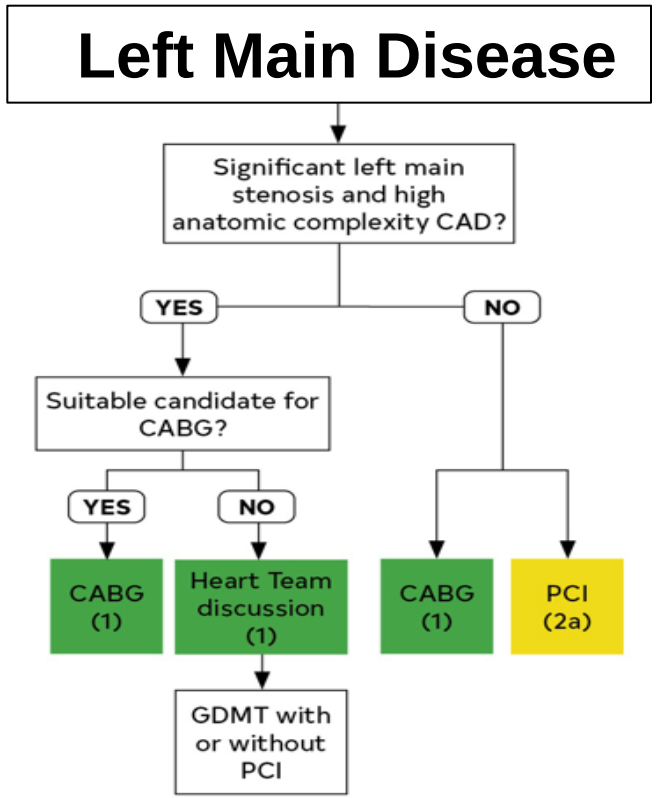
J Am Coll Cardiol. Dec 09, 2021. Epublished DOI: 10.1016/j.jacc.2021.09.006

2021 ACC/AHA/SCAI Guideline
Revascularization for Left Main Disease

High Anatomic Complexity

Suitable candidate for CABG

CABG



Low Anatomic Complexity

PCI : Class 2a
For Simple Lesions

J Am Coll Cardiol. Dec 09, 2021. Epublished DOI: 10.1016/j.jacc.2021.09.006

2018 ESC Guideline

Revascularization for Left Main Disease

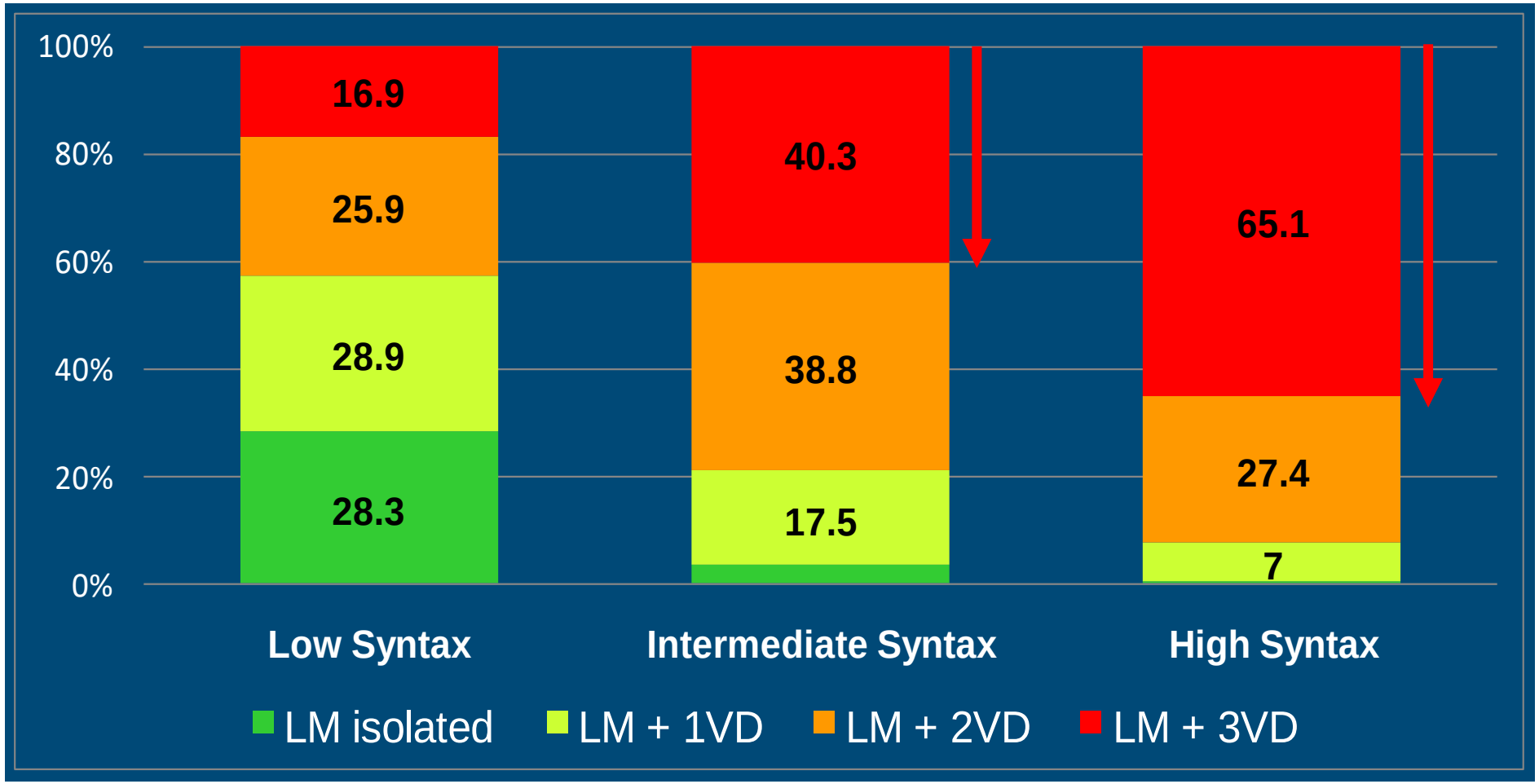
	CABG		PCI	
Recommendation according to extent of CAD	**Class**	**Level**	**Class**	**Level**
LM disease a SYNTAX score ≤ 22	**I**	**A**	**I**	**A**
LM disease a SYNTAX score 23 -32	**I**	**A**	**IIa**	**A**
LM disease a SYNTAX score > 32	**I**	**A**	**III**	**B**

Reference; SYNTAX Study, PRECOMBAT study, MAINCOMPARE registry study and Meta-Analysis. *Patrick, SW et al, NEJM. 2009 March 5;360(10), Park SJ et al, NEJM. 2011 May 5;364(18):1718-27, Levin GN et al. ACC/AHA guidelines. JACC 2011;58:44-122, Capodanno et al, JACC 2011;58:1426-32*

What Does it Mean
High Anatomic Complexity or High Syntax Score ?

What Does It Mean, High Syntax Score ?

Due to Concomitant 3VD Distribution



2018 ESC Guideline

Revascularization for Left Main Disease

	CABG		PCI	
Recommendation according to extent of CAD	Class	Level	Class	Level
LM disease a SYNTAX score ≤ 22	I	A	I	A
LM disease a SYNTAX score 23 -32	I	A	IIa	A
LM disease a SYNTAX score > 32	I	A	III	B

>60%

More then 60% of Patients with Left Main Disease Would be Candidate for PCI

PCI vs. CABG
for Left Main Disease

2024 Practical Guideline

Revascularization for Left Main Disease:

1. **If LM with Extensive Non-LM CAD (3VD) is present CABG may be preferred.**
2. **If LM with Low Anatomic Complexity is present PCI may be preferred.**
3. **If Multiple Comorbidities (prior stroke, lung disease, frailty) are present PCI may be strongly preferred.**

Changing Concept and Technique
of Left Main PCI

Beyond,

Left Main Disease:

1. *Big Vessel,*
2. *Proximal Lesions,*
3. *Short Lesion Length,*

It Is Really Good Target for PCI !

Contemporary PCI

Physiology and Imaging Supported PCI

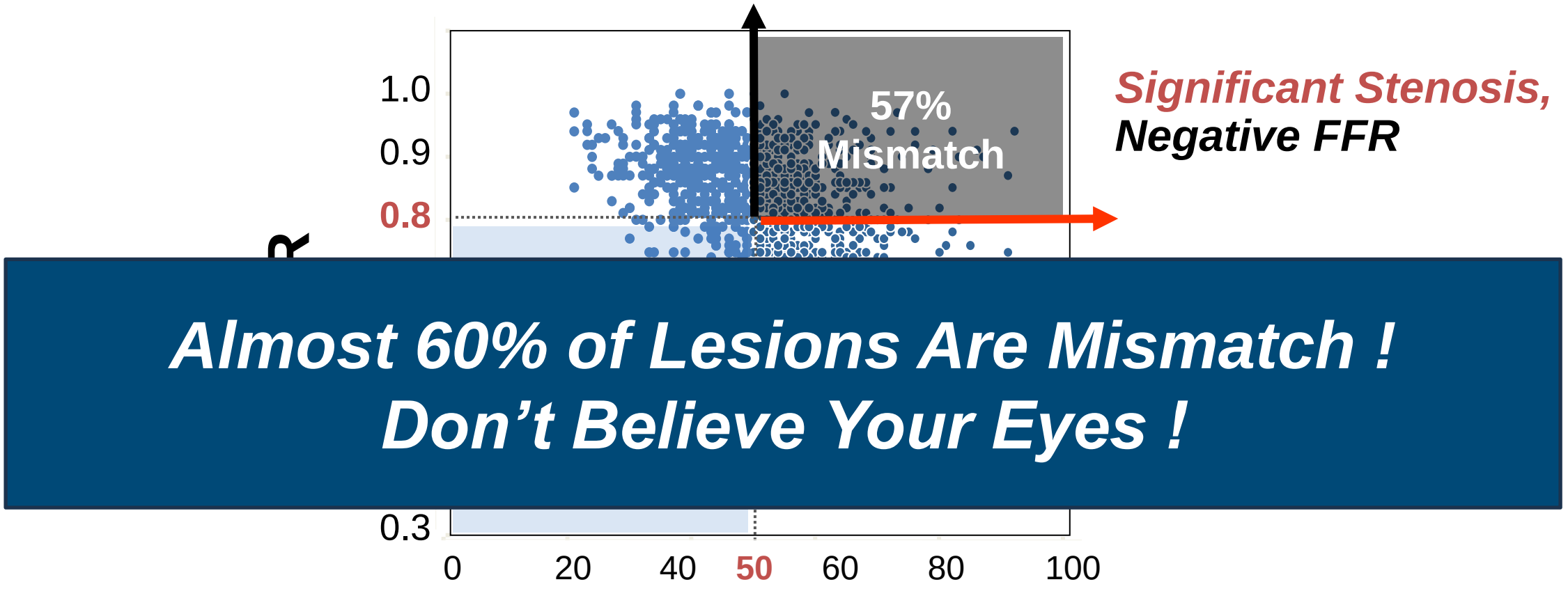
Ahn JM, et al, AJC 2015 Oct;116(8):1163-71.
Escaned J, Banning A, Serruys PW. Eur Heart J. 2017 Nov 7;38(42):3124-3134.
Kang DY, et al. Circ Cardiovasc Interv 2021;14(10):e011011

Current Guideline of FFR

2018 ESC Guidelines,
2021 ACC/AHA/SCAI Guideline

Class	Level
I	**A**

Mismatches of Non-LM Stenosis (n=1066)

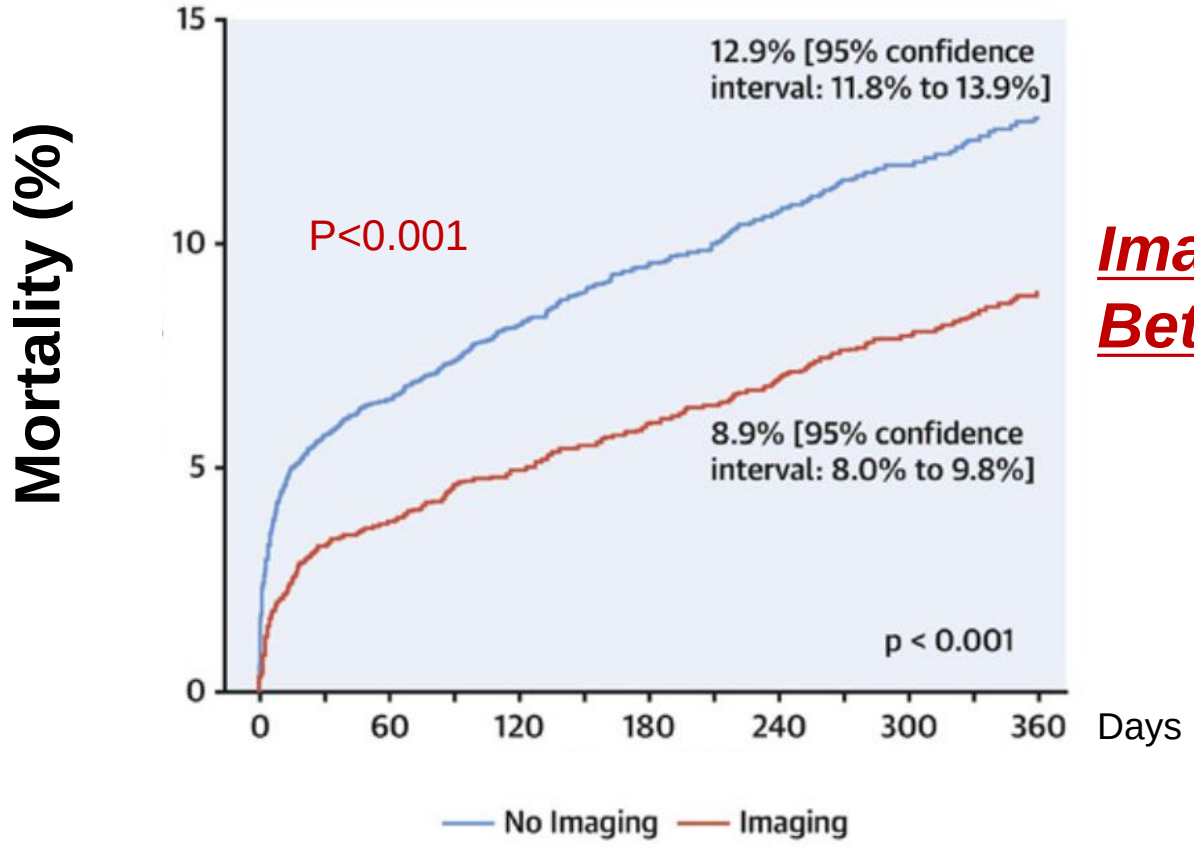


Almost 60% of Lesions Are Mismatch !
Don't Believe Your Eyes !

Park SJ et al, JACC Intv 2012;5:1029 –36

Imaging-Guidance

Propensity Matching 5,056 Pairs of LM PCI British Cardiovascular Intervention Society (BCIS) Registry Data at 1 Year

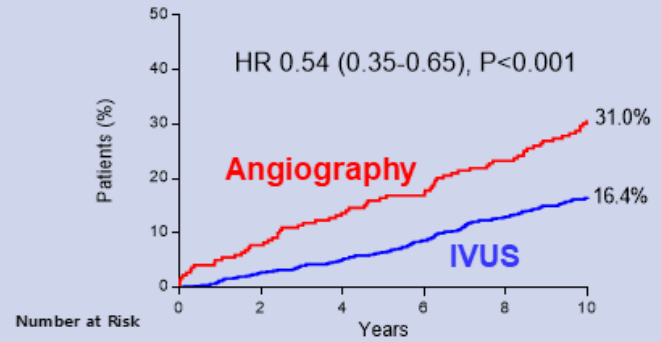
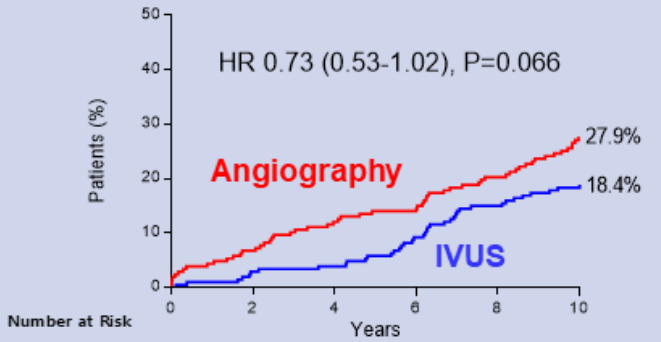
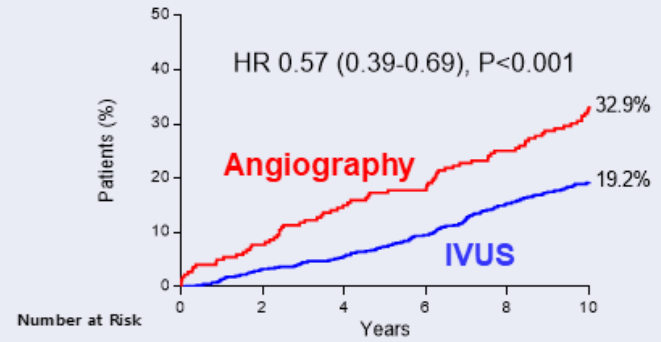
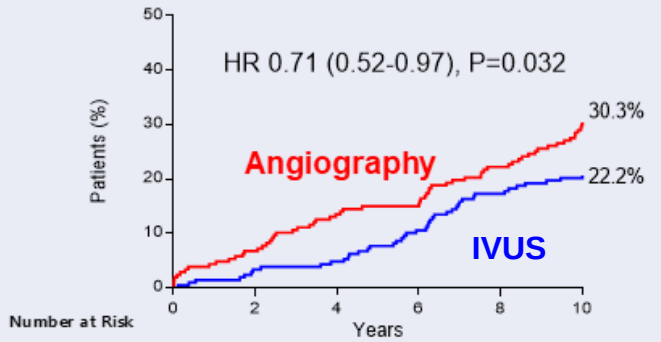


Imaging Guided Has Better Survival !

Kinnaird, T et al. J Am Coll Cardiol Intv. 2020;13(3):346-57

IVUS-Guidance

MAIN-COMPARE 10-Year FU

	Overall Population	After Propensity-score Matching
All-cause death		
Composite of all-cause death, Q-wave MI, or stroke		

Kang DY et al, Circ Cardiovasc Interv. 2021.

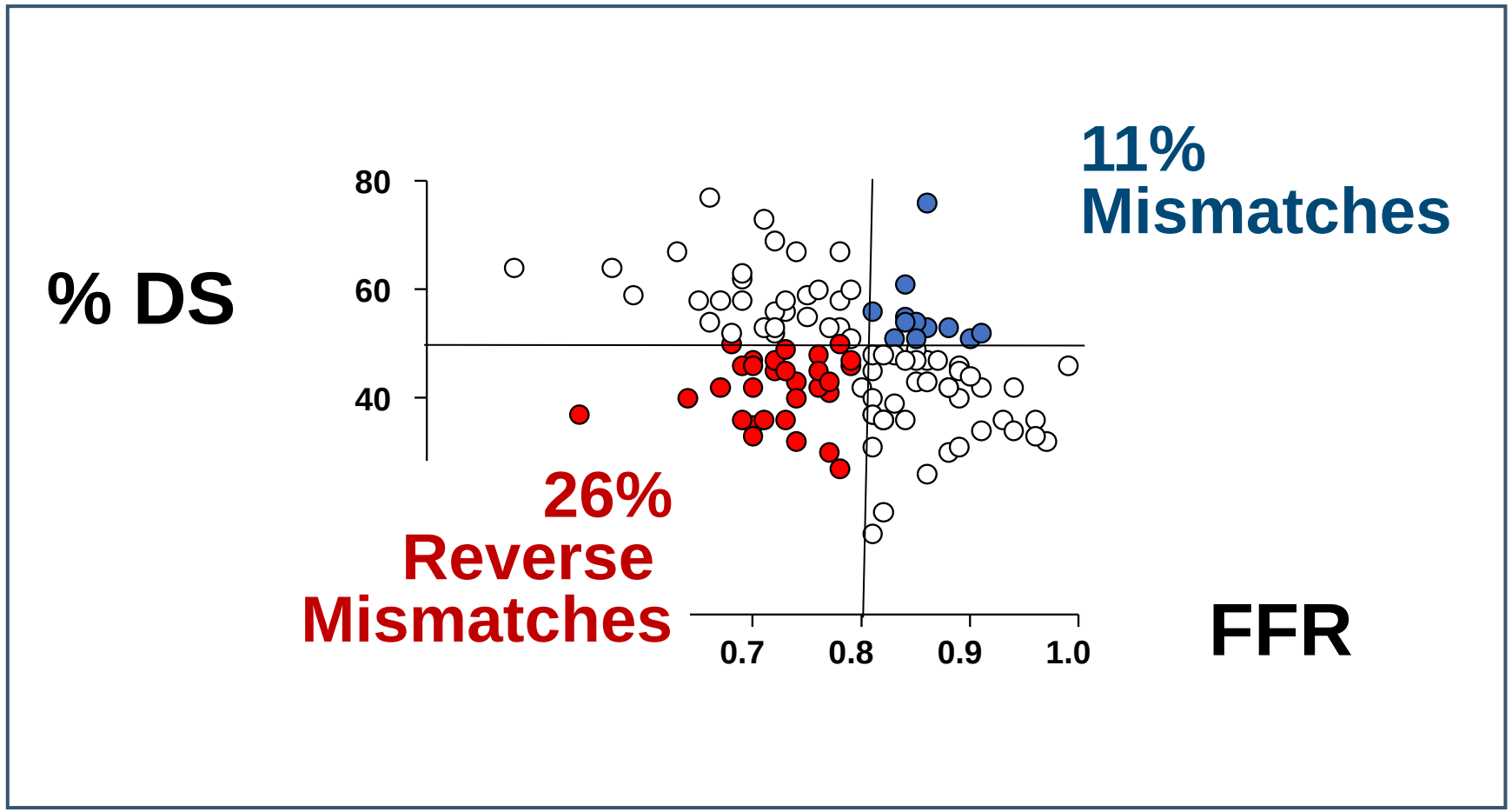
Imaging Guided PCI Has

Better Survival !

Ostial or Shaft LM Disease

Mismatches of Intermediate LM Disease, *Os/Shaft*

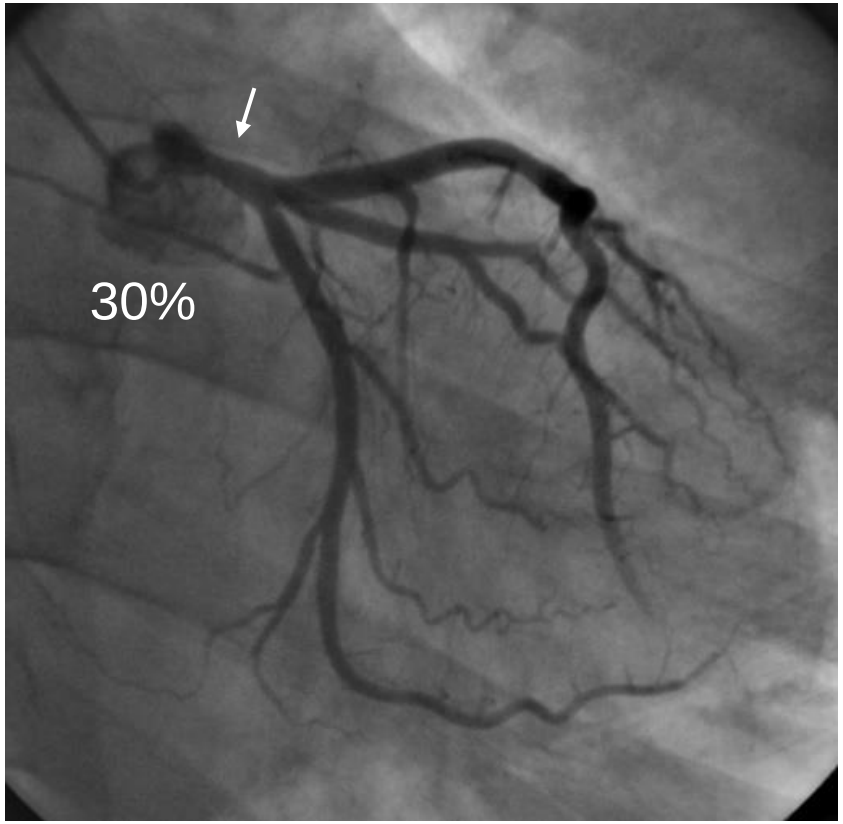
37 %

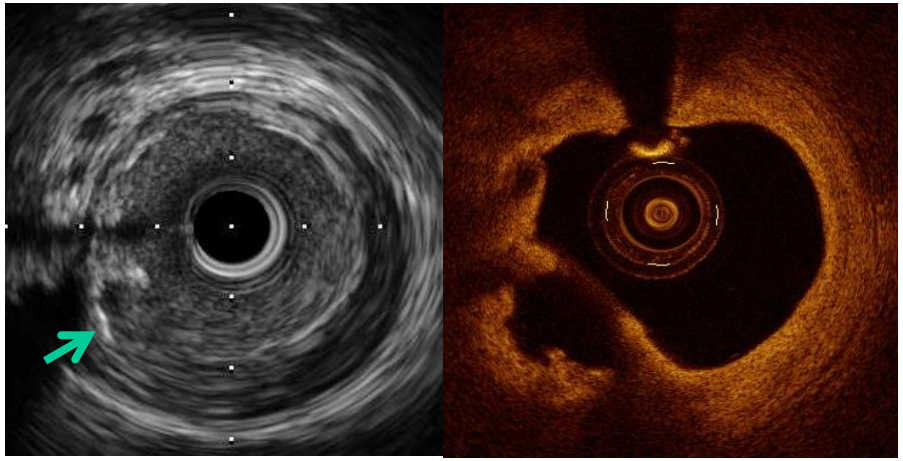


Park SJ et al. *JACC Interv, 2014;7(8):868-874*

Reverse Mismatch

Insignificant Stenosis,
Positive FFR, 0.70



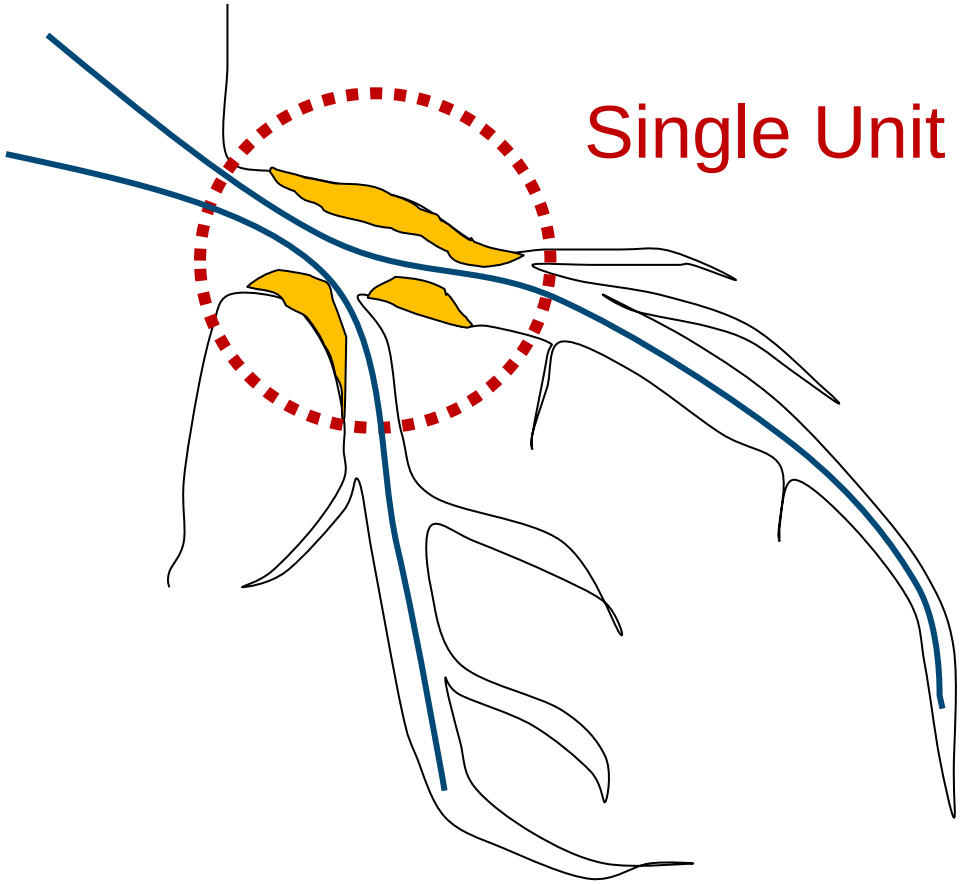


Plaque Rupture, MLA 6.2mm²

Bifurcation LM Disease

FFR for LM Bifurcation

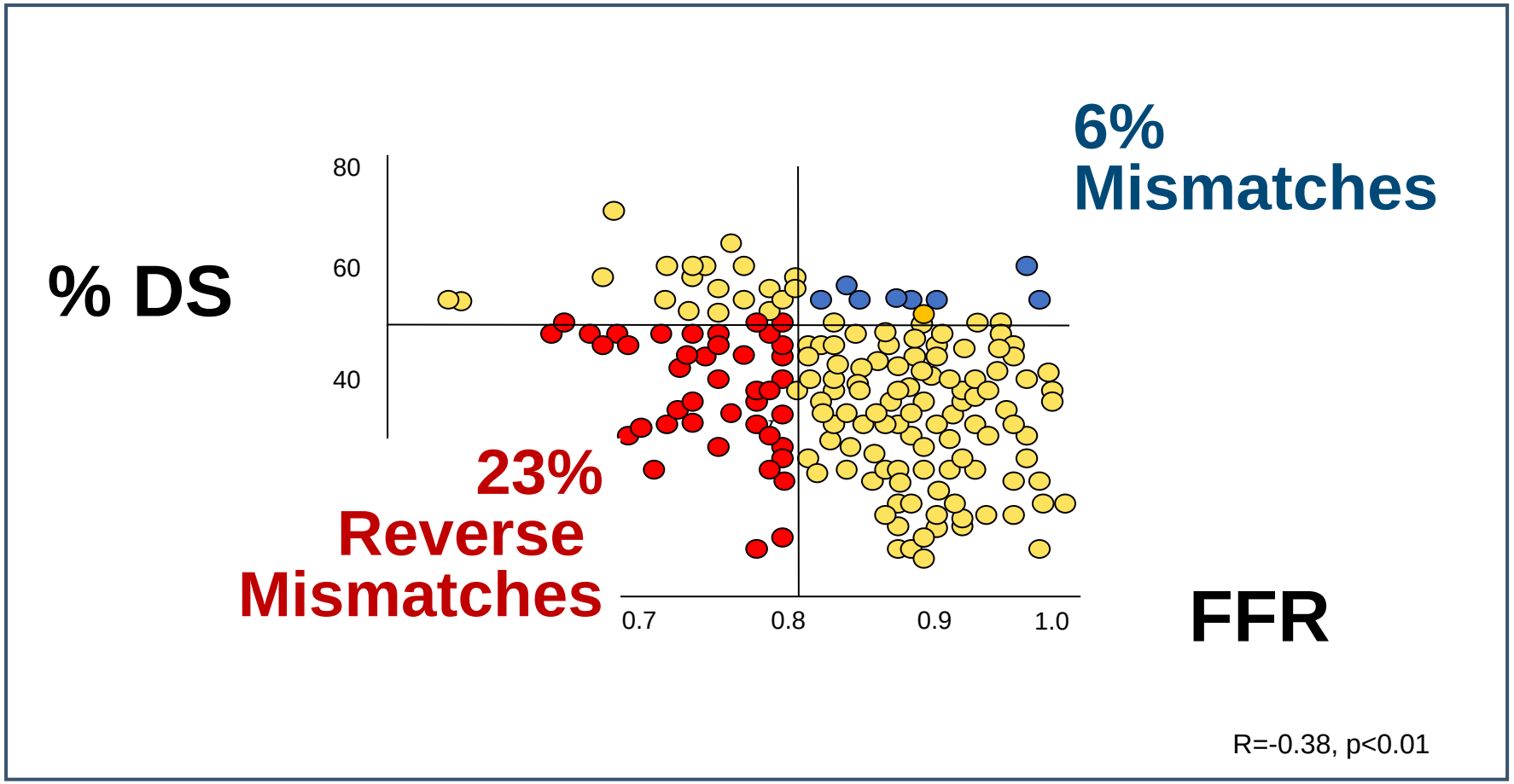
90% of LM Bifurcation Has Downstream Disease



FFR Works !

Mismatches of Intermediate LM Disease, *with Downstream Disease*

29 %



Hamilos M et al. *Circulation 2009;120:1505-1512*

Relatively,

High Frequency

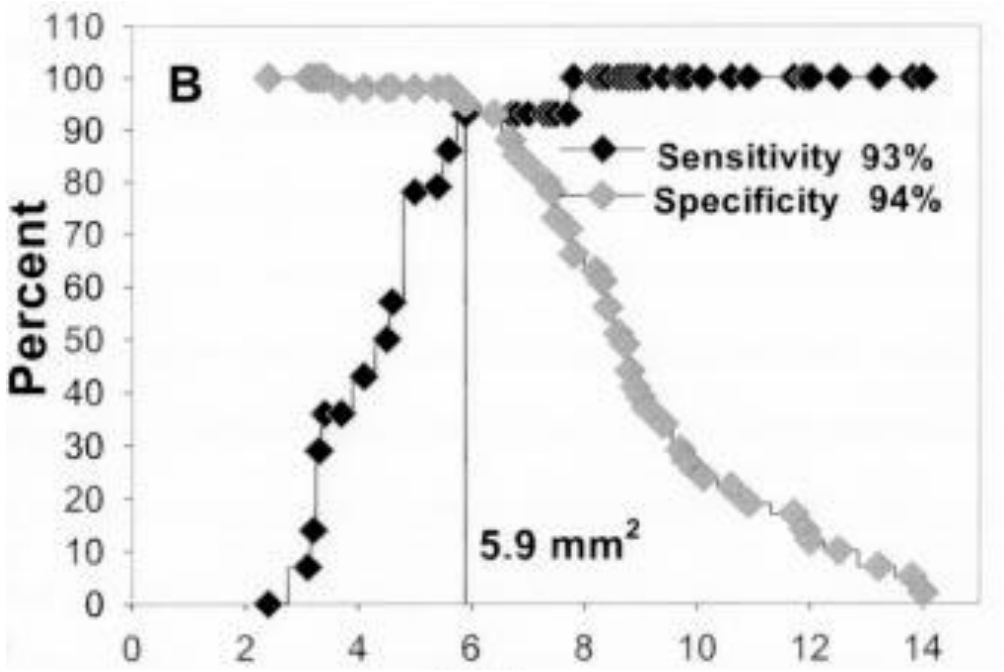
of Reverse Mismatches

In Intermediate Left Main Disease.

Can We Make A Treatment Decision
By IVUS MLA ?

IVUS MLA Matched with FFR

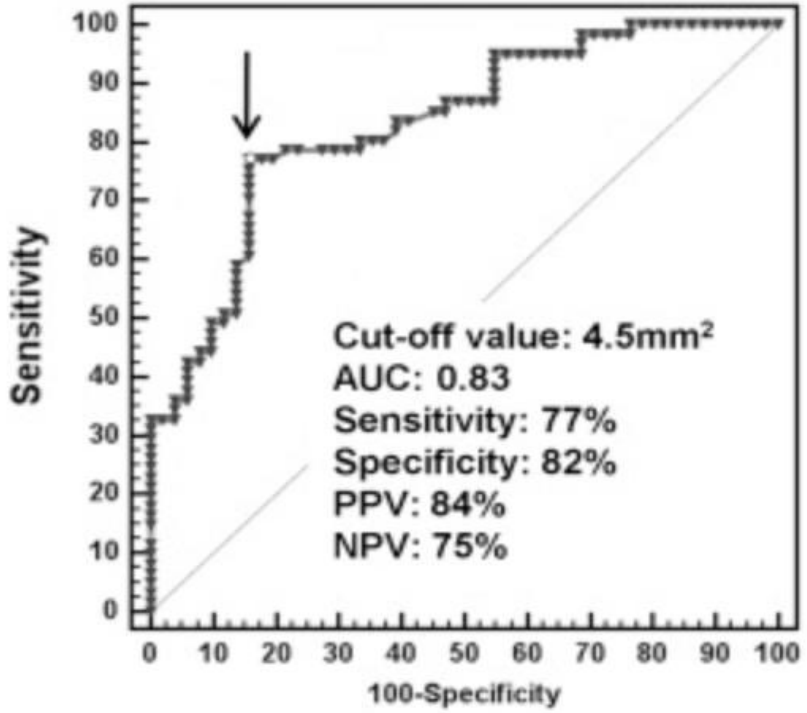
FFR 0.75 Matched with Down stream disease



MLA 5.9 mm²

Jasti, et al. Circulation. 2004;110:2831–2836

FFR 0.80 Matched with Ostial shaft disease

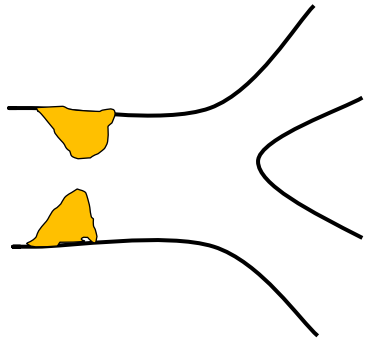


MLA 4.5 mm²

Park, et al. JACC: CI. 2014, 7(8), 868-874

How do We Implement ?

Ostial and Shaft



< 4.5 mm^2

Positive FFR

(83%)

Down Stream Disease

4.5~6.0 mm^2

Consider FFR !

> 6.0 mm^2

Negative FFR

(94%)

J Am Coll Cardiol. Dec 09, 2021. Epublished DOI: 10.1016/j.jacc.2021.09.006

LM Bifurcation PCI

1 Stent, ***Normal or Small Diminutive LCX,***
(< 2.5 mm in diameter)

2 Stent, ***True Bifurcation Disease***
in Large LCX (>2.5 mm),

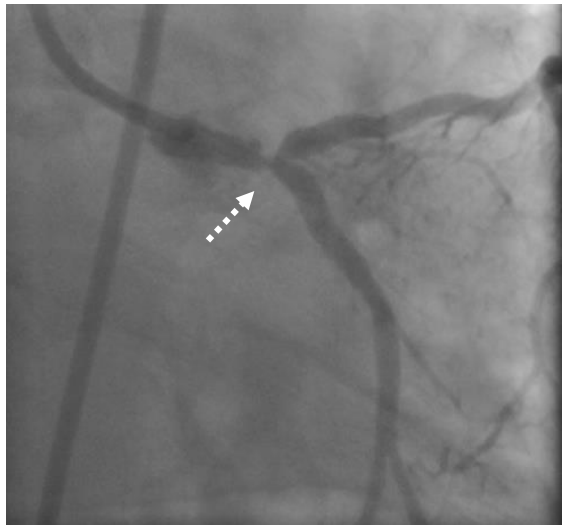
Park SJ, Textbook of Bifurcation Stenting 2007

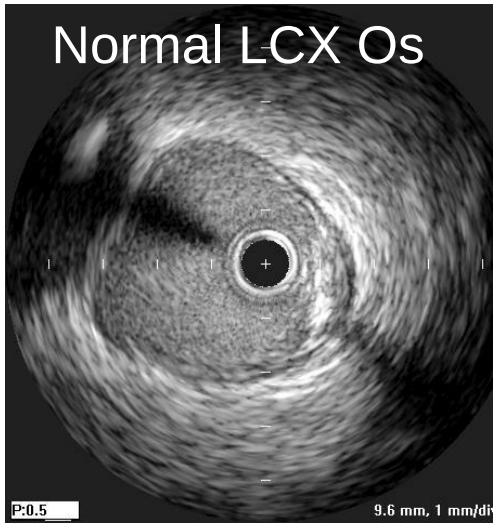
Provisional One stent

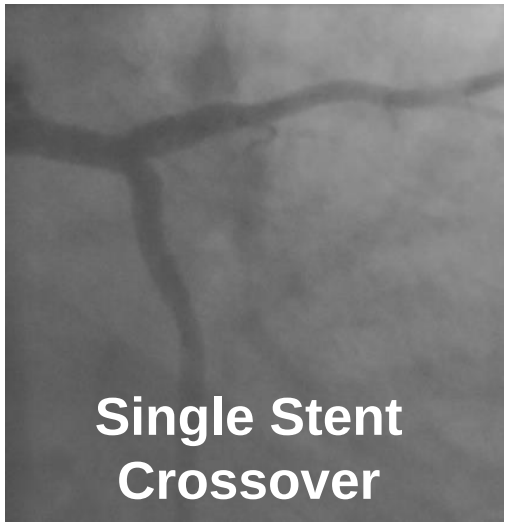
Normal or Diminutive Small LCX,
(< 2.5 mm in diameter)

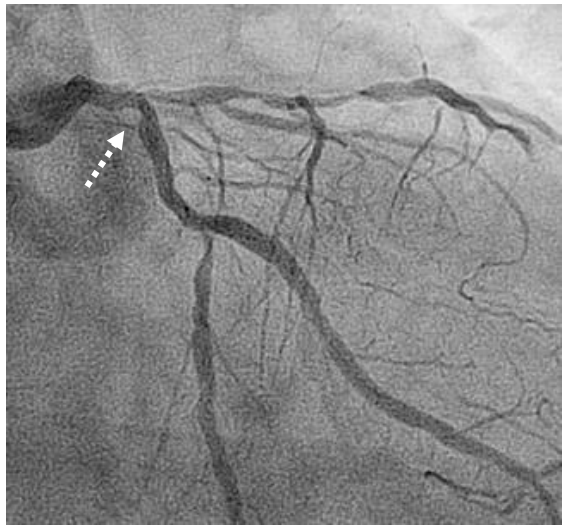
1 or 2 Stents

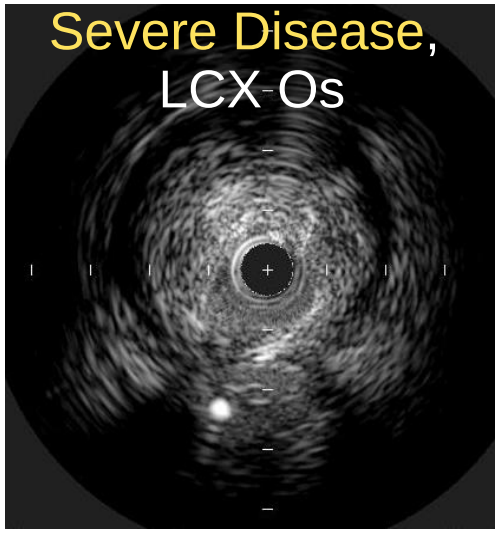
According to LCX Disease Status by IVUS

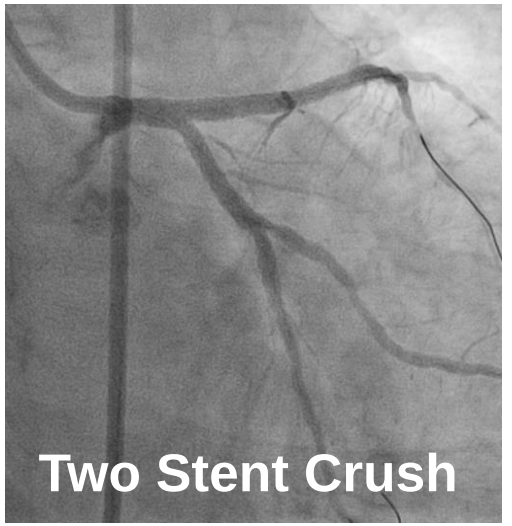




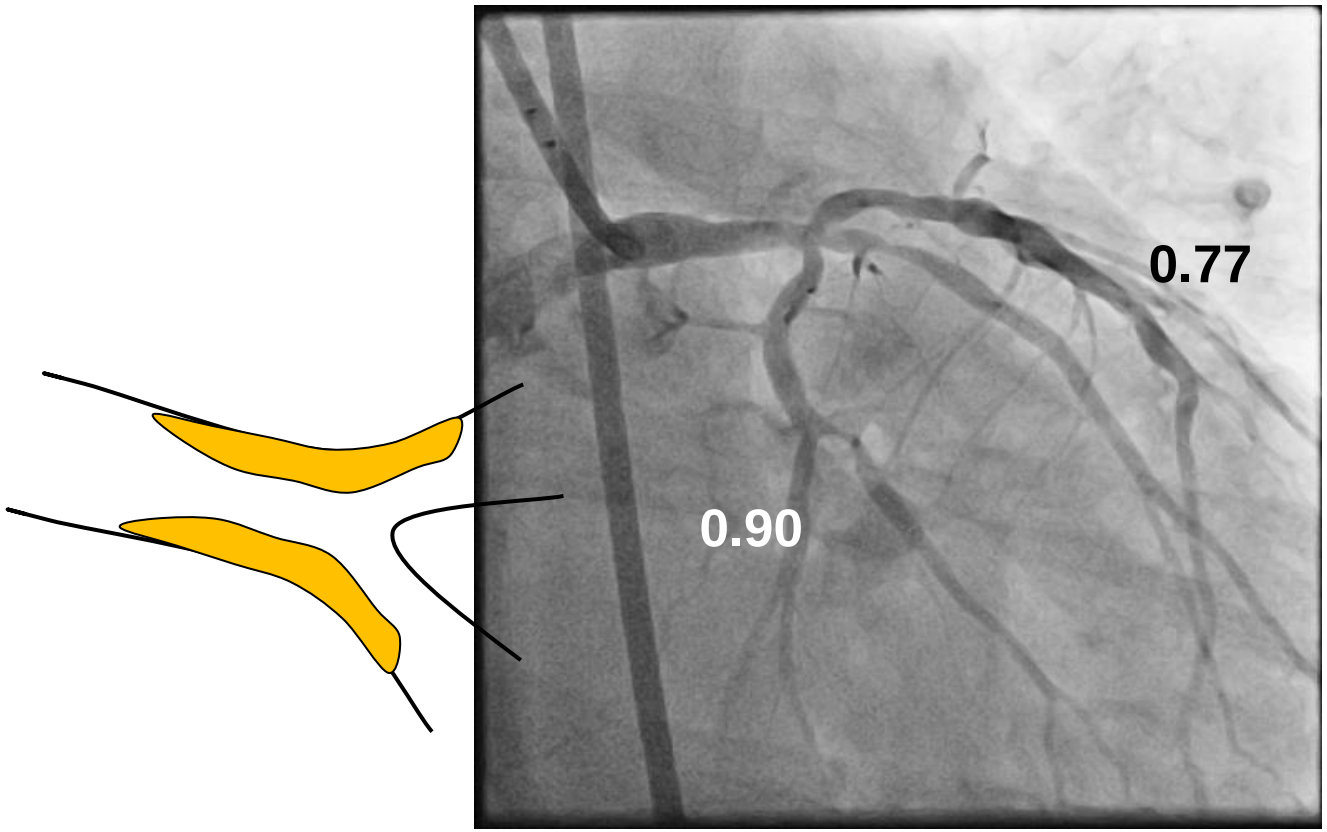






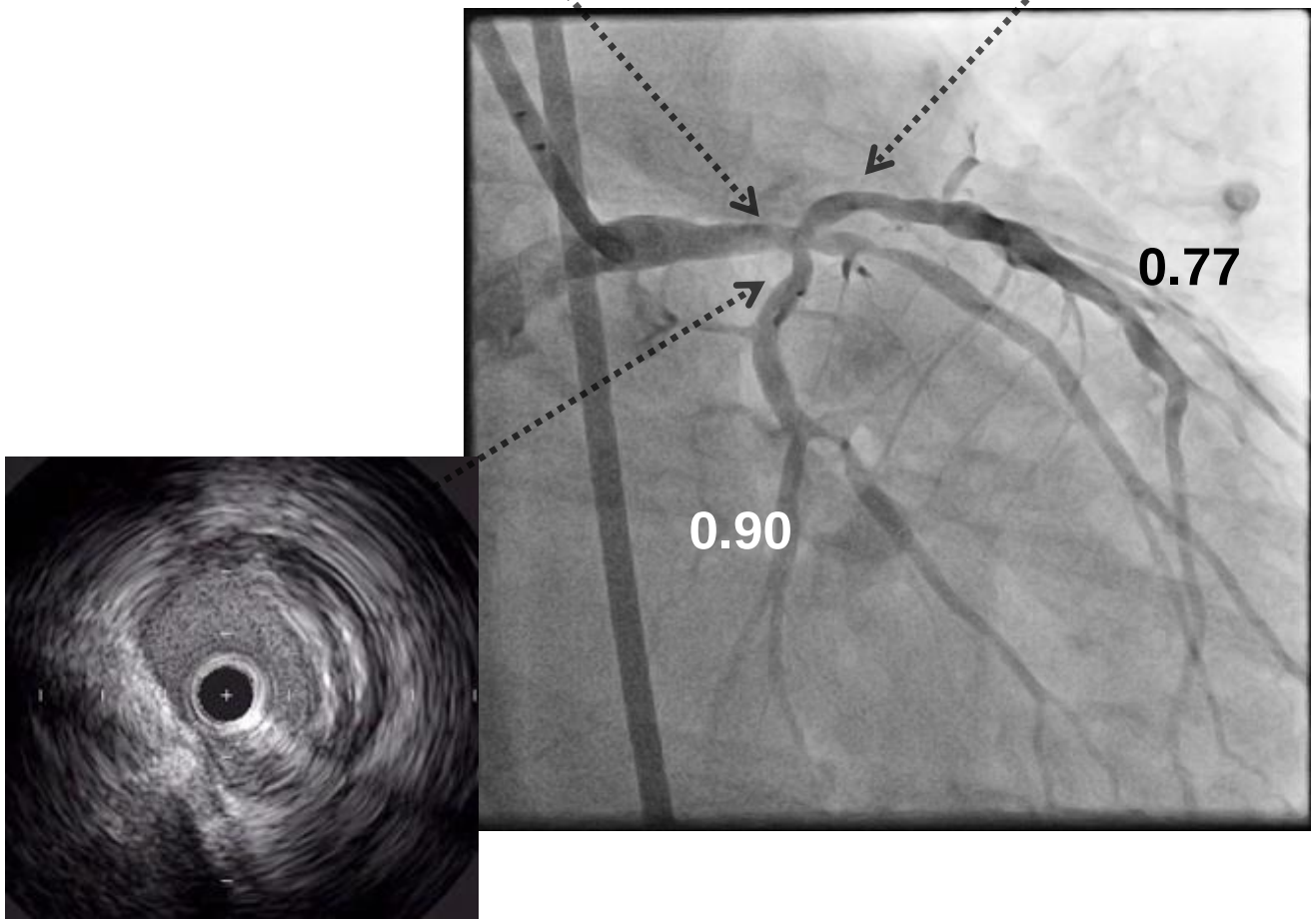


How to Treat?



MLA 5.3 mm^2

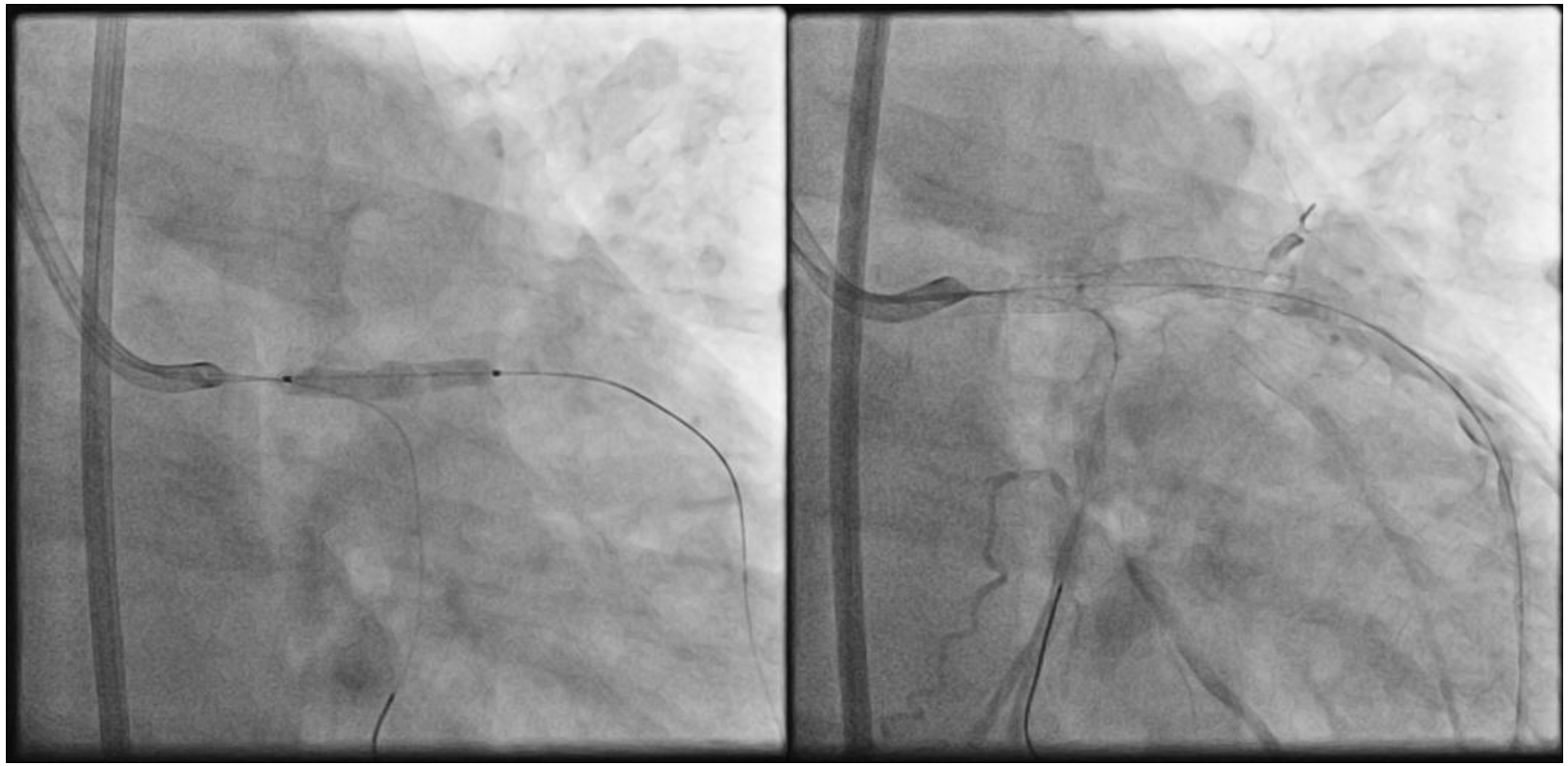
MLA 3.2 mm^2



MLA 3.3 mm^2

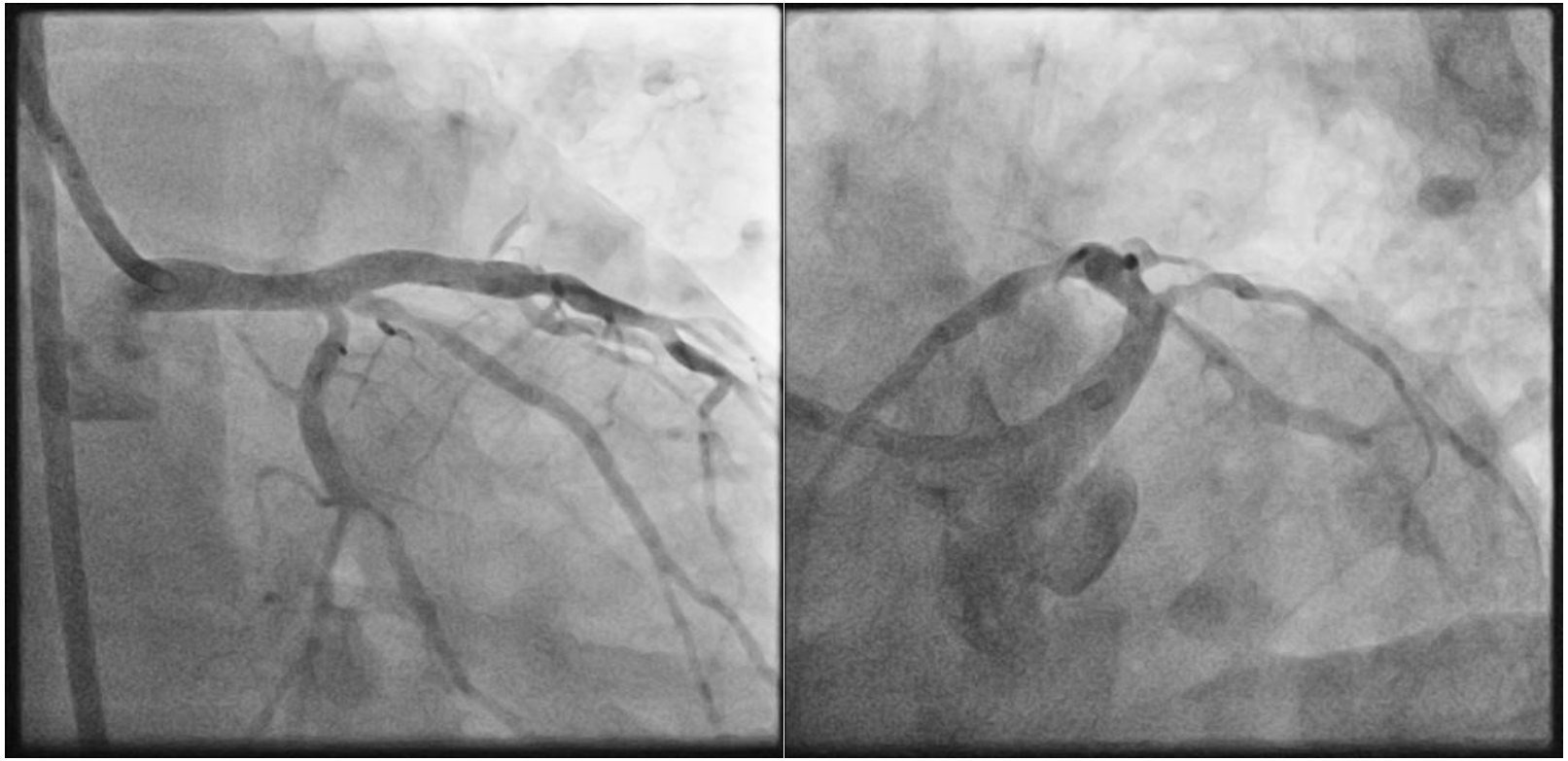
Not Significant Disease on LCX Ostium

1 Stent Crossover

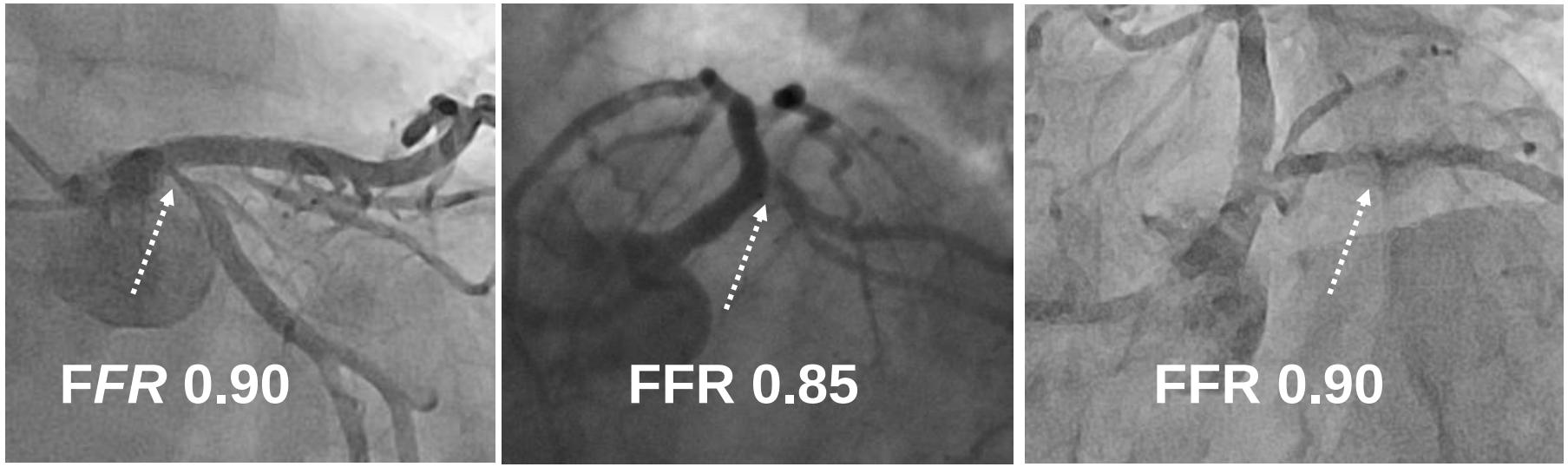


XIENCE Alpine
4.0mm x 30mm

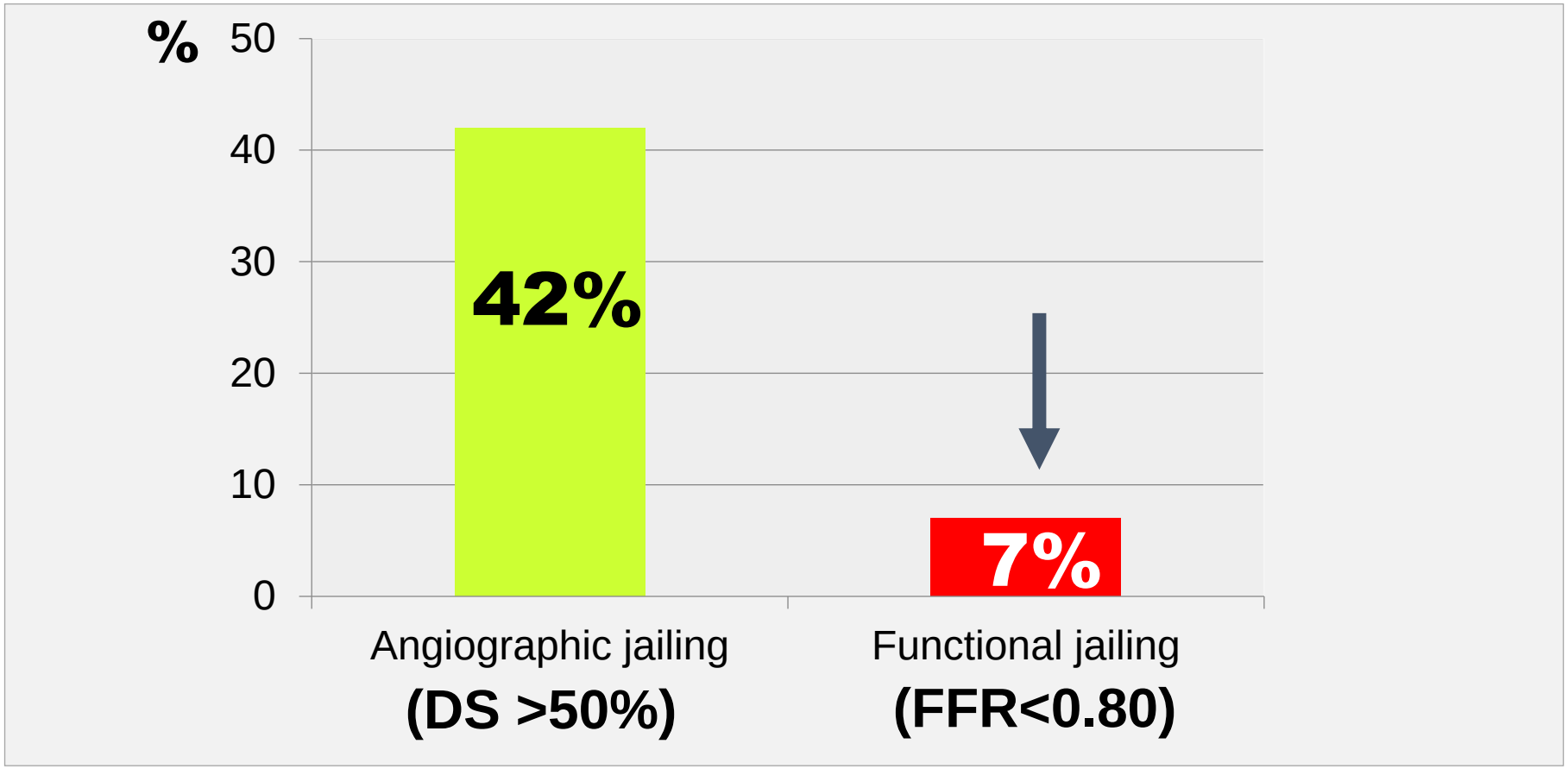
Final Angiogram



Many Mismatches Between Morphologic LCX Jailing and FFR



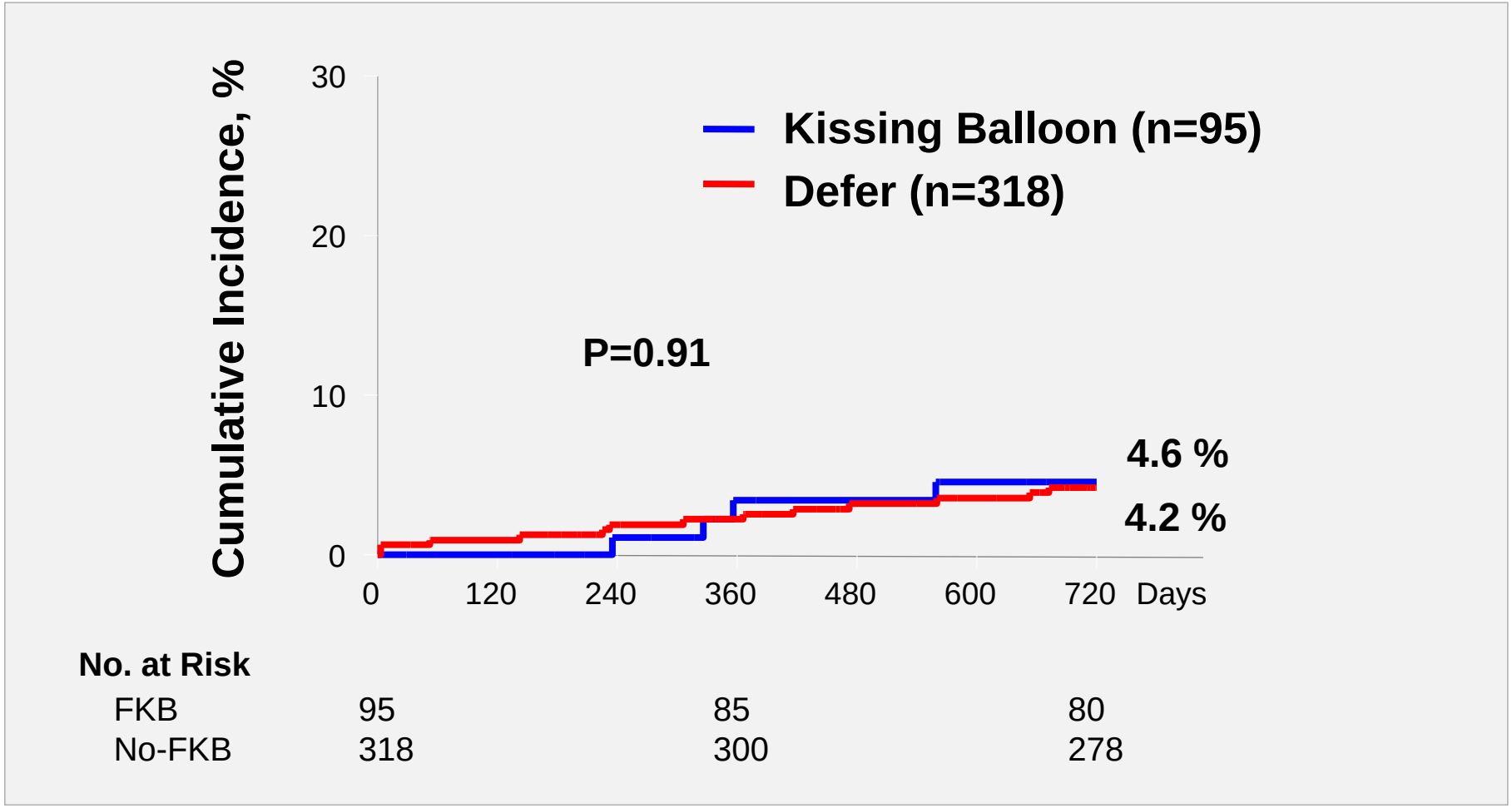
Functionally Significant LCX Jailing Is Only 7%



Kang SJ, Catheterization and Cardiovascular Interventions. 2014;83(4):545-52.

Death or MI at 2 Years

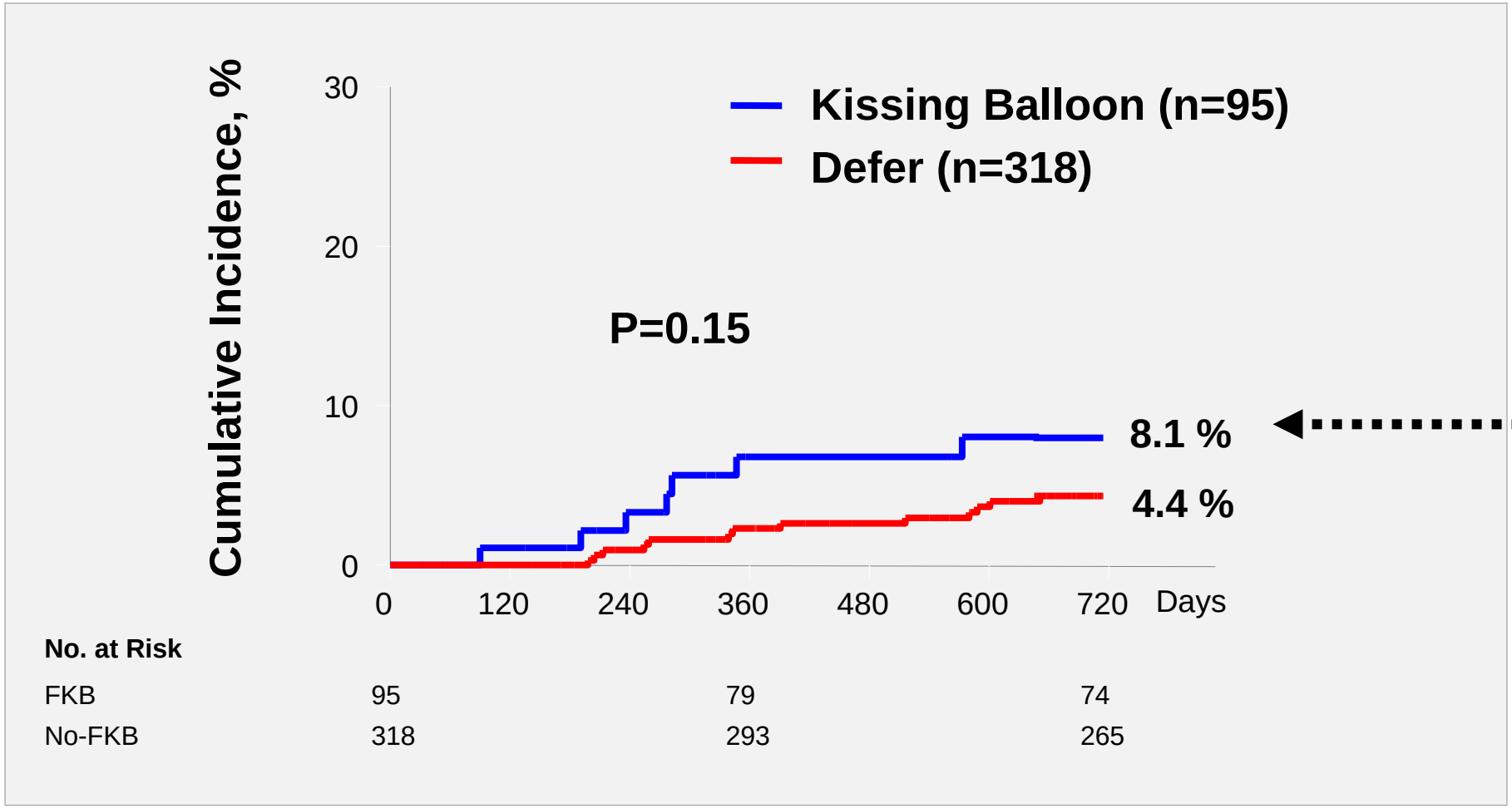
No Difference !



Ahn JM et al, AJC 2017 15;119(4):528-534.

TLR at 2 Years

If You Do Touch, May Increase TLR ?



Ahn JM et al, AJC 2017 15;119(4):528-534.

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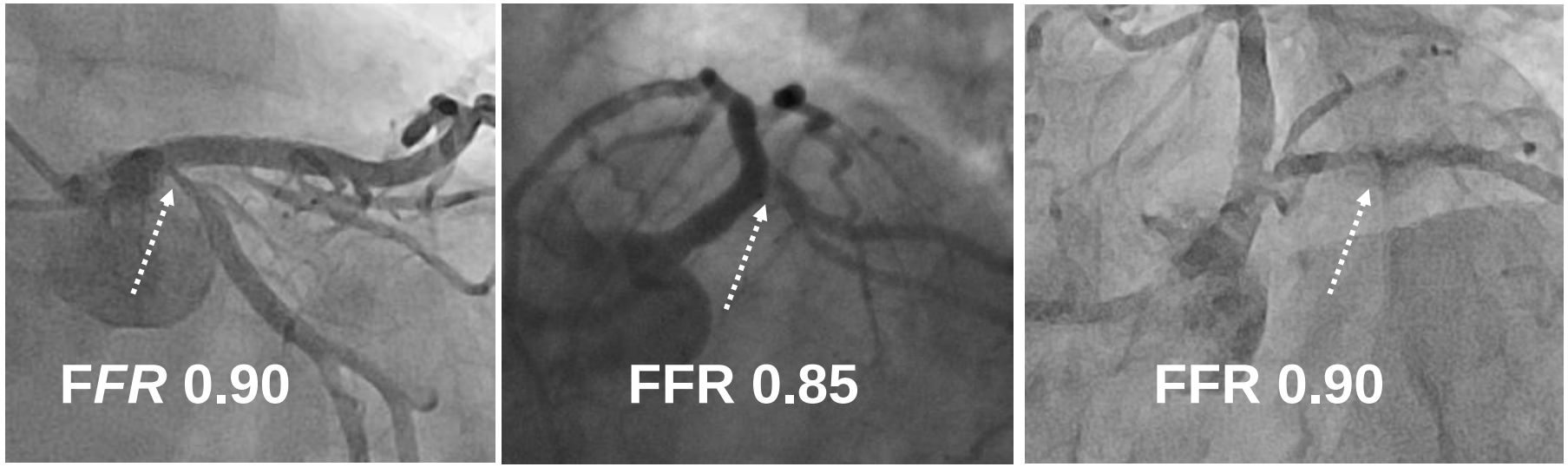
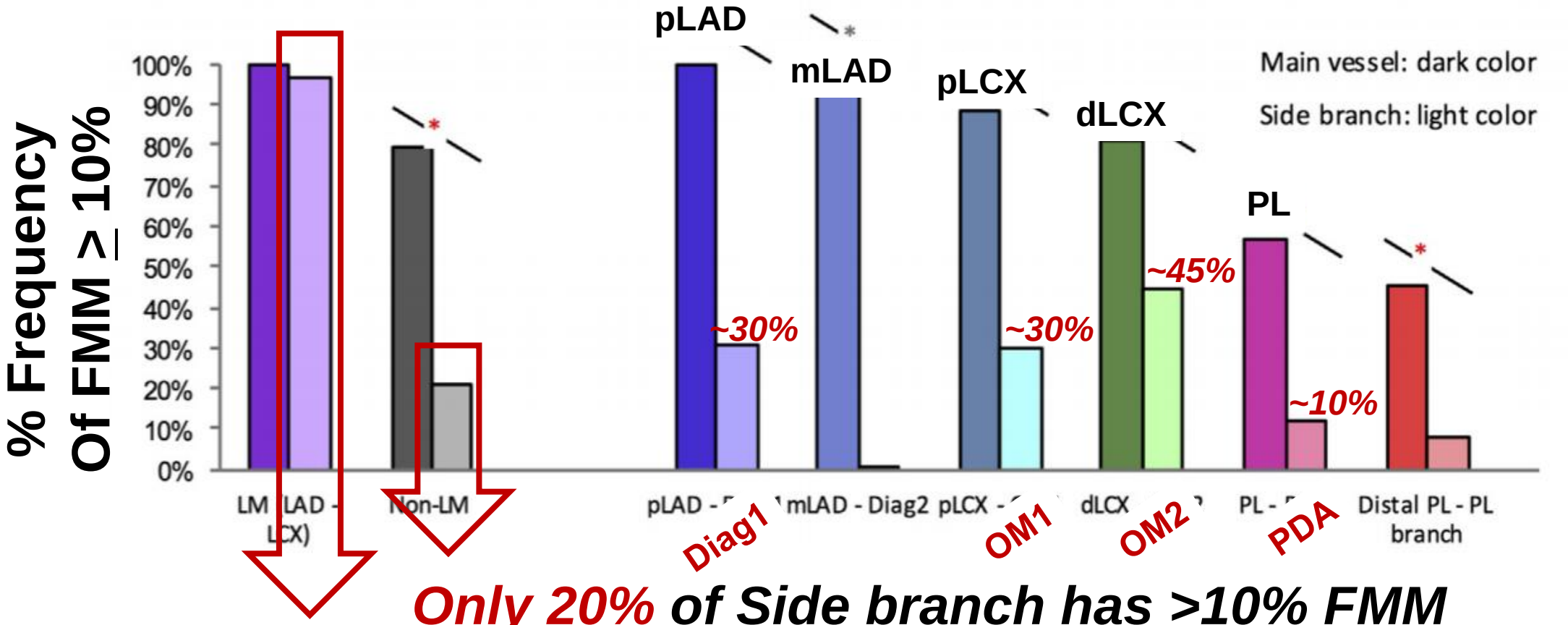


Don’t Touch! Leave It Alone !

Upfront 2 stents

True Bifurcation Disease in Large LCX
(Medina 1.1.1, or 0.1.1, ≥2.5 mm)

Frequency of Fractional Myocardial Mass >10%



Only 20% of Side branch has >10% FMM

>90% of LCX has >10% FMM

Kim HY, et al. JACC Intv 2017;10:571–81

Left Circumflex Artery Is Usually
Big Enough To Treat !

Zhang JJ, Ye F, Xu K, et al. Eur Heart J 2020;Jun 26 (DEFINITION 2)

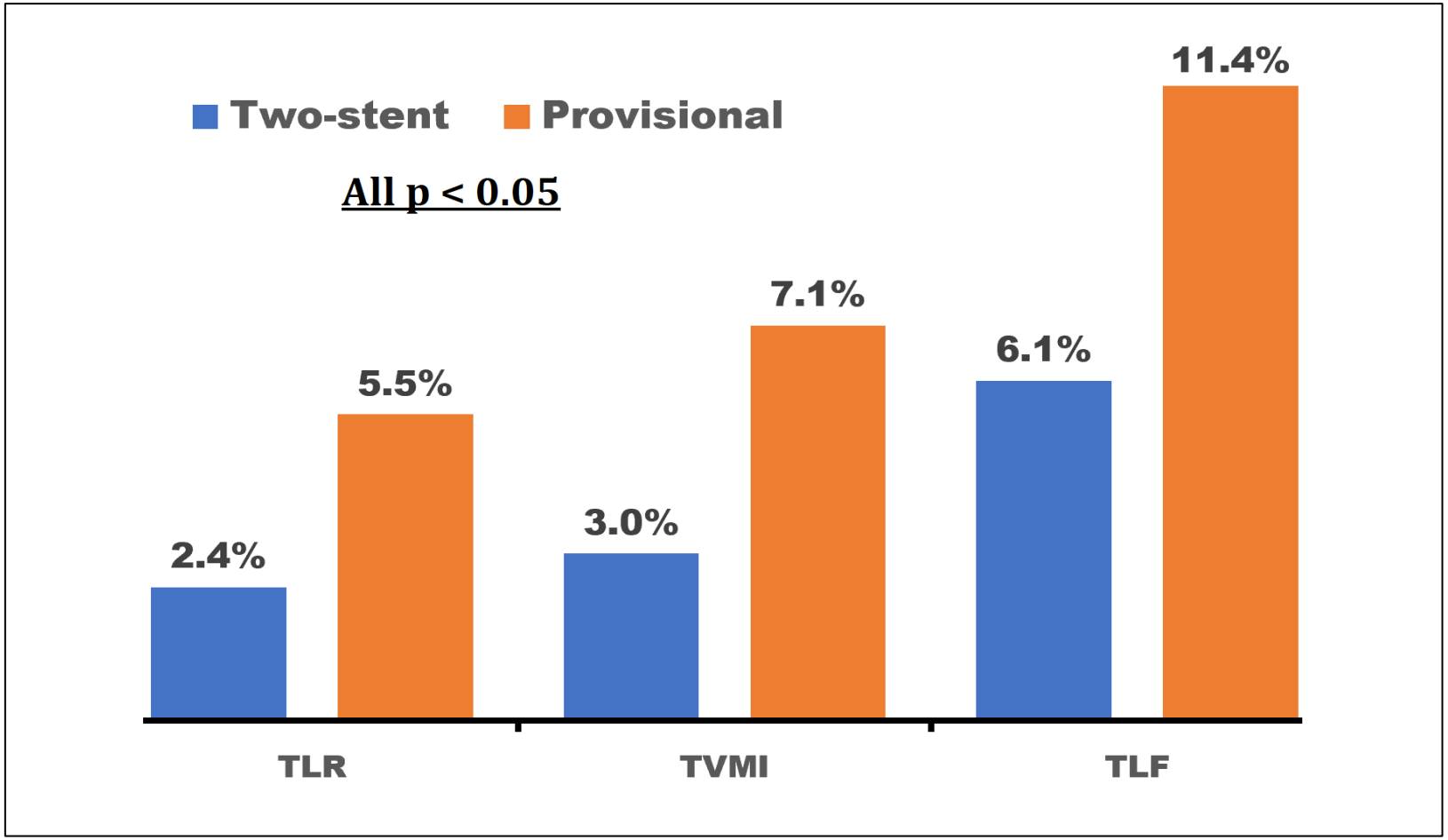
Cheol Hyun Lee, et al. Catheter Cardiovasc Interv. 2021;97:776–785.

Upfront 2 Stents

1. ***Upfront 2 Stents Strategies Would Be Safe and Good !***
2. **We Can Avoid Risk of Side Branch Closure.**
3. **Clinical Outcomes of 2 Stents Are Good.**

Zhang JJ, Ye F, Xu K, et al. Eur Heart J 2020;Jun 26 (DEFINITION 2)
Cheol Hyun Lee, et al. Catheter Cardiovasc Interv. 2021;97:776–785.

2 Stent Is Better !



DKCRUSH For All Complex Bifurcations (RVD>2.5mm)

Zhang, et al. Eur H J 2020, Definition II Randomized Study

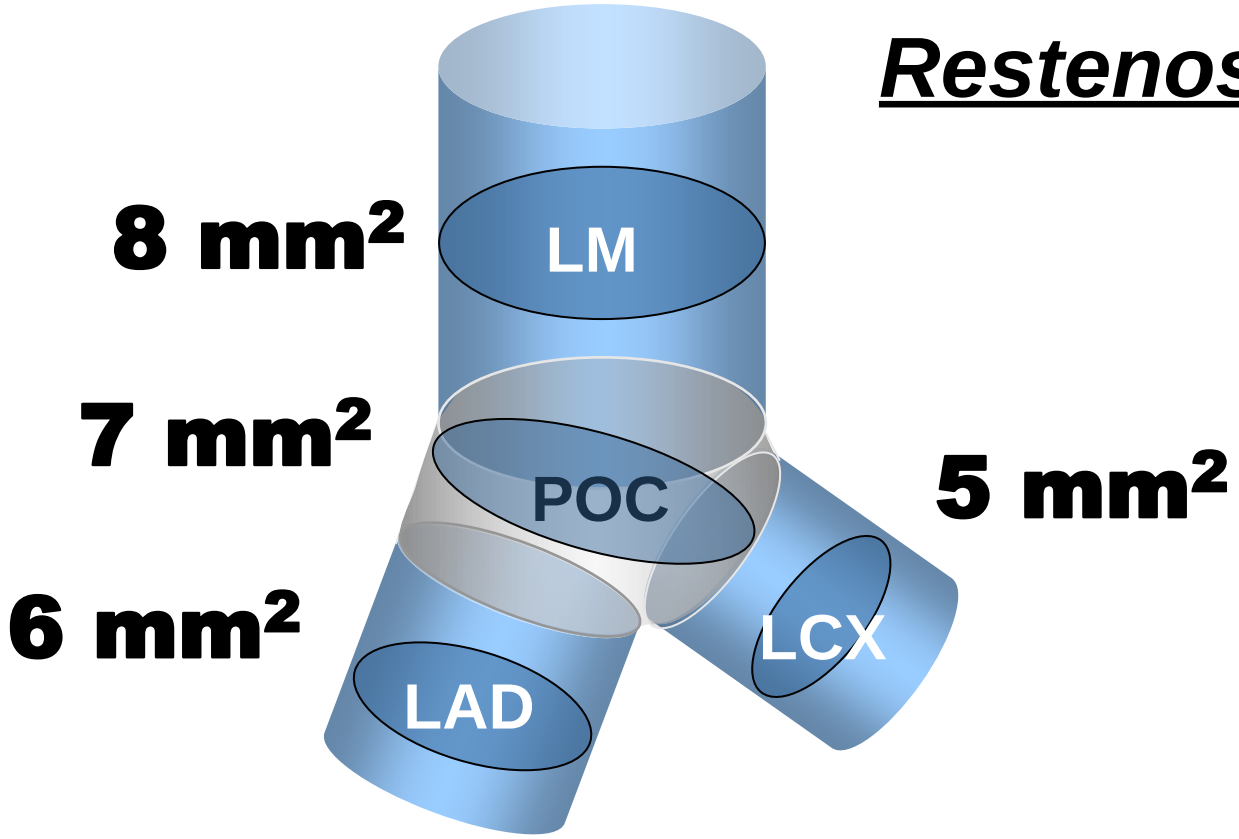
Any 2 Stents Technique

Post-Stenting Minimal Stent Area (MSA)
Is The Only Important Predictor
for Good Clinical Outcomes.

Ahn JM, et al, Preliminary Data from IRIS LM Registry, 2022
Zhang JJ, Ye F, Xu K, et al. Eur Heart J 2020;Jun 26 (DEFINITION 2)
Cheol Hyun Lee, et al. Catheter Cardiovasc Interv. 2021;97:776–785.

Post-Stenting Minimal Stent Area,
According to 9 Month Restenosis Rate

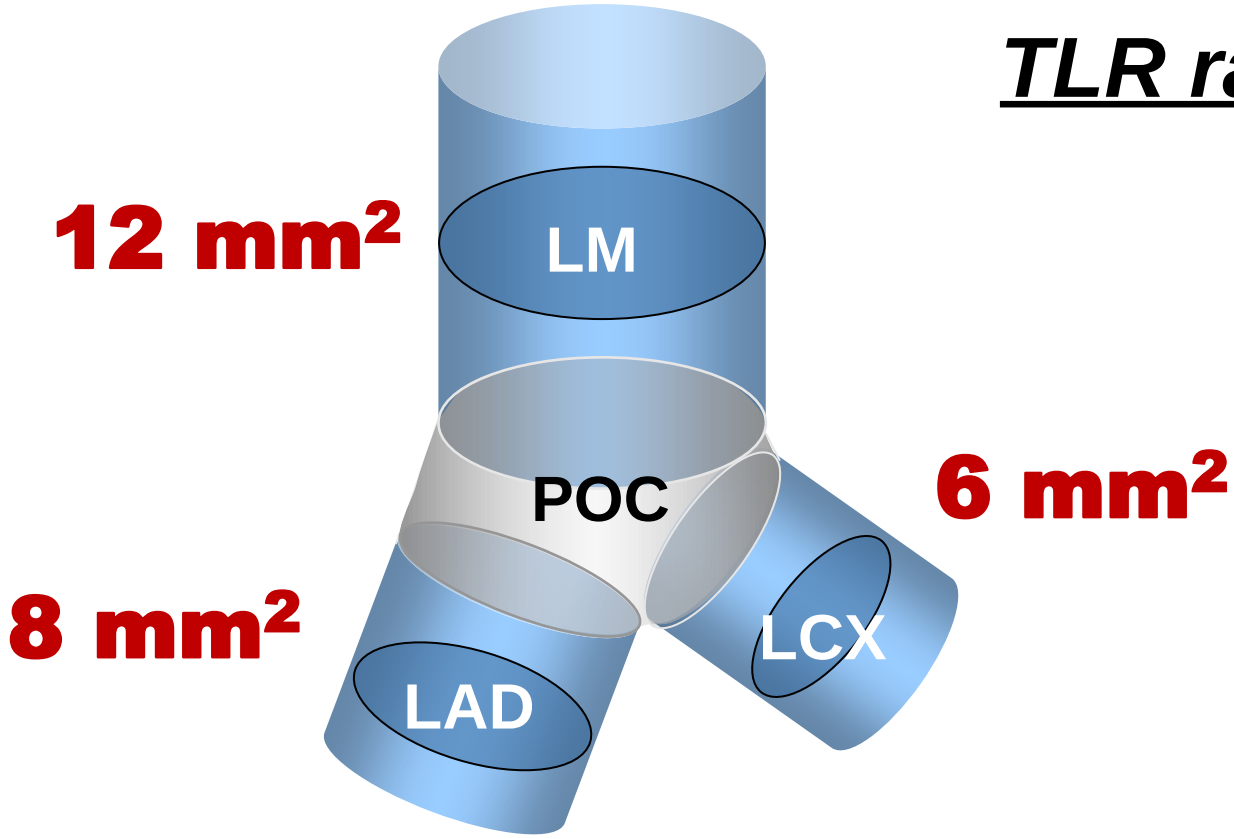
Restenosis rate < 5%



Kang SJ, et al. Circ Cardiovasc Interv 2011;4:562-9

Post-Stenting Minimal Stent Area, ***According to 5 Year MACE Rate***

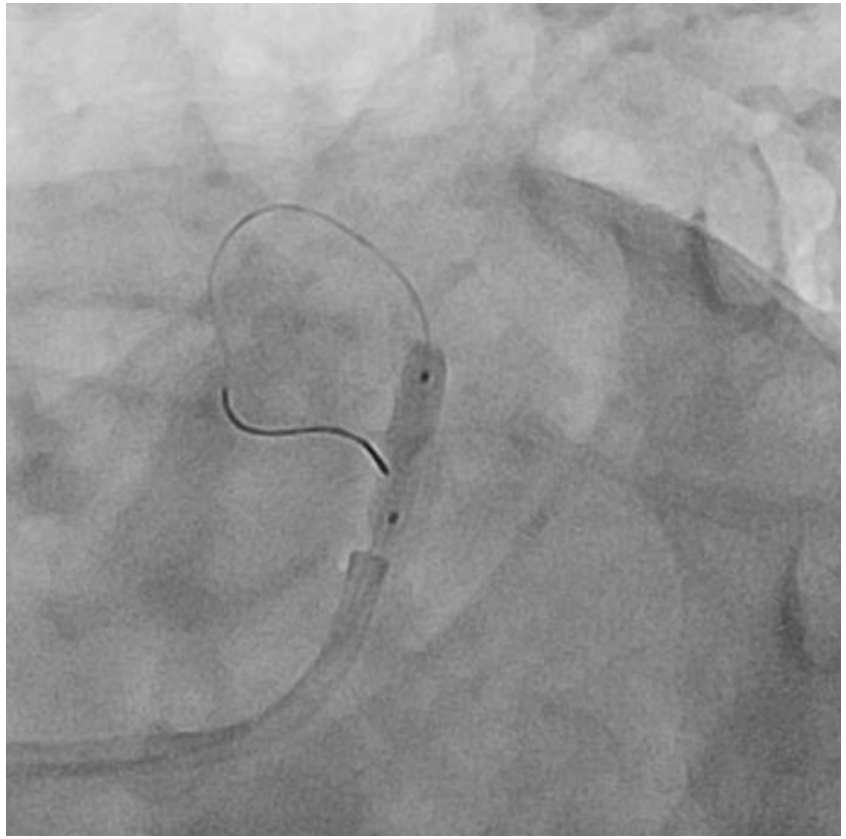
TLR rate < 5%



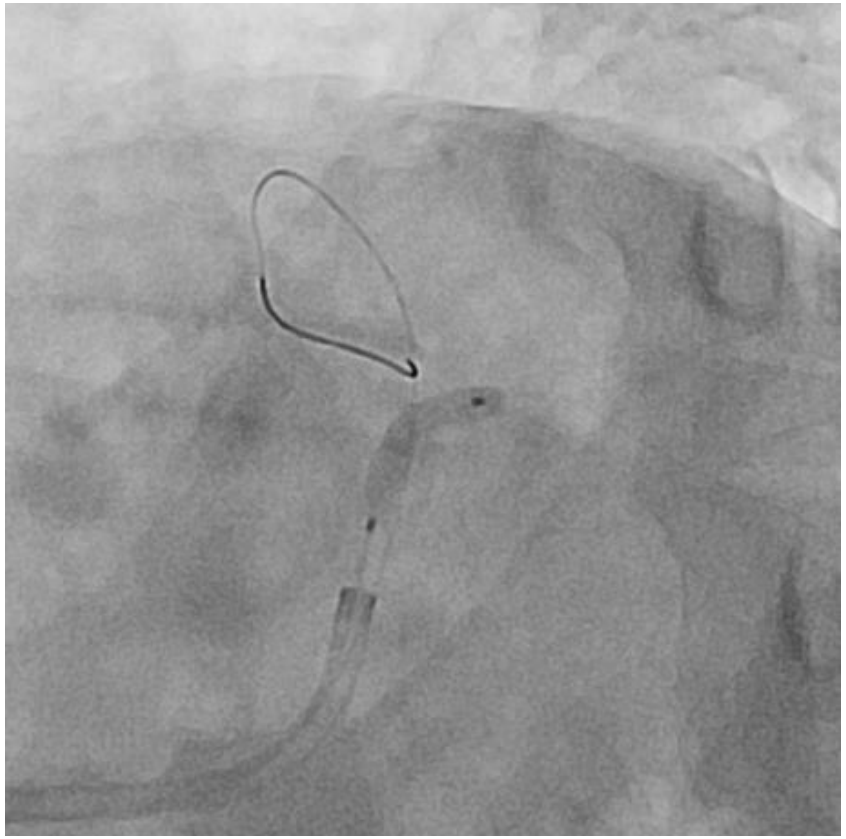
Ahn JM, et al, Preliminary Data from IRIS LM Registry, 2022

Calcific LM Bifurcation Disease

Pre-Lesion Modification

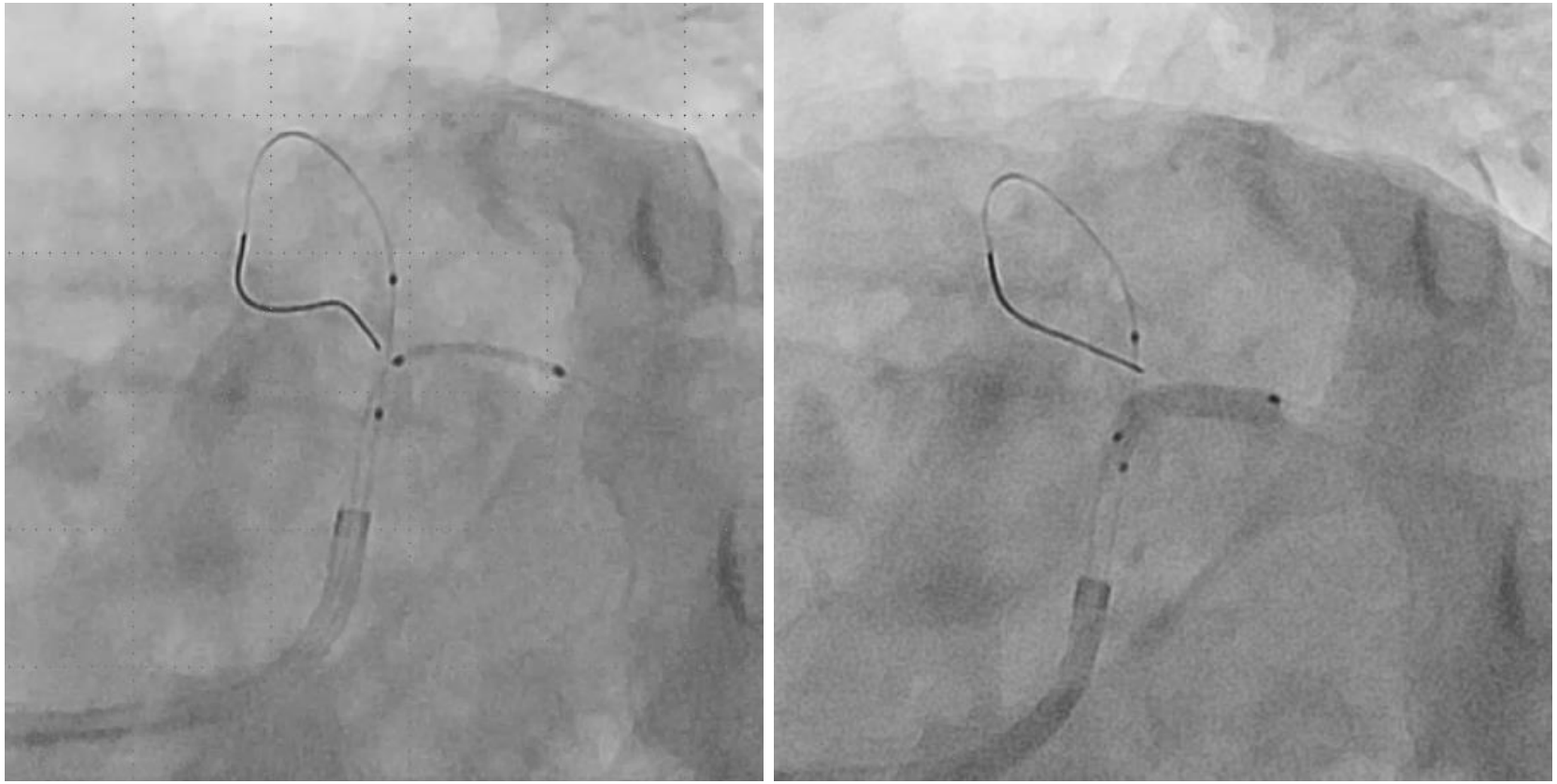


LAD : NC 3.5 (15)
upto 24 atm



LCX : NC 3.0 (15)
upto 22 atm

LCX Stenting First,



LCX : Xience 2.75 * 15 at 14 atm (2.9)

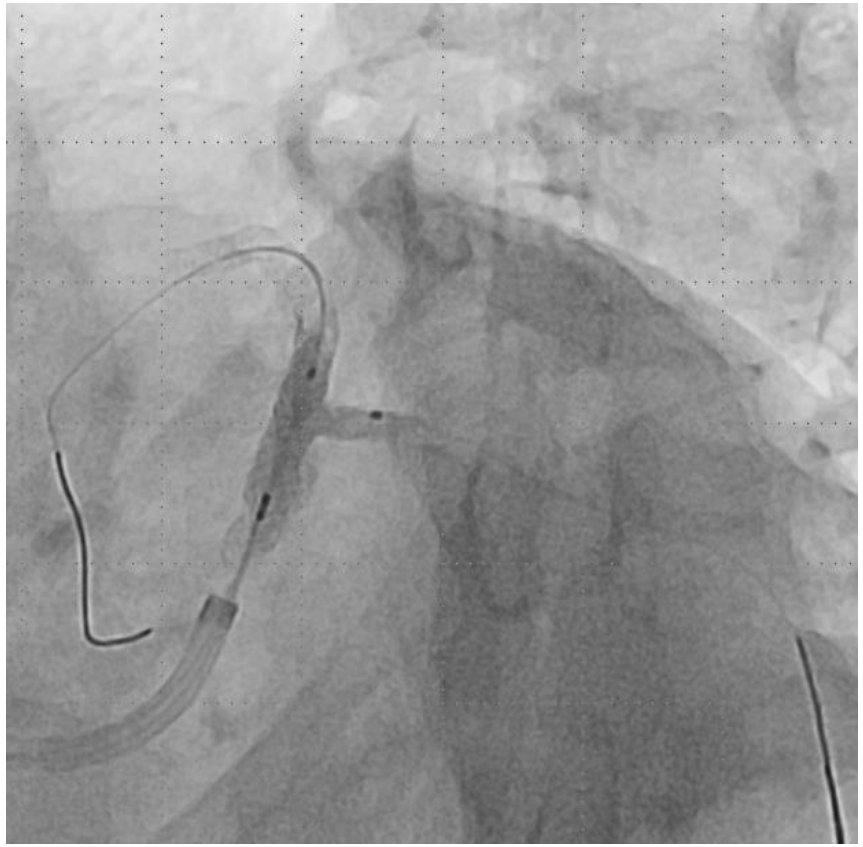
LM-LAD Balloon Crushing

NC 3.5mm
upto 16-22 atm

LM-LAD Stent Implantation

Xience 3.5 * 28 at 12 atm (3.5)

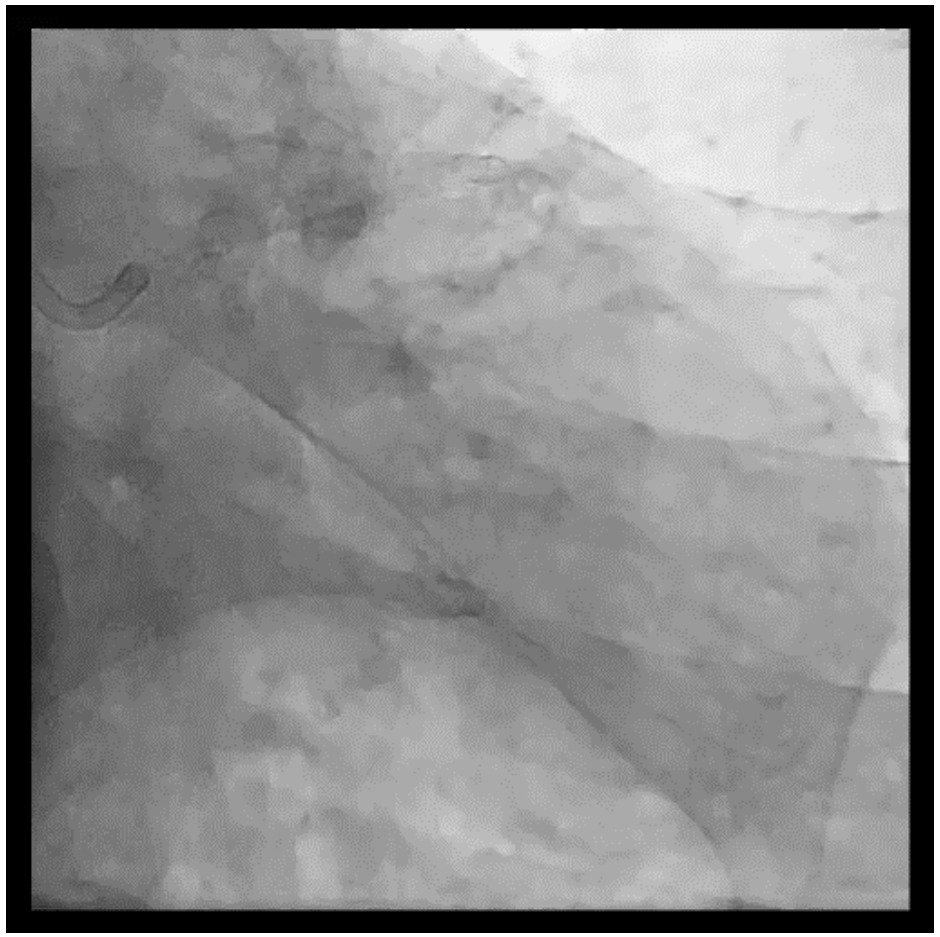
Final Kissing Balloon



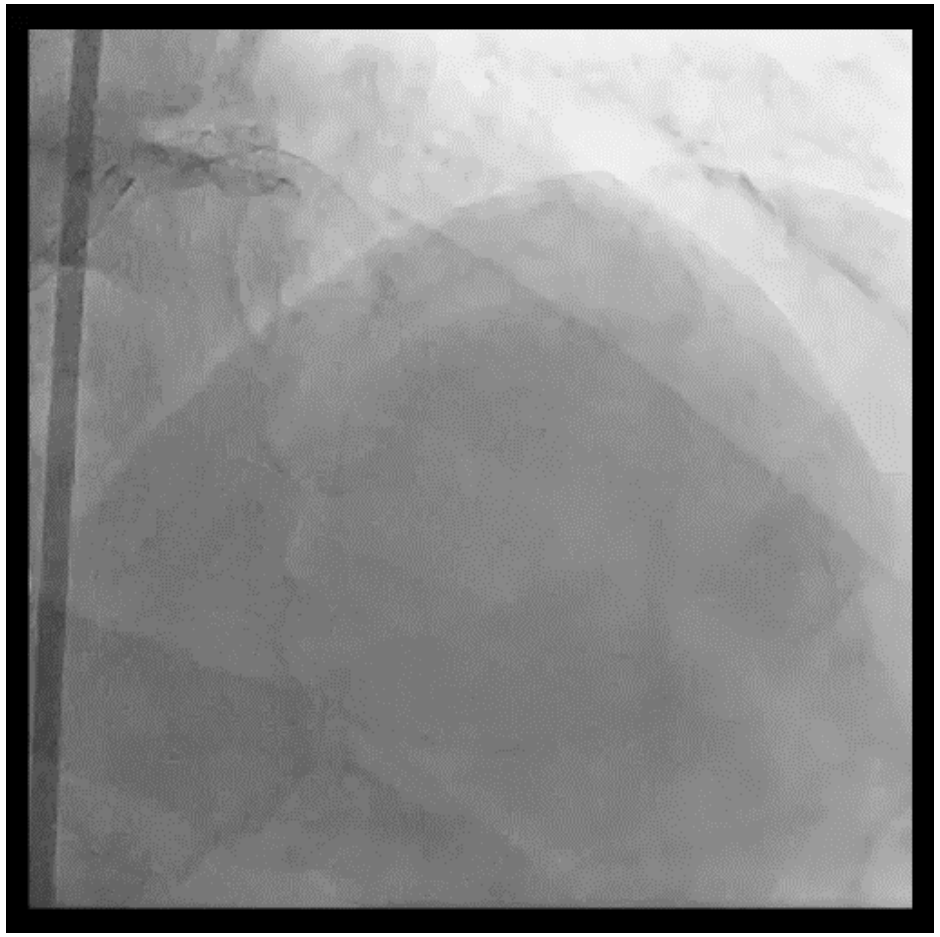
LM-LAD : NC 3.5 up to 3.5 (10 atm)
LM-LCX : NC 3.0 up to 3.0 (10 atm)

Final Result

Final angiography

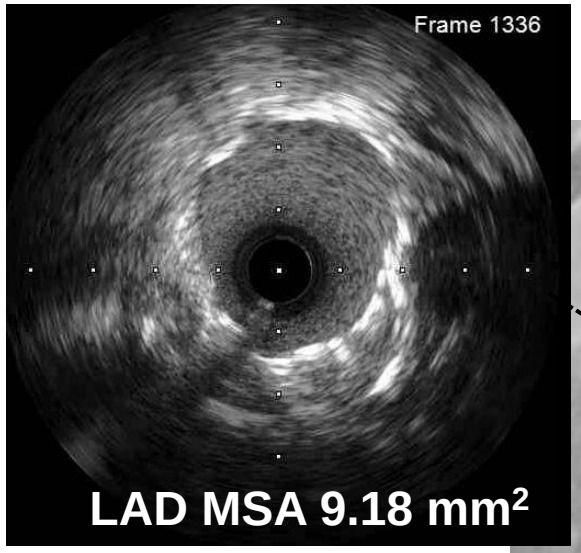


AP CAUDAL

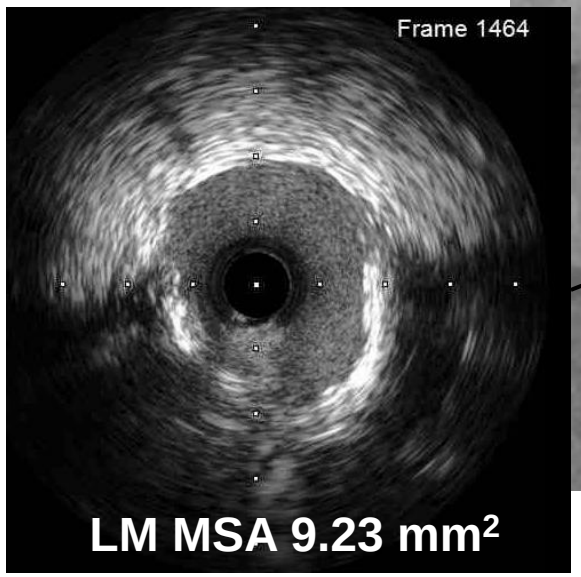


AP CRANIAL

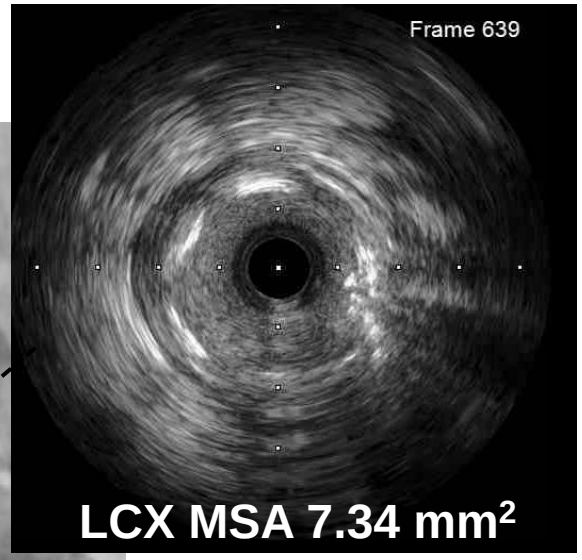
Final IVUS



LAD MSA 9.18 mm^2



LM MSA 9.23 mm^2



LCX MSA 7.34 mm^2

Revascularization for Left Main Disease: 2024

1. LM Disease is Not Surgical Disease Anymore !
2. Imaging and Physiology Guided PCI Can Improve Clinical Outcomes.
3. Upfront 2 stents for True Bifurcation Would be Safe and Good !