Can IVUS MLA Predict Functional Significance of Stenosis ?

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Q1

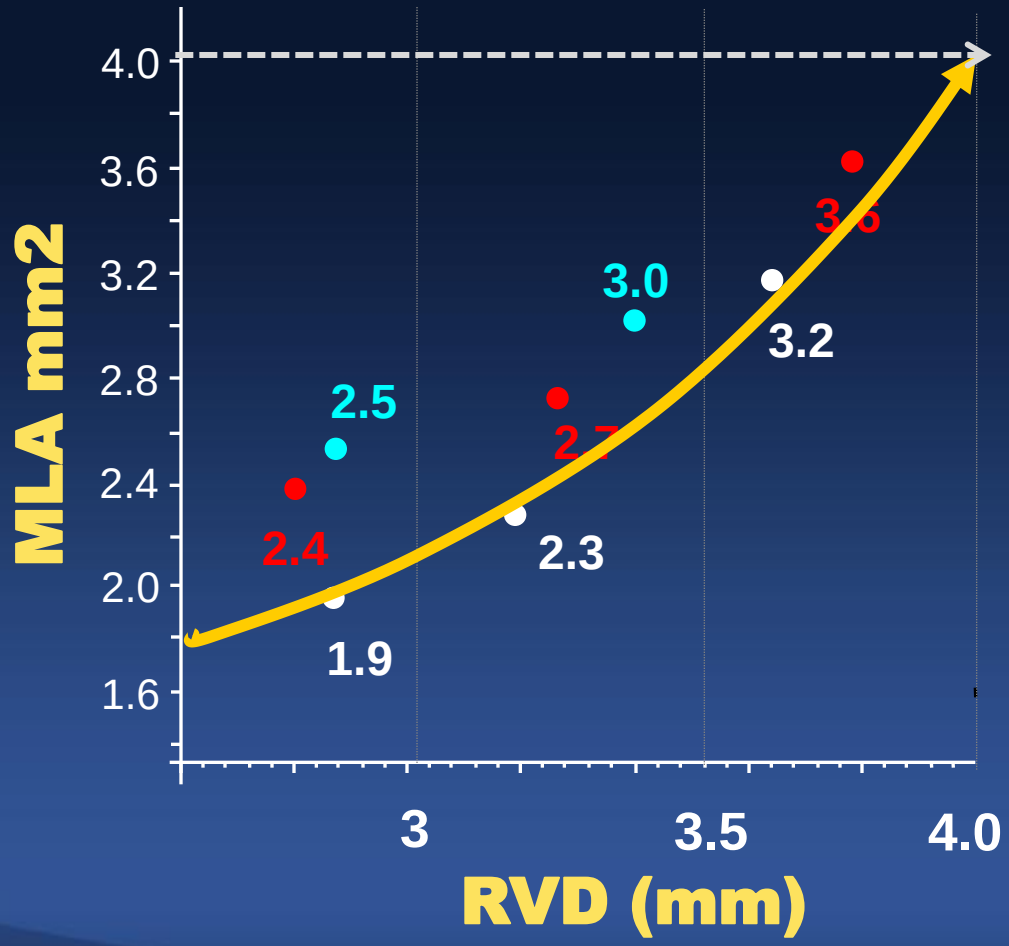
Can IVUS MLA Predict the Functional Significance of Stenosis in Non-LM Epicardial Artery ?

IVUS MLA Matched with FFR, Non-LM
New Published Data (2010-2013)

	N	FFR	RLA	MLA mm^2	AUC	Sens	Spec	PPV	NPV	Accu
Briguori (2001, AJC)	53	0.75	7.8	4.0	–	92%	56%	38%	96%	64%
[illegible]										
(2012, JACC)				IVUS						
Gonzalo (2012, JACC)	61	0.80	7.1	1.95 OCT	0.70	82%	63%	66%	80%	72%
Koo (2011, JACC int)	267	0.80	6.8	2.75	0.81	69%	65%	27%	81%	67%
Lee (2010, AJC)	94	0.75	5.9	2.0	0.80	82%	81%	–	–	81%

FFR matched IVUS MLA, 4.0 mm^2 is Too Big,
New Cut-off Values Are < 3.0 mm^2

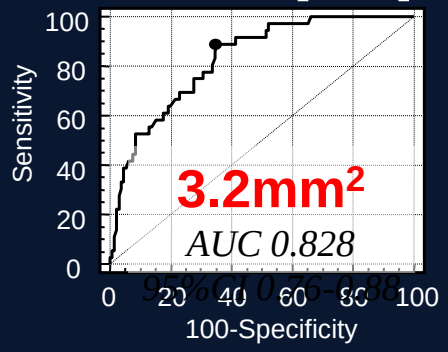
1. The Bigger Reference Vessel Diameter, the Bigger IVUS MLA.
2. IVUS MLA 4 mm^2 Criteria Would Be Matched with Bigger Reference Vessel Diameter (≥ 4.0 mm).



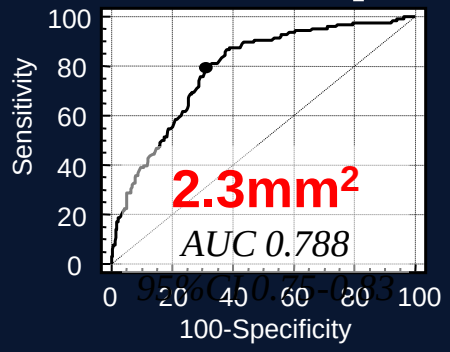
	RLD (mm)	MLA (mm^2)	AUC
Waksman	>3.5	**3.6**	0.70
N=350	3.0–3.5	**2.7**	0.77
	<3.0	**2.4**	0.74
Kang	>3.5	**3.2**	0.83
N=784	2.75–3.5	**2.3**	0.79
	<2.75	**1.9**	0.69
Koo	>3.0	**3.0**	0.70
N=784	<3.0	**2.5**	0.61

Waksman R, et al. JACC. 2013;61(9):917-923,
Kang et al. Am J Cardiol 2012;109:947-53,
Koo et al. JACC Interv 2011;4:803-11

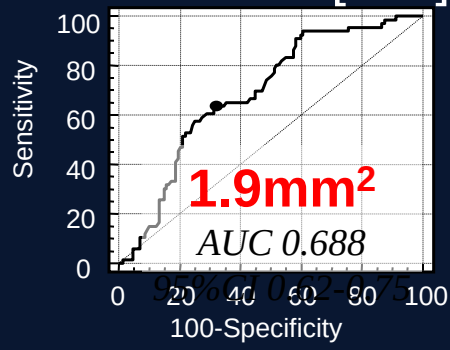
RLD>3.5mm [161]



RLD 2.75–3.5mm [439]



RLD<2.75mm [184]



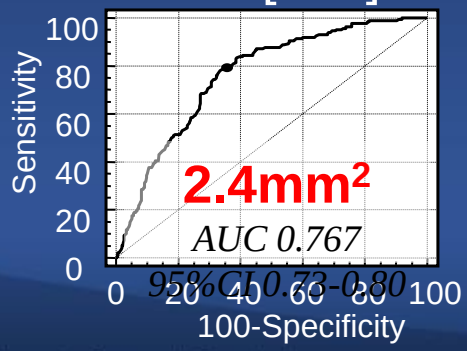
Proximal [285]

Mid [405]

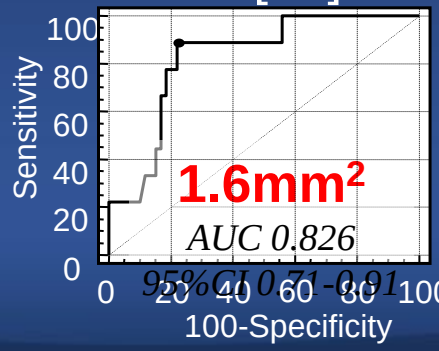
Distal [94]

All Subgroup-specific MLAs Showed Diagnostic Accuracies <70-75%

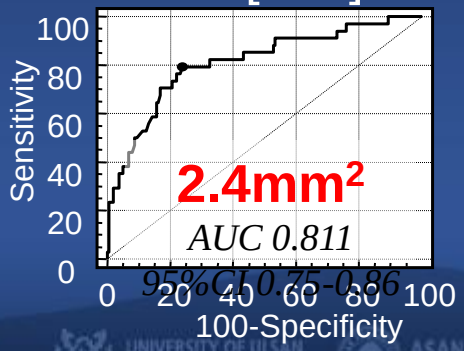
LAD [528]



LCX [68]



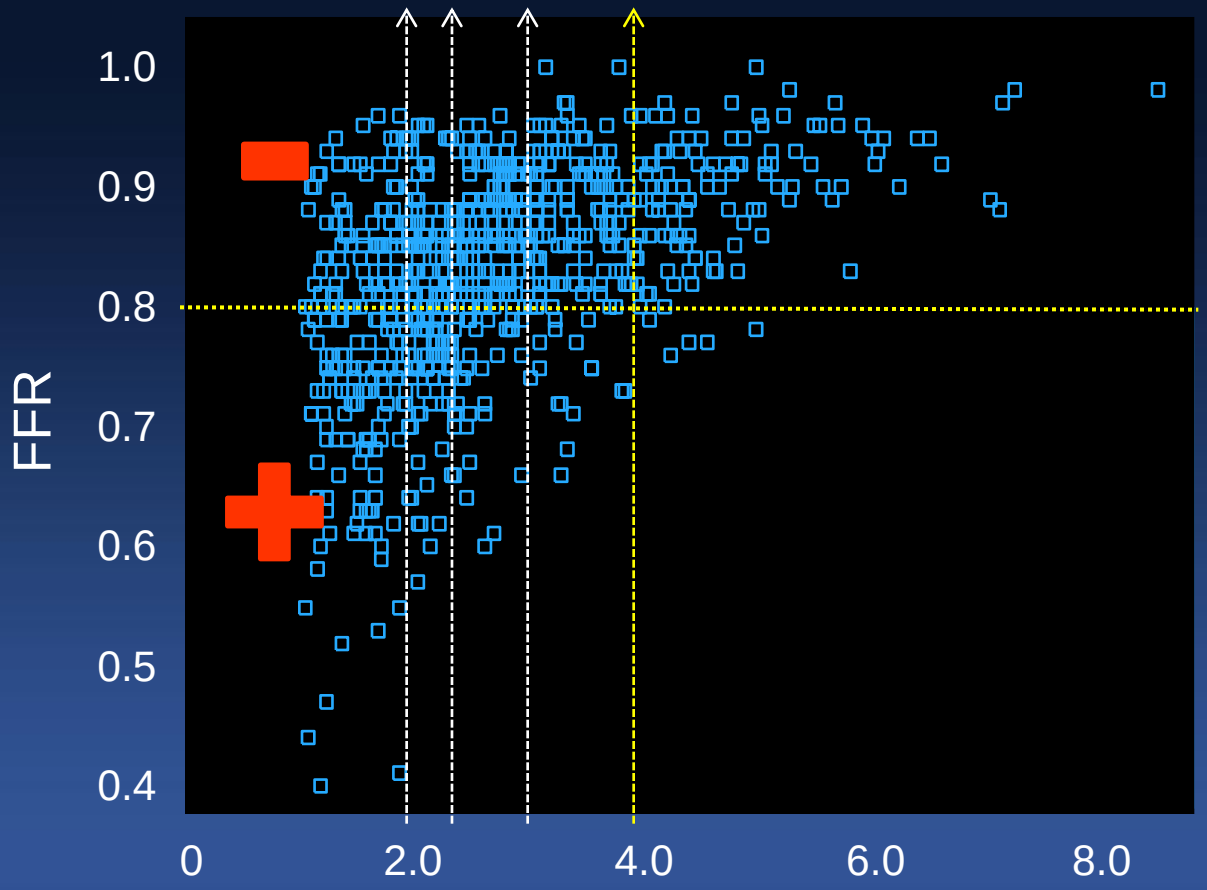
RCA [188]



Kang et al. Am J Cardiol 2012;109:947-53

Can IVUS MLA Predict The Functional Significance of Lesions ?

(AMC data, n=784)



Sensitivity 84%
Specificity 63%
PPV 48%
NPV 90%
Accuracy 69%

Q1

Can IVUS MLA Predict the Functional Significance of Stenosis in Non-LM Epicardial Artery ?

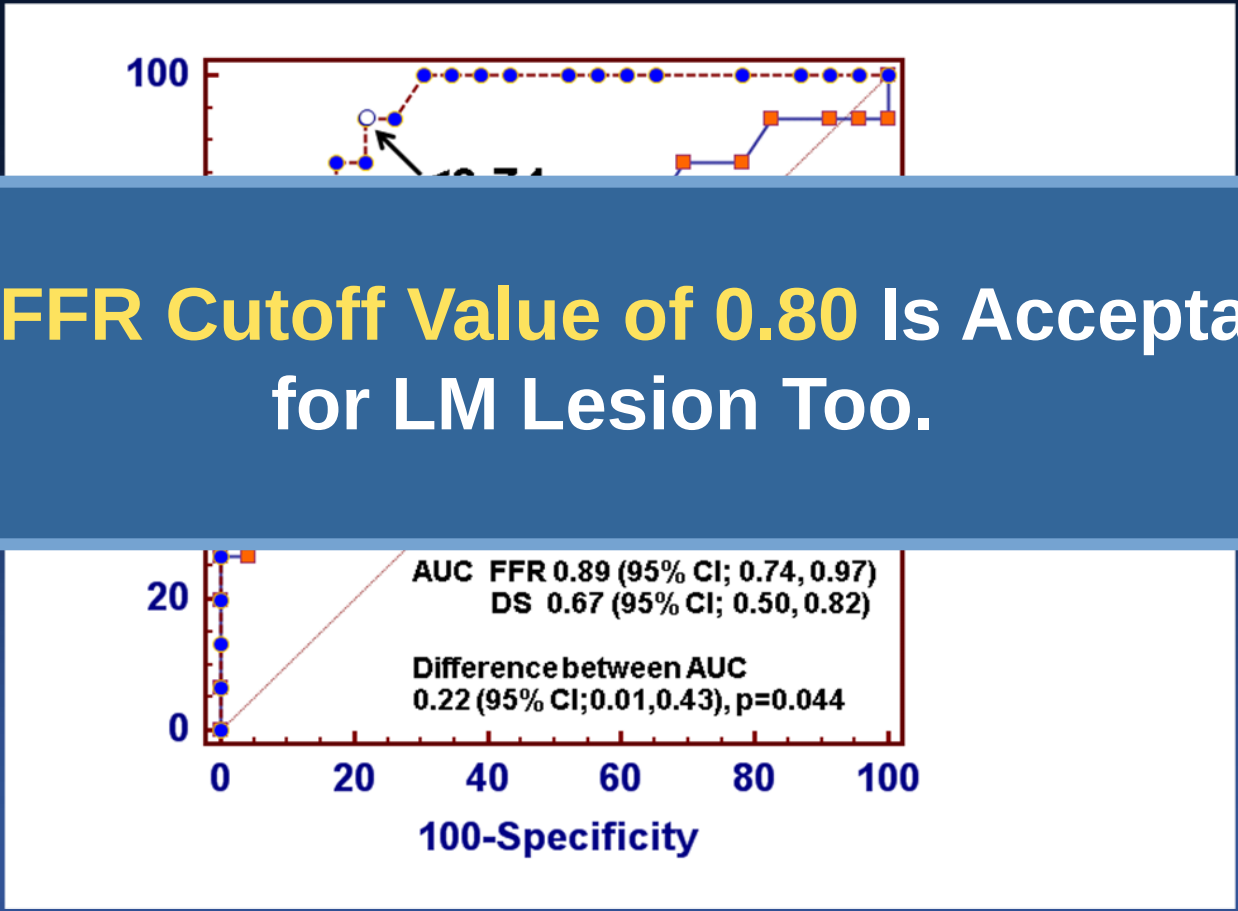
No !

Q2

Is FFR Cutoff Value of 0.80, Validated in LM Lesion Too ?

Validation of FFR Cut-Off for LM Lesion ; 0.74

(Matched with Thallium Perfusion Scan, n=38)



The FFR Cutoff Value of 0.80 Is Acceptable for LM Lesion Too.

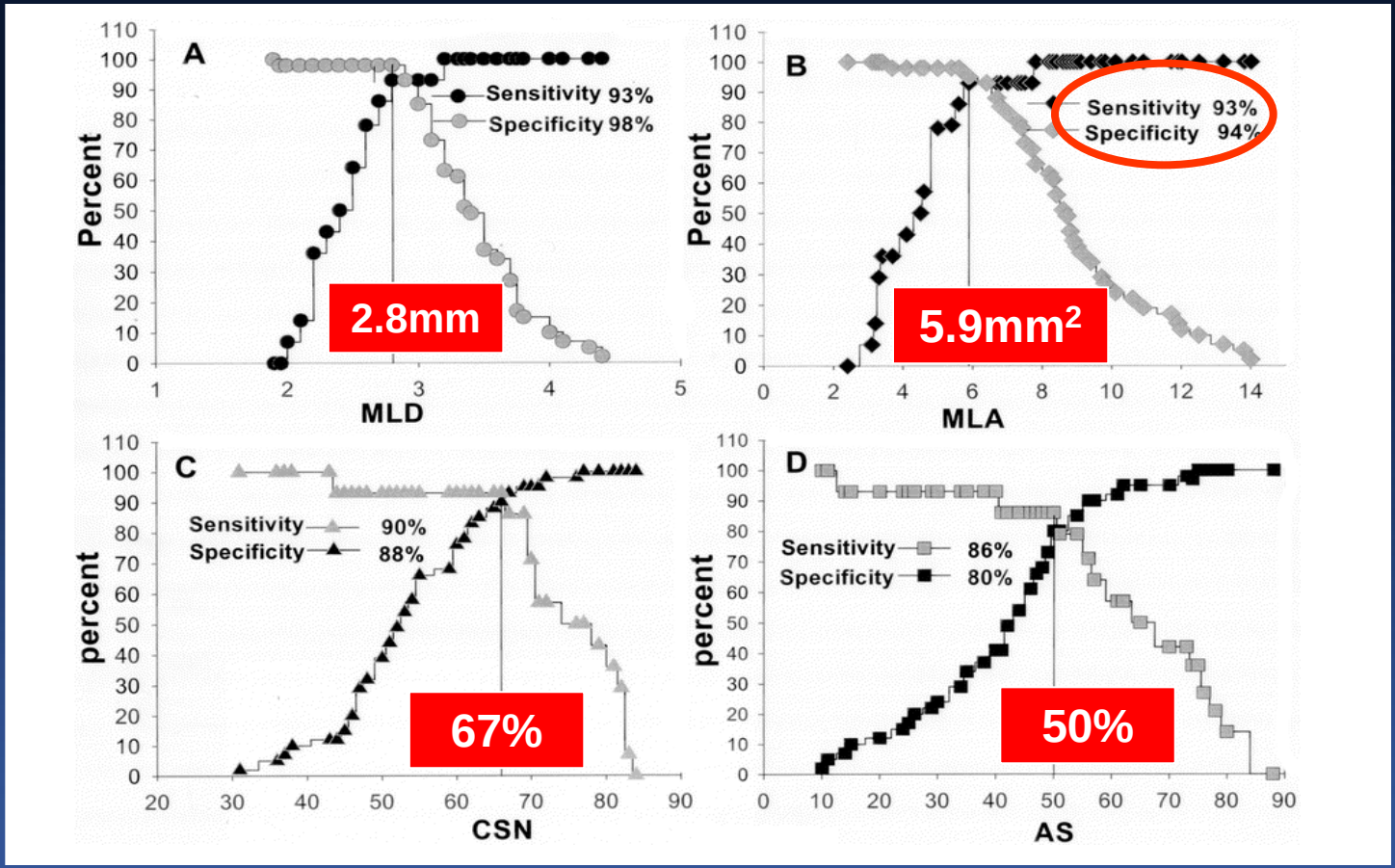
AMC FFR Registry data

Q3

Can IVUS MLA Predict the Functional Significance of Stenosis in LM Lesion ?

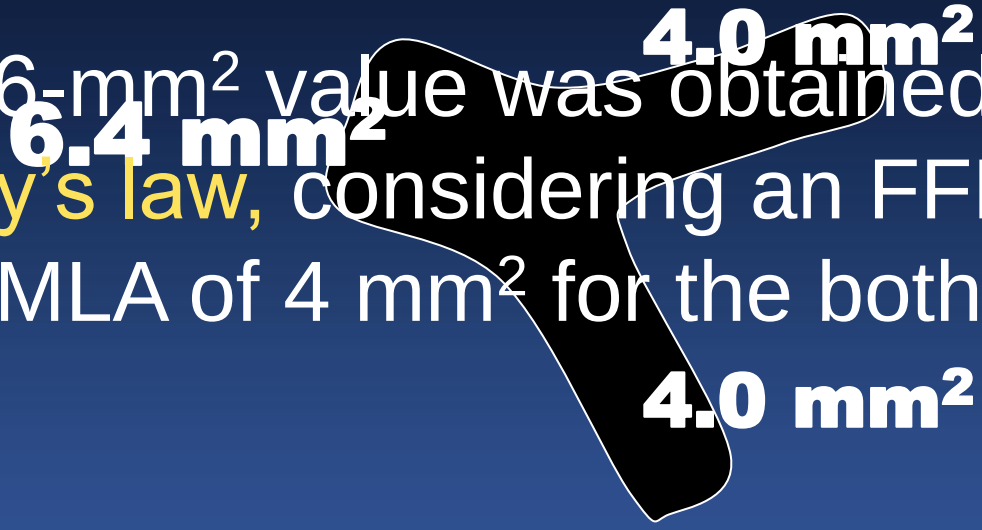
LM, IVUS MLA < 6.0 mm²

Matched with FFR <0.75



Jasti V et al. Circulation 2004;110:2831-6

Background,
Geometric Abstraction



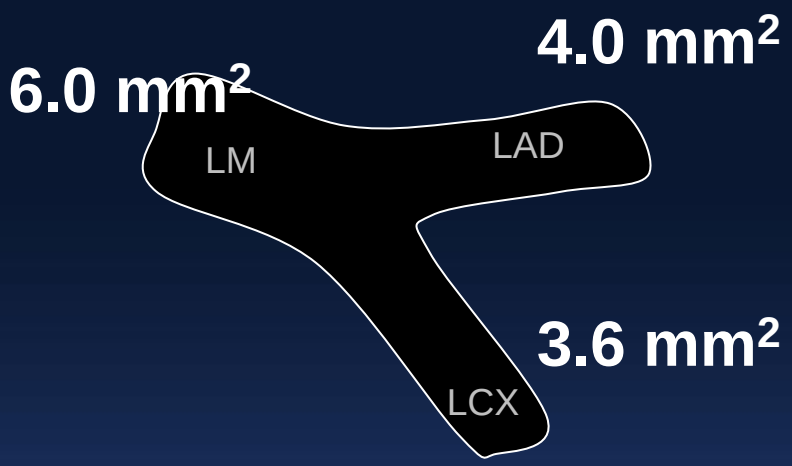
" The 6-mm^2 value was obtained from Murray's law, considering an FFR matched IVUS MLA of 4 mm^2 for the both branches.

De La Torre Hernandez et al. JACC 2011;58:351-8
Jasti V et al. Circulation 2004;110:2831-6

Geometric Abstraction

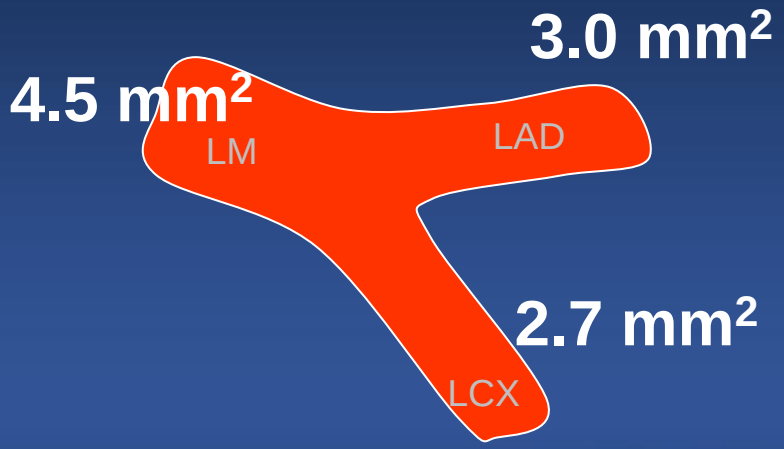
Old Data

LAD	LCX	Murray's LM	Finet's LM
4.0	4.0	6.35	7.35
4.0	3.9	6.27	7.26
4.0	3.8	6.19	7.17
4.0	3.7	6.11	7.08
4.0	3.6	6.04	6.98
4.0	3.5	5.96	6.89

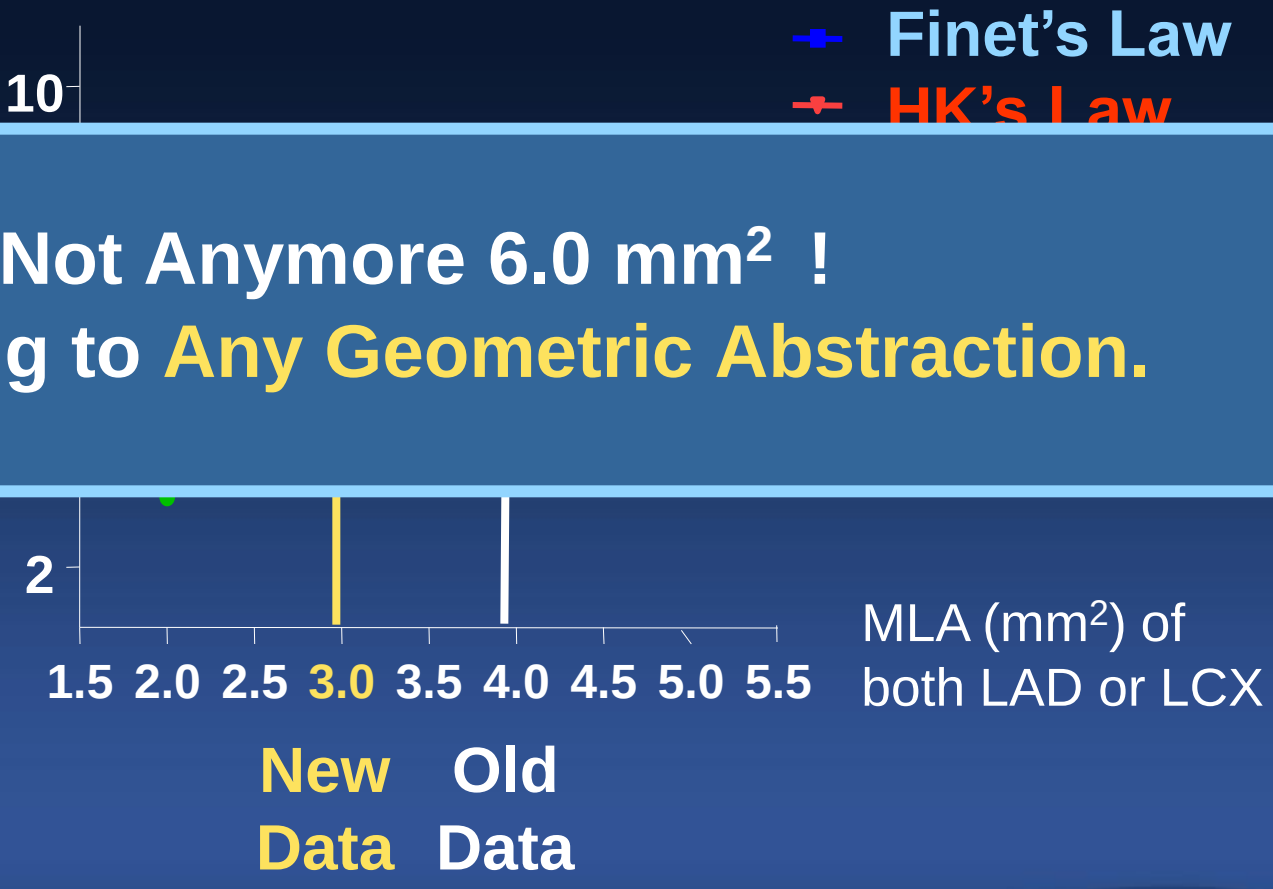


New Data

LAD	LCX	Murray's LM	Finet's LM
3.0	3.0	4.76	5.52
3.0	2.9	4.68	5.42
3.0	2.8	4.60	5.33
3.0	2.7	4.53	5.24
3.0	2.6	4.45	5.14
3.0	2.5	4.37	5.05



Geometric Abstraction of New LM IVUS MLA

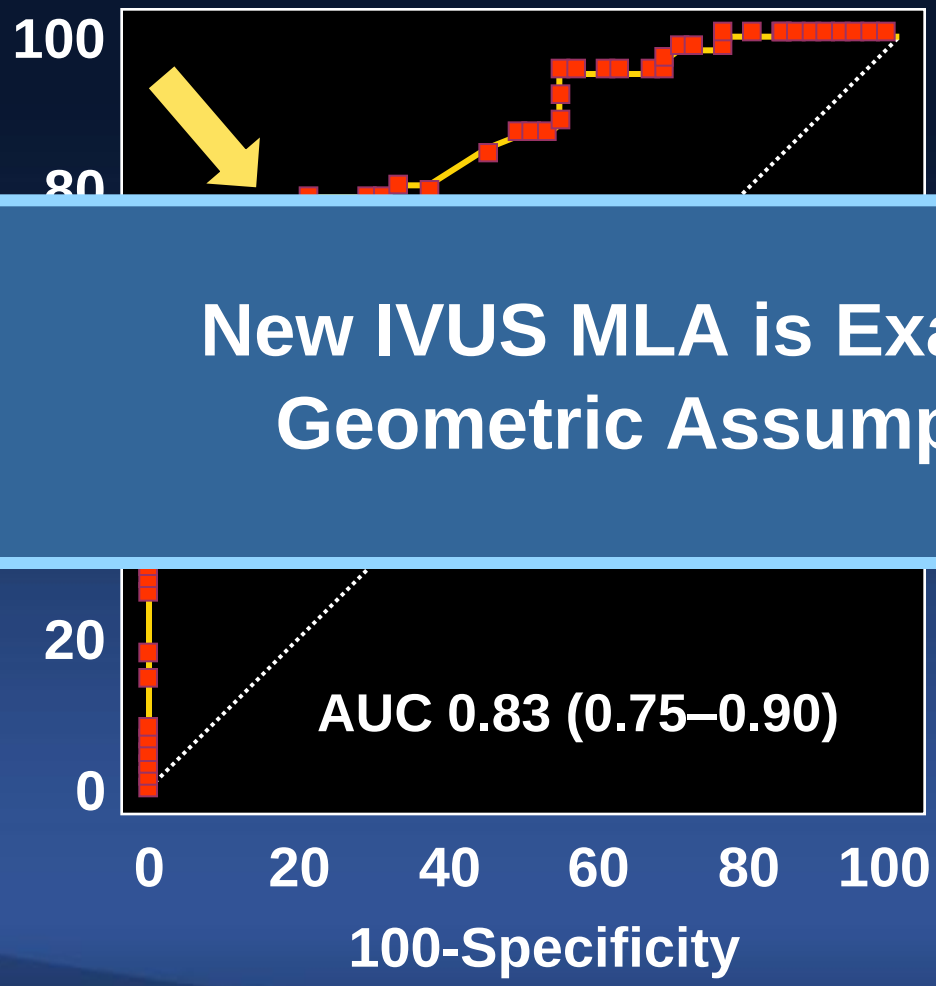


Not Anymore 6.0 mm² !
According to Any Geometric Abstraction.

Yunlong Huo PhD et al, Eurointervention 2012; 7(11):1310-1316

New LM IVUS MLA

Matched with FFR <0.80,
Ostial and Shaft LM Disease (N=112)



Cut-off = 4.5 mm²

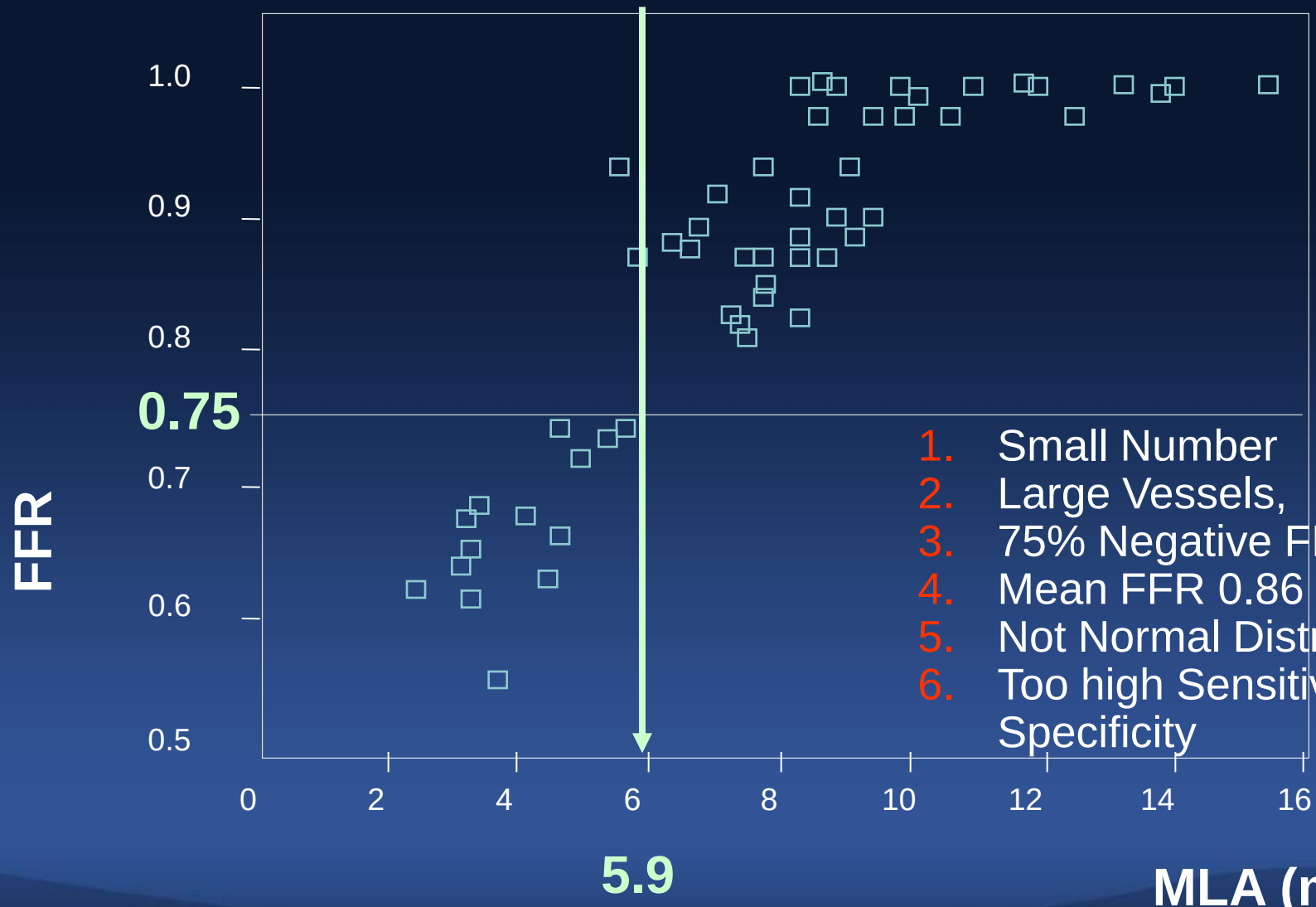
New IVUS MLA is Exactly Same With Geometric Assumption, 4.5 mm²

NPV	76%
Accuracy	80%

Park SJ et al, JACC Intv 2014 *In Press*

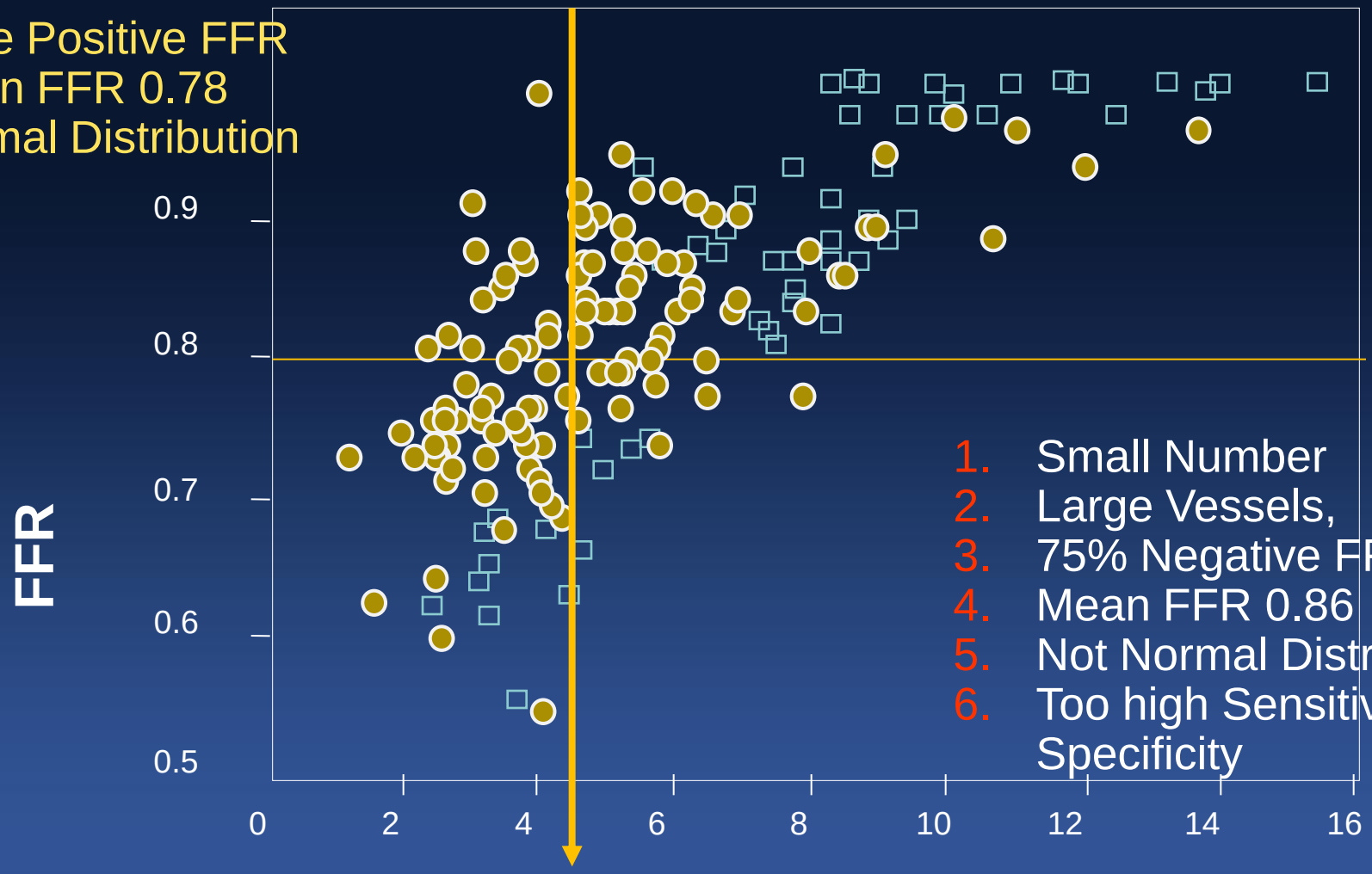
Why
6.0 mm^2 is Too Big ?

Jasti's data (n=55)



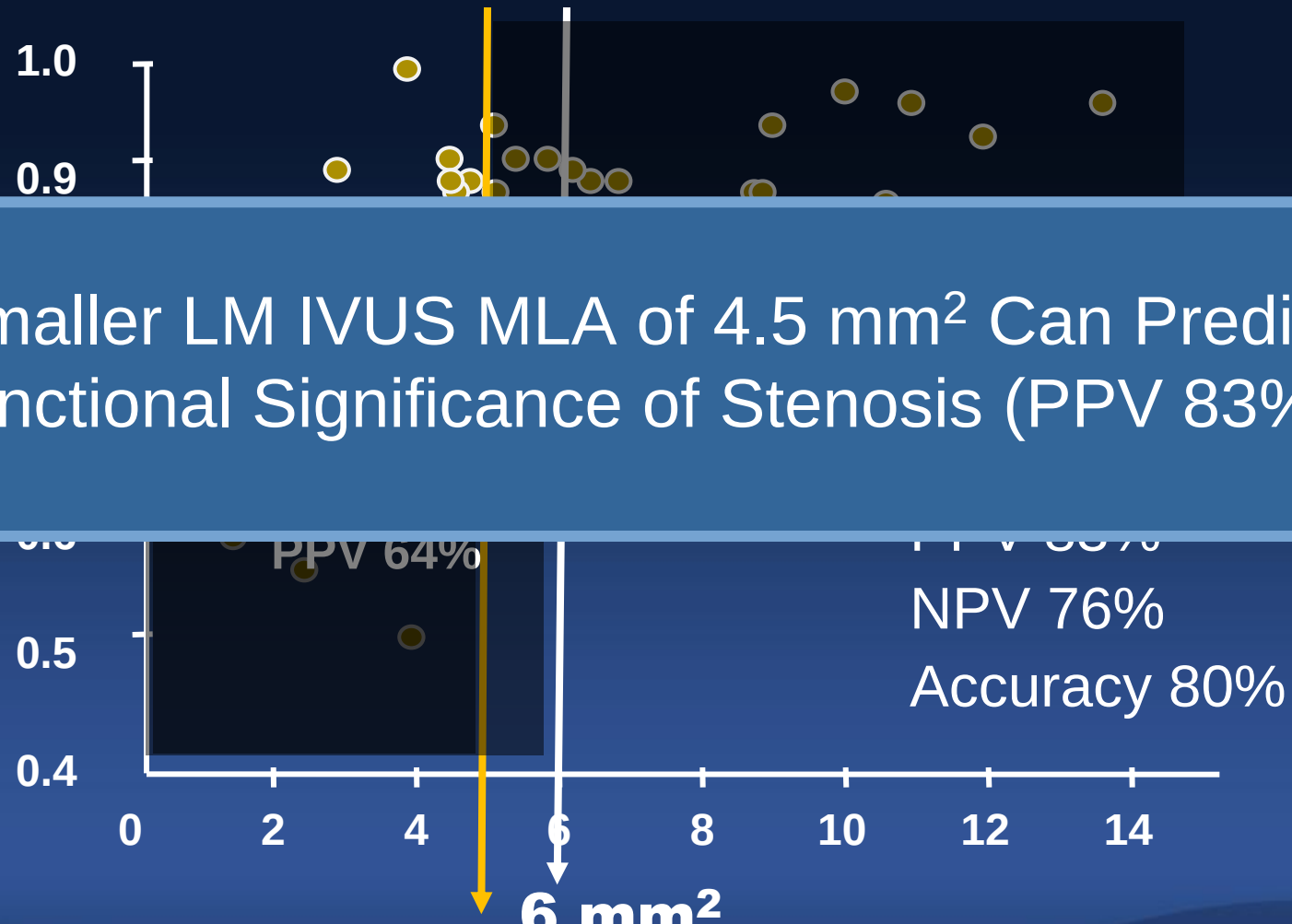
AMC New Data (n=112) Jasti's data (n=55)

More Positive FFR
mean FFR 0.78
Normal Distribution



1. Small Number
2. Large Vessels,
3. 75% Negative FFR
4. Mean FFR 0.86
5. Not Normal Distribution
6. Too high Sensitivity and Specificity

In Practice,

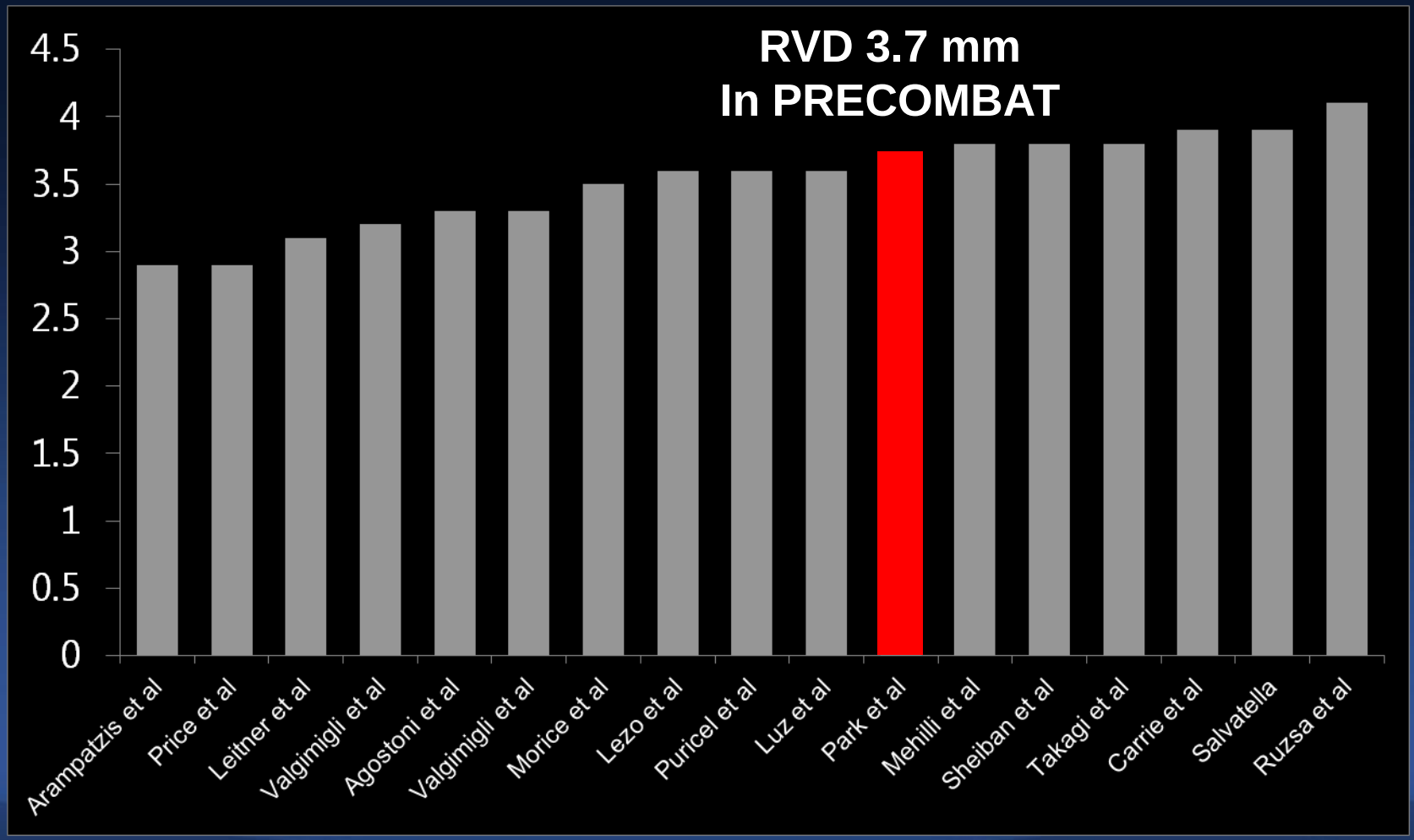


Smaller LM IVUS MLA of 4.5 mm^2 Can Predict Functional Significance of Stenosis (PPV 83%).

Ethnic Difference ?

Reference Vessel Diameter of LM Artery

2309 USA/EU Patients in 17 Studies



Q3

Can IVUS MLA Predict the Functional Significance of Stenosis in LM Lesion ?

Yes !

But, Choose Your Cutoff Values Wisely !