

IVUS guided Left Main

Second Affiliated Hospital of Zhejiang
University School of Medicine

Dong, Liang MD



Disclosure Statement of Financial Interest

I, Dong,Liang DO NOT have a financial interest/arrangement or affiliation with one or more organizations that could be perceived as a real or apparent conflict of interest in the context of the subject of this presentation



Case 1

- Male, 61yrs
- Recurrent chest pain for 2 months
- Received emergency RCA PCI 1 month ago
- Hypertension for 6 yrs
- Smoker for 30 yrs, ceased 2 yrs ago
- Deny diabetes

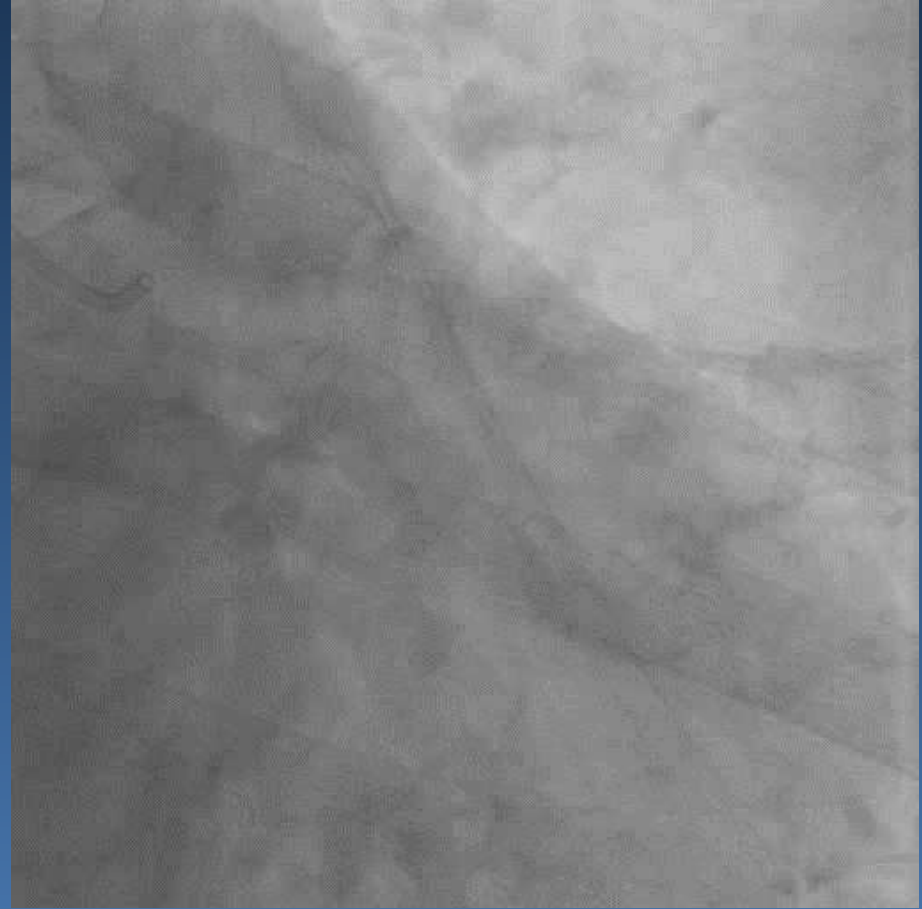
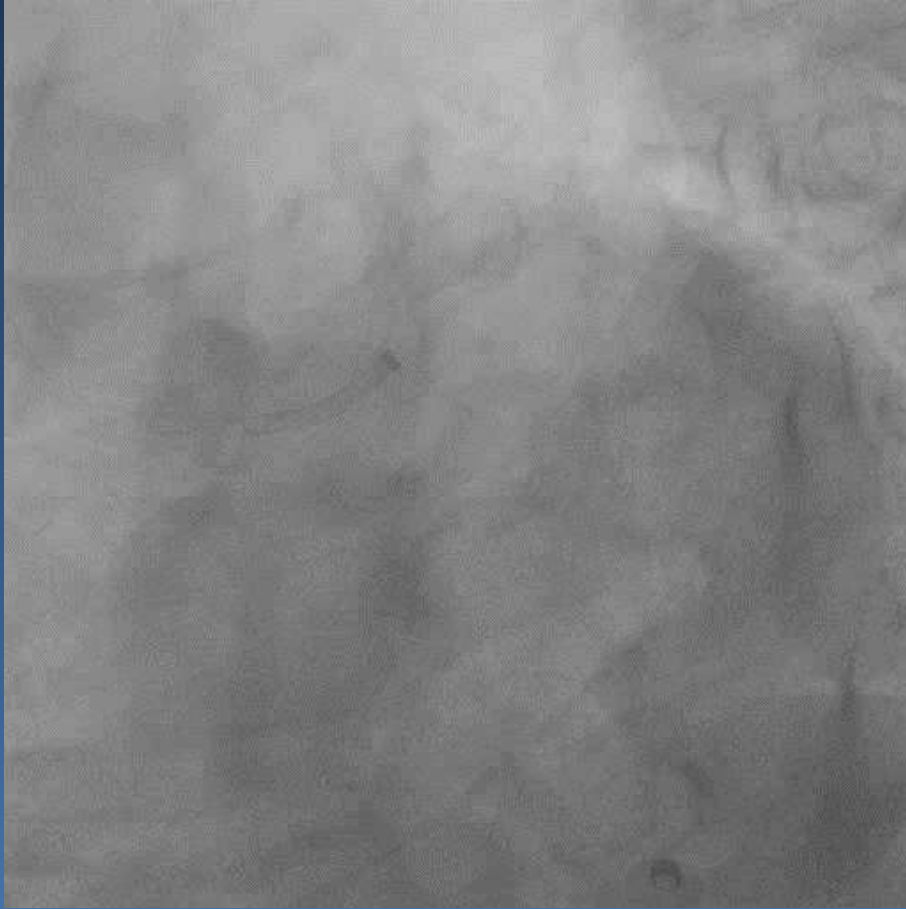


Echocardiography

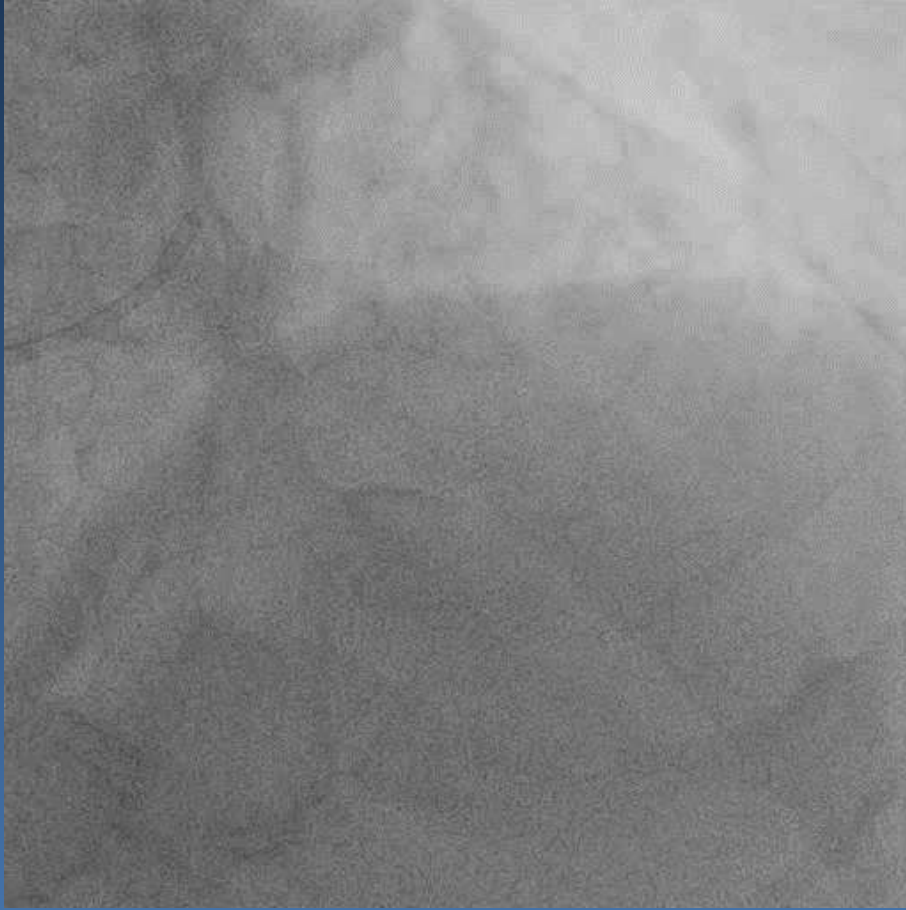
- Myocardial movement disappeared in inferior wall.
- The other walls are normal.



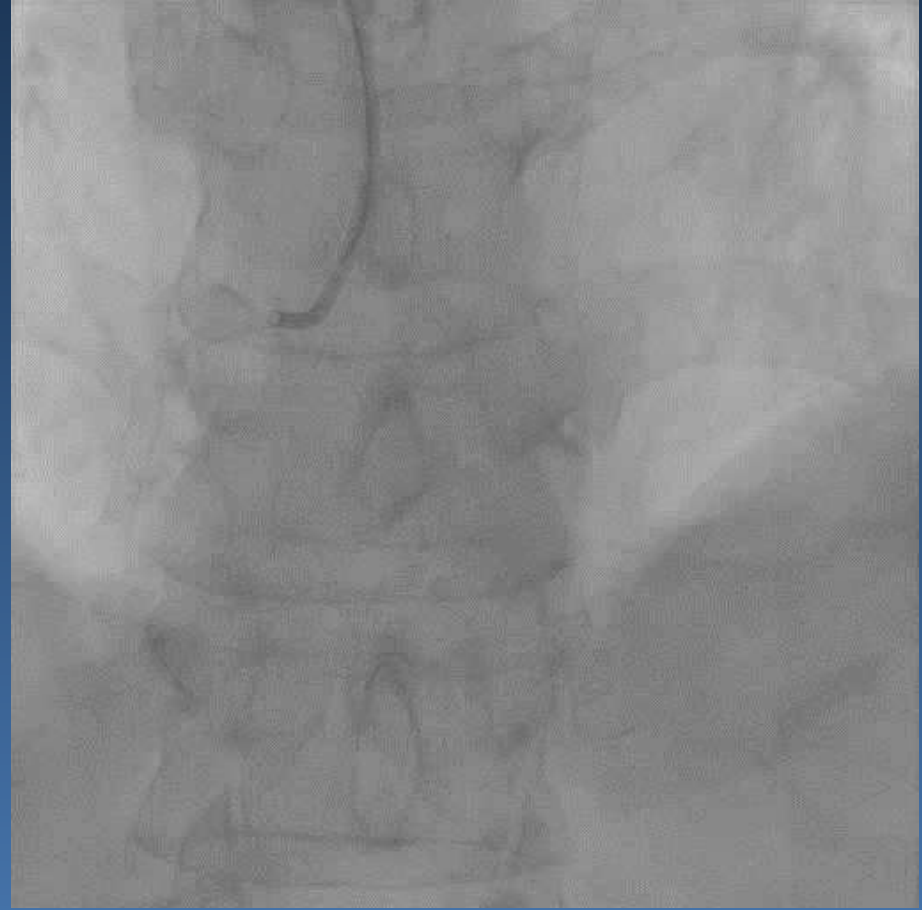
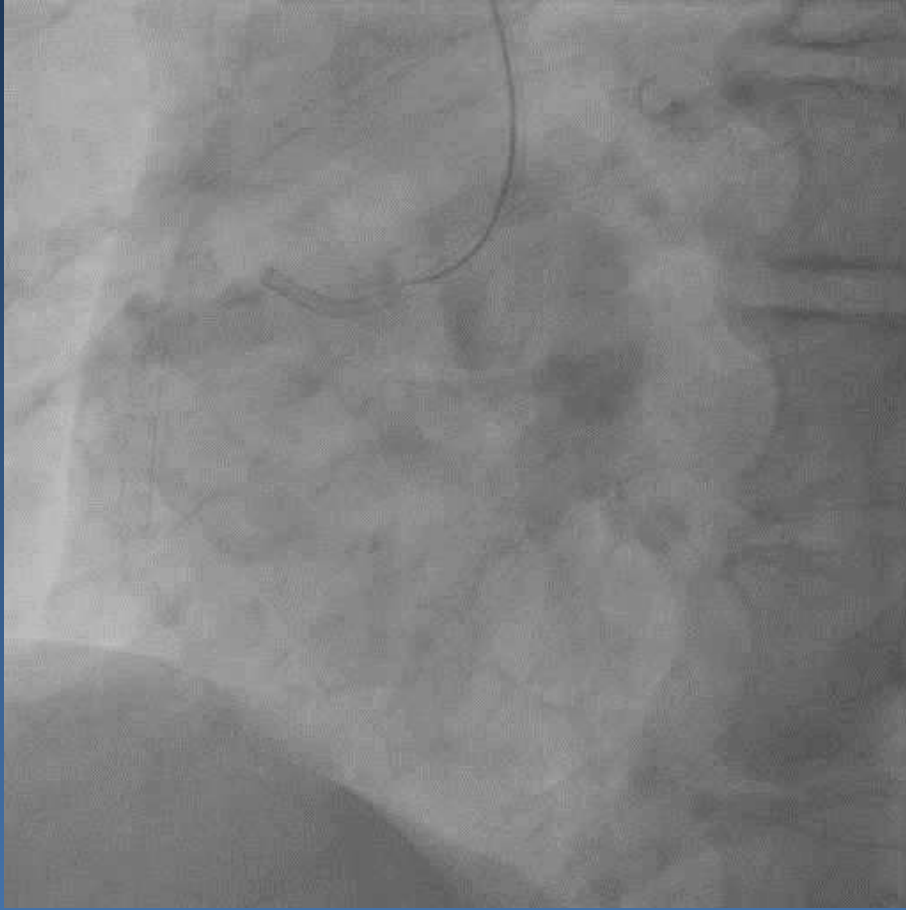
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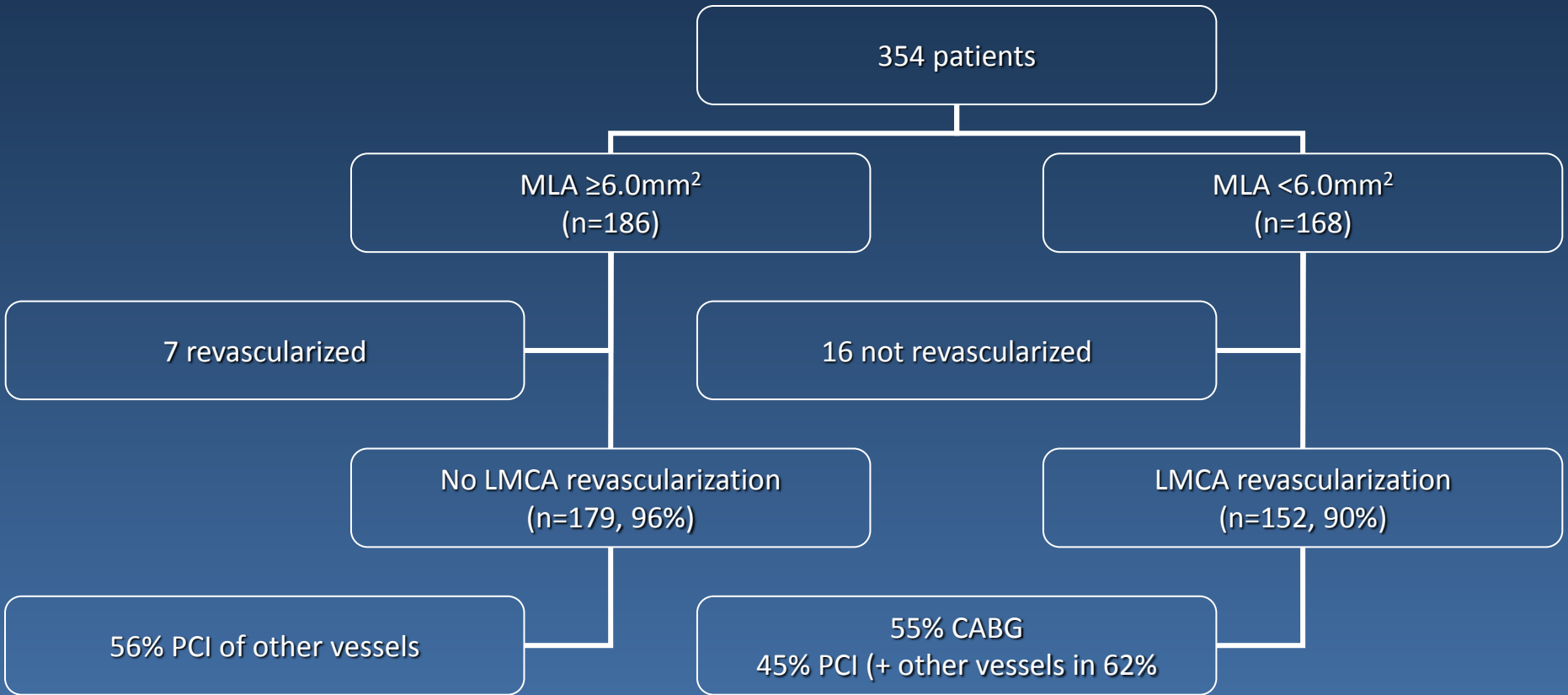
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What's your strategy? PCI or Medical therapy



Prospective application of predefined IVUS criteria for revascularization of intermediate LM lesions: Results at 2 years from the LITRO study

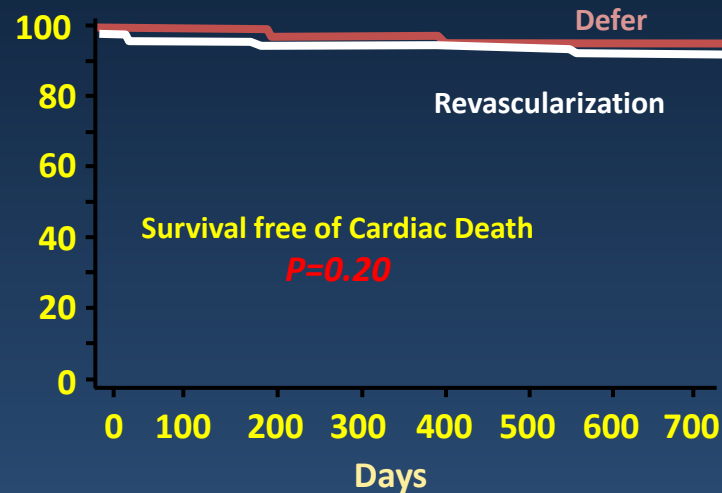
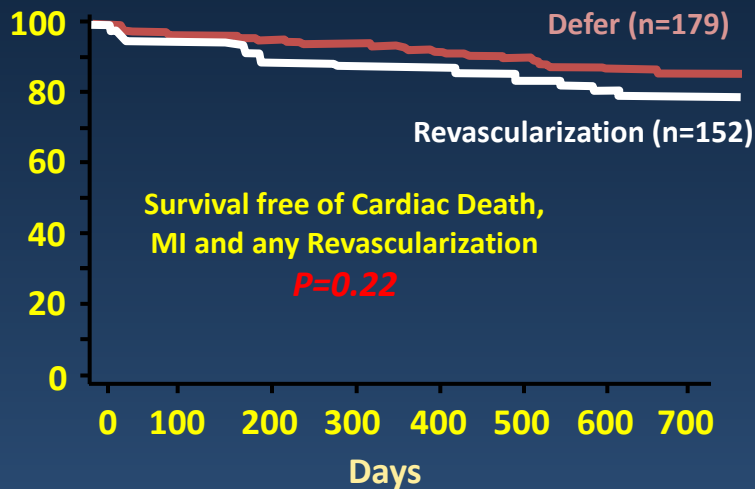


De La Torre Hernandez et al. J Am Coll Cardiol 2011;58:351-8

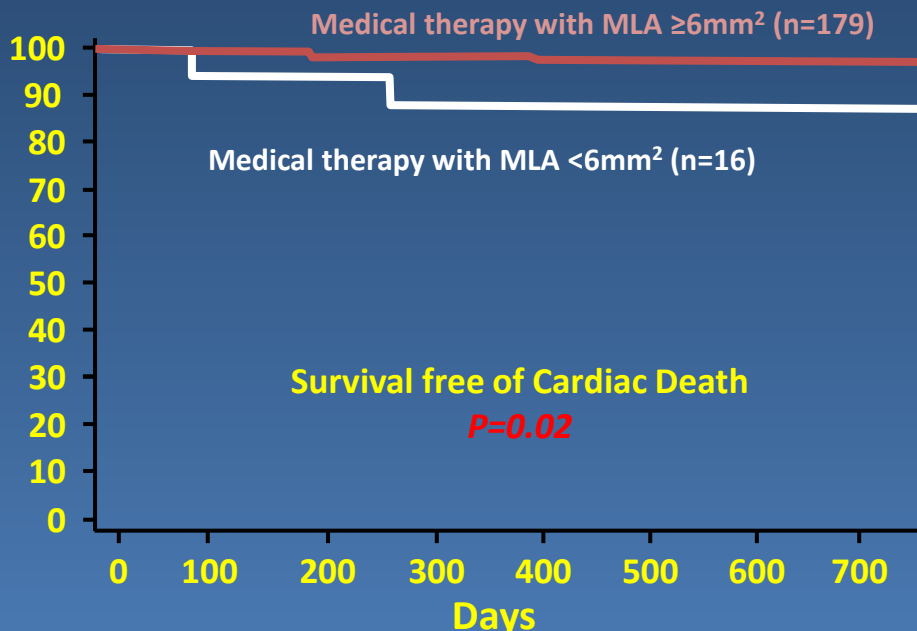
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Clinical Outcome of Pts With vs Without Revascularization



Clinical Outcome of Pts Treated Medically According to the MLA



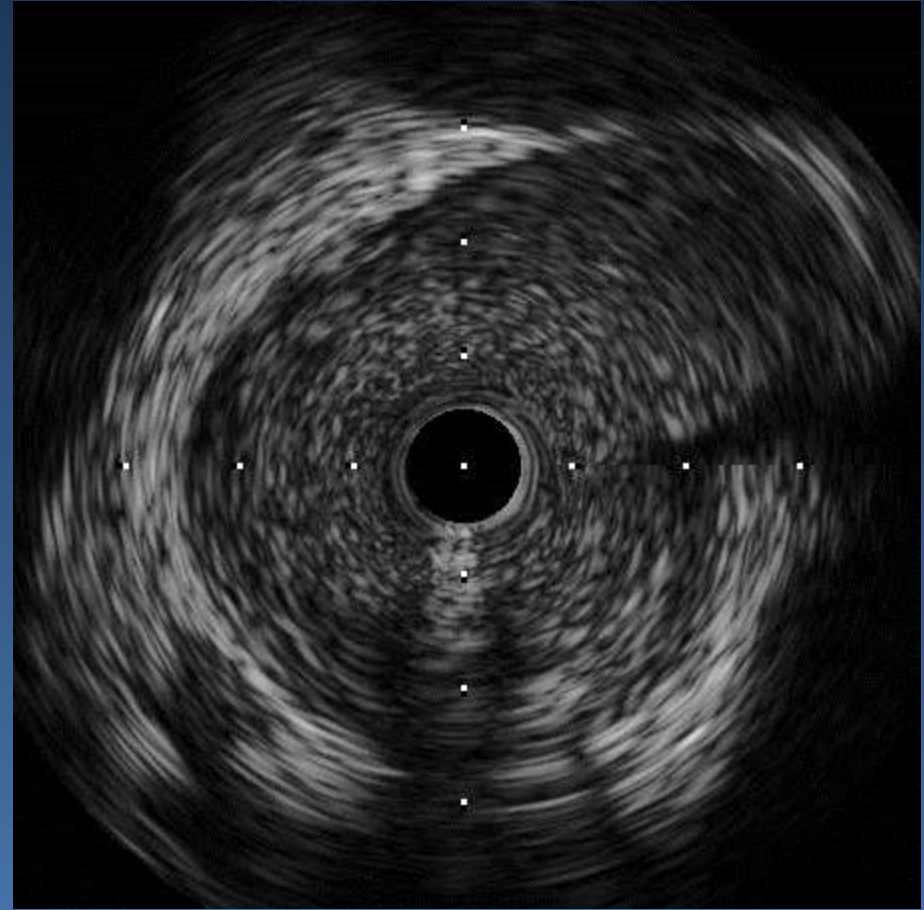
In the group of 16 patients with MLA $<6\text{mm}^2$ who were treated medically, cardiac death-free survival to 2 years was 86% (97.7% in the deferred group; $p=0.04$), and survival free of cardiac death, MI, and revascularization was 62.5% (87.3% in the deferred group; $p=0.02$)

De La Torre Hernandez et al. *J Am Coll Cardiol* 2011;58:351-8

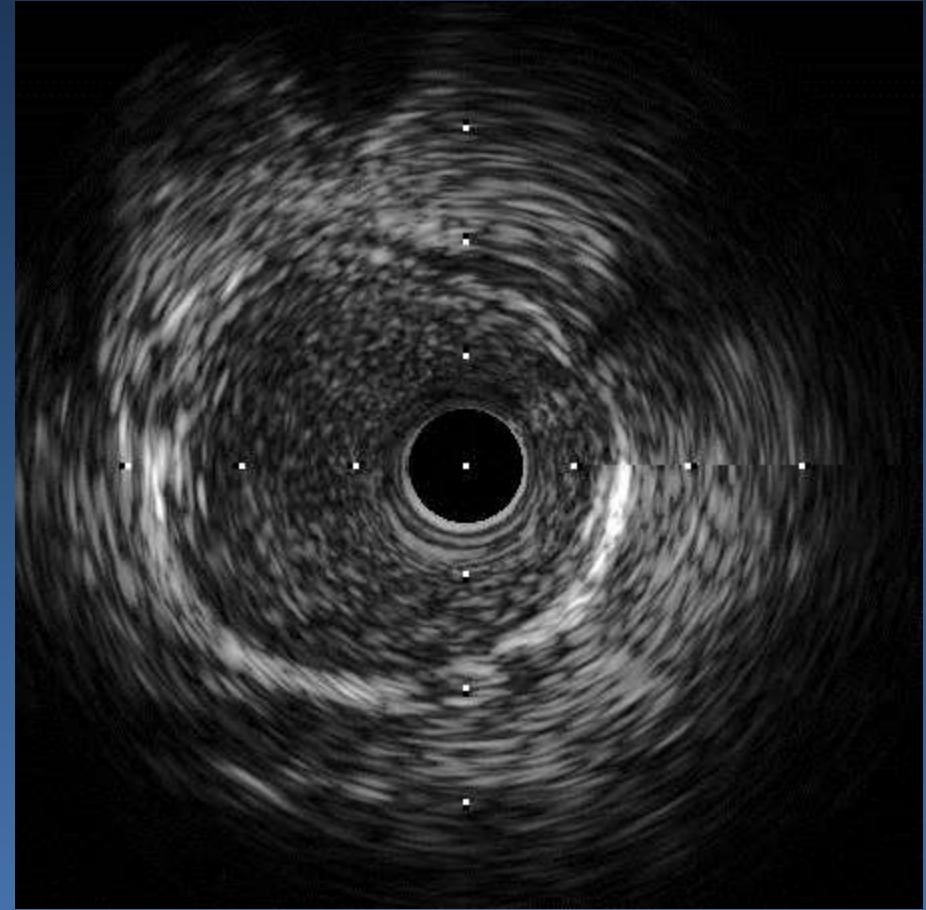
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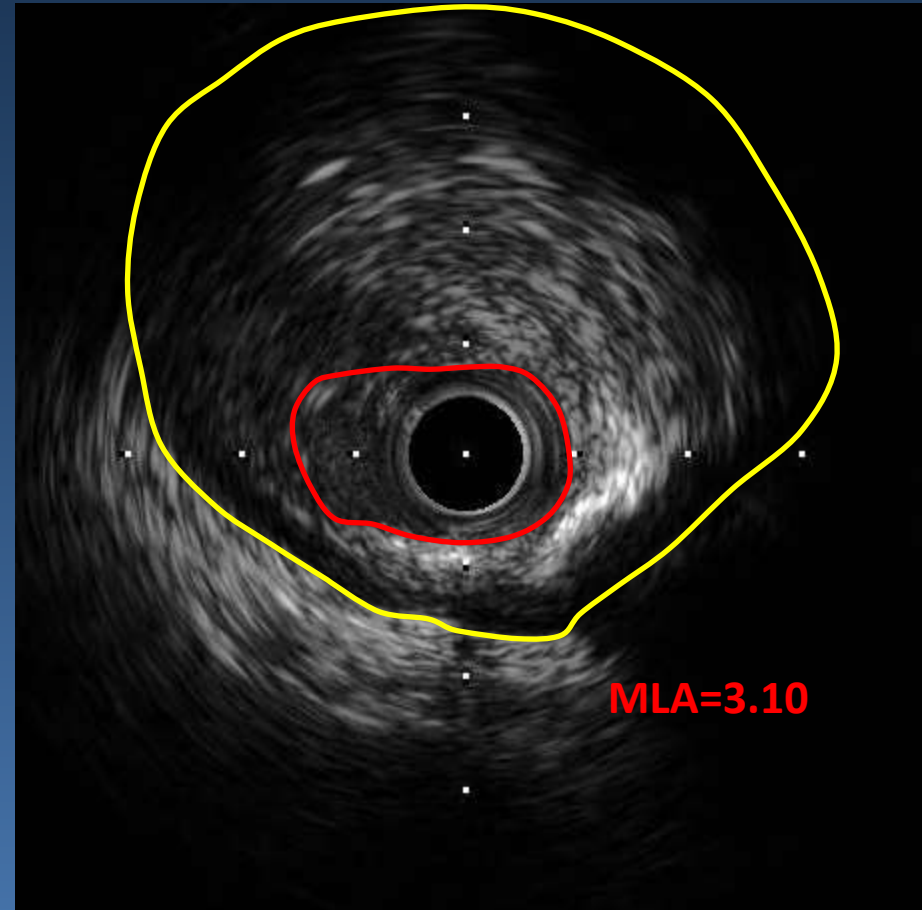
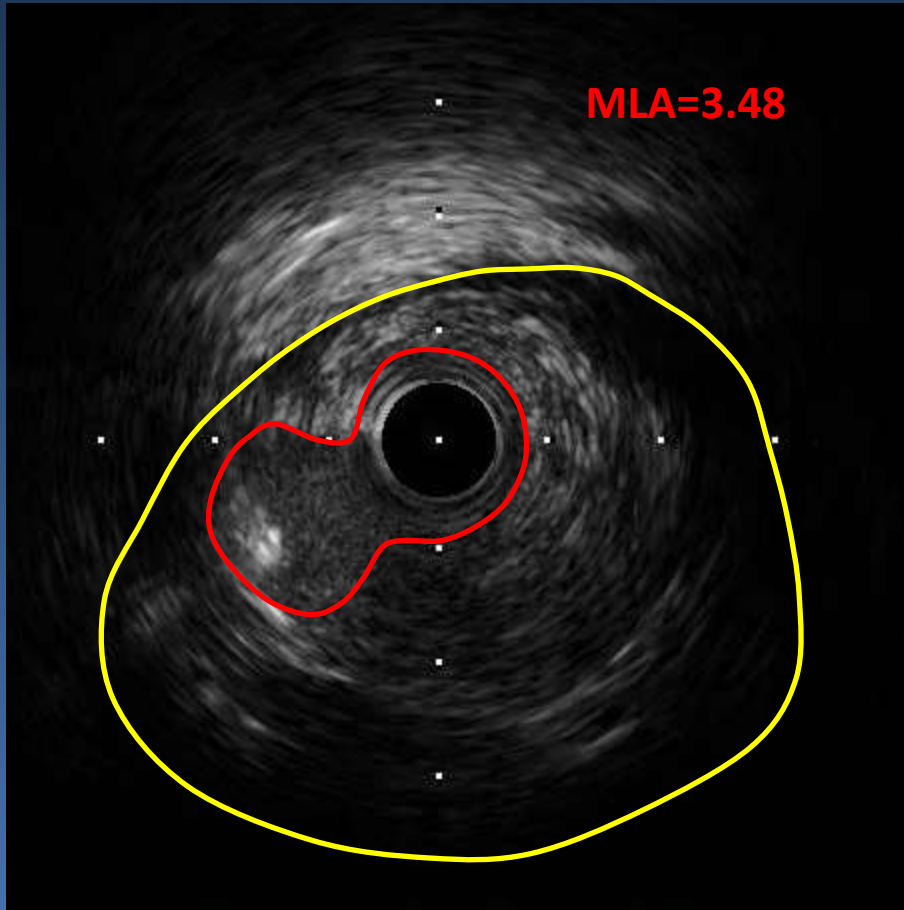
Pre LCX IVUS



Pre LAD IVUS



LM MLA from LAD & LCX pullback



- In 25% of patients, the left main MLA differed by 1mm^2 when imaged from a pullback beginning in the LAD vs a pullback beginning in the LCX.
- Since IVUS can artificially increase, but not decrease lumen dimensions, the smallest MLA is always the most accurate



Transducer Angulation

- Transducer angulation is usually not a problem in uninterrupted (non-branching, non-ostial) segments of the artery
- Conversely, transducer angulation can be a problem
 - when imaging a stenosis just proximal to a bifurcation (should select the straighter daughter vessel to begin imaging)
 - at the aortoostial junction (should make sure that the guiding catheter is co-axial with the proximal vessel)
- Transducer angulation can make lumen (and other) measurements artifactually large, BUT NOT ARTIFACTUALLY SMALL



What's your plan? One Stent or Two stents?



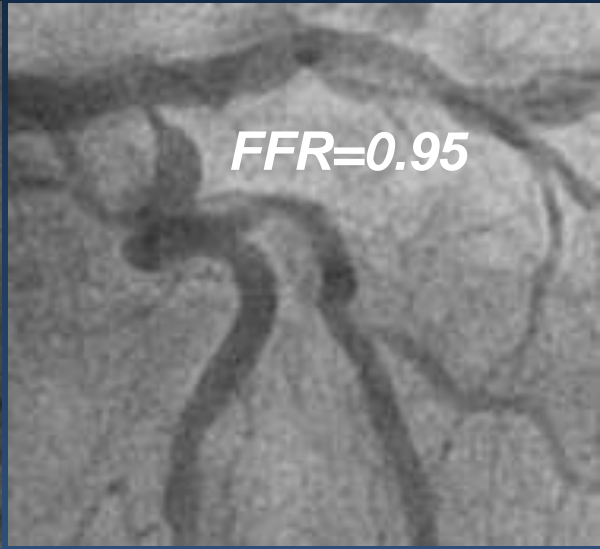
FFR=0.67



FFR=0.93



FFR=0.95



FFR=0.92



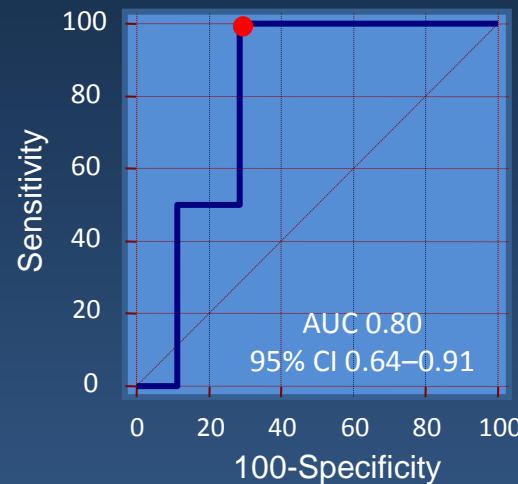
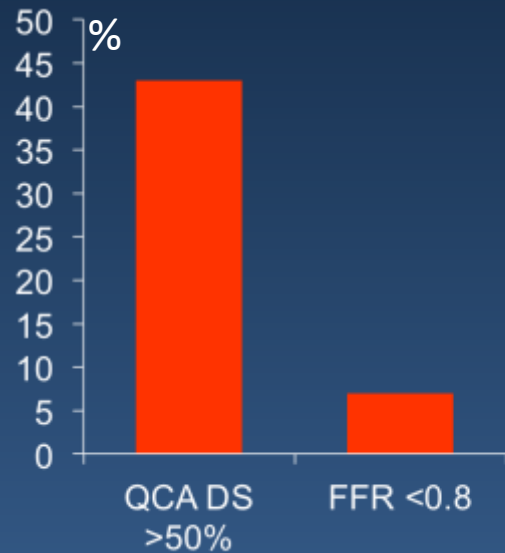
FFR=0.74



Courtesy of Dr Colombo and Dr Airoidi

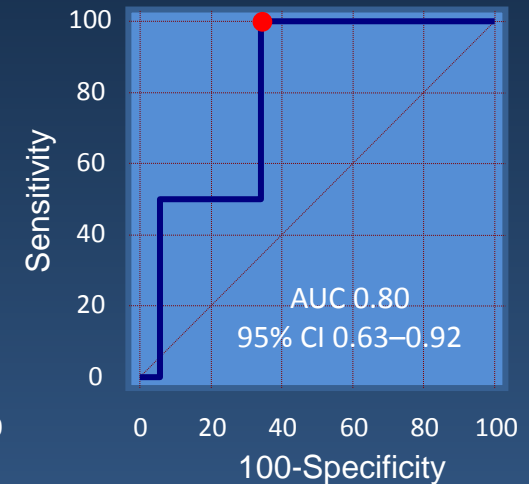
Bon-Kwon Koo. TCT2013

43 LMCA bifurcation lesions with pre-PCI LCX ostial DS <50% were treated by single-stent cross-over



MLA <3.7mm²

- Sensitivity 100%
- Specificity 71%
- PPV 16%
- NPV 100%



Plaque Burden >56%

- Sensitivity 100%
- Specificity 65%
- PPV 14%
- NPV 100%

Why Does Cross-over Stenting Rarely Reduce FFR in the LCX?

- Eccentric vessel deformation with little increase in ostial plaque mass
- Changes are extremely focal
- Large vessel size with modest amount of supplied myocardium
- Angiographic artifacts

Kang et al. Catheter Cardiovasc Interv 2014;83:545-52

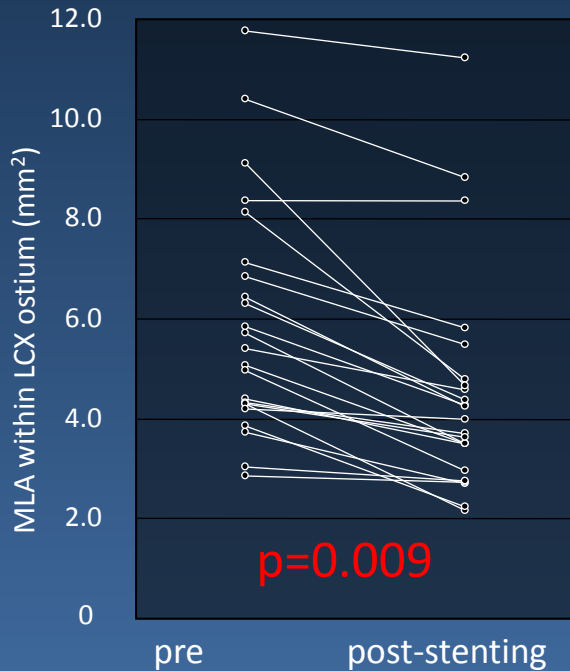
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Carina shift is eccentric and the main cause of lumen compromise after cross-over stenting

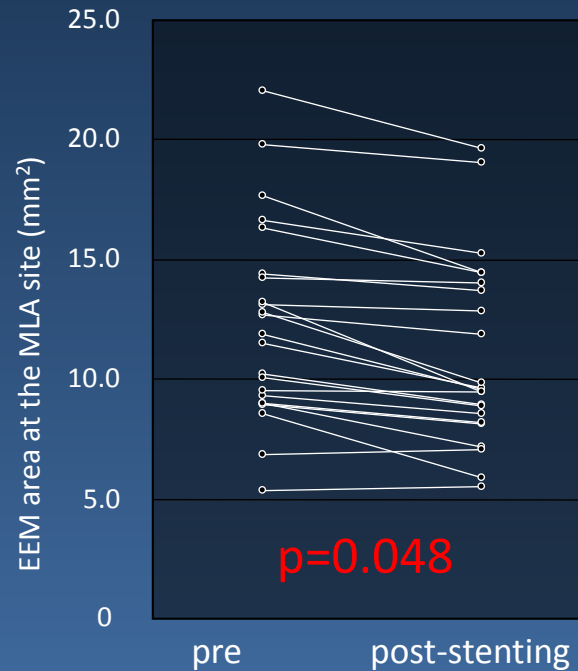
MLA within LCX ostium

5.4mm²→4.0mm²



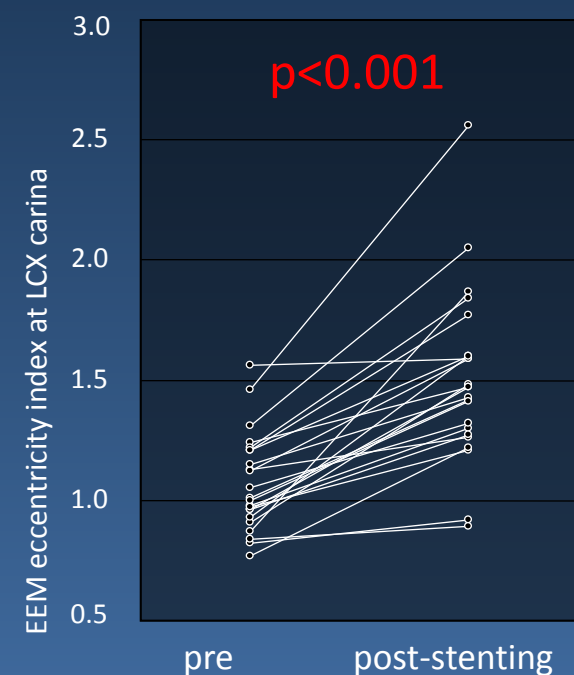
EEM area at MLA

11.8mm²→9.6mm²



EEM eccentricity

1.22→1.47



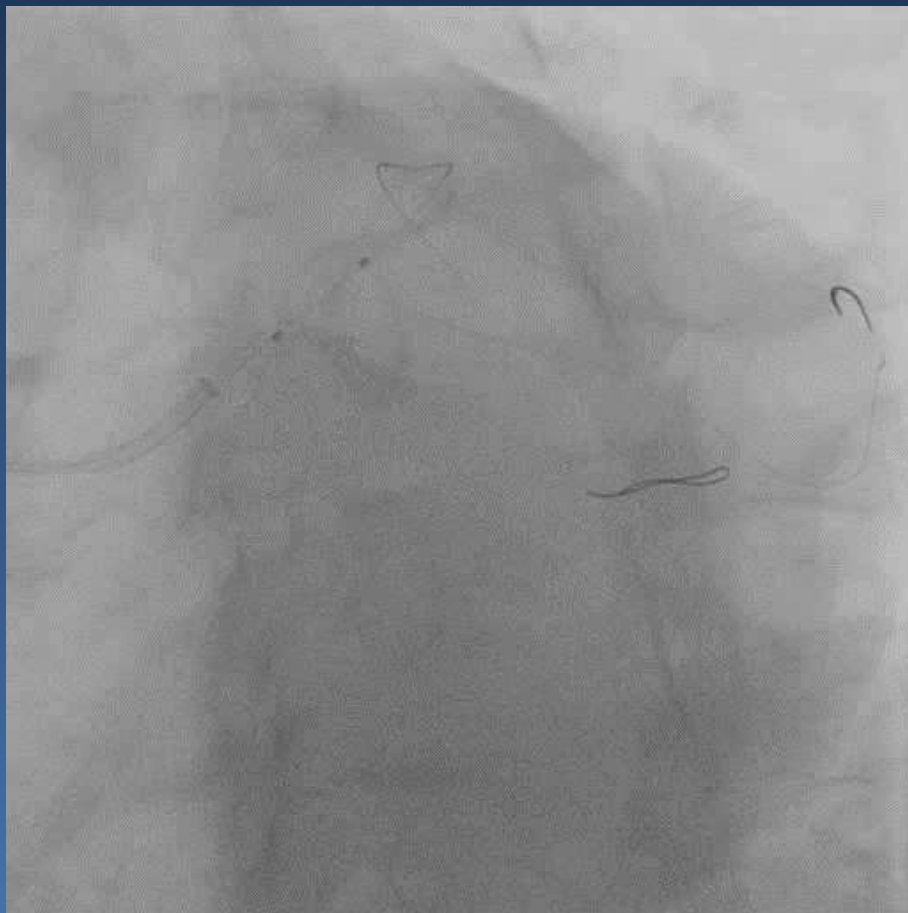
While 78% showed a >10% reduction of MLA within LCX ostium after cross-over stenting, there was no change in P&M CSA ($2.8\pm 1.5\rightarrow 2.7\pm 1.3\text{mm}^2$, $p=0.2$)

Kang et al. *Circulation Cardiovasc Interv* 2011;4:355-61

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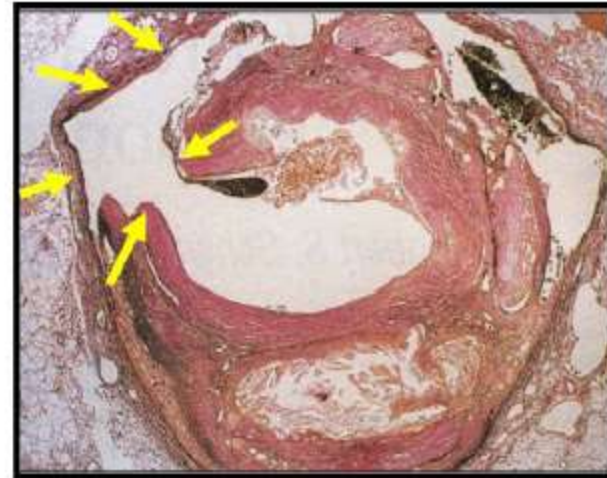


Cutting balloon

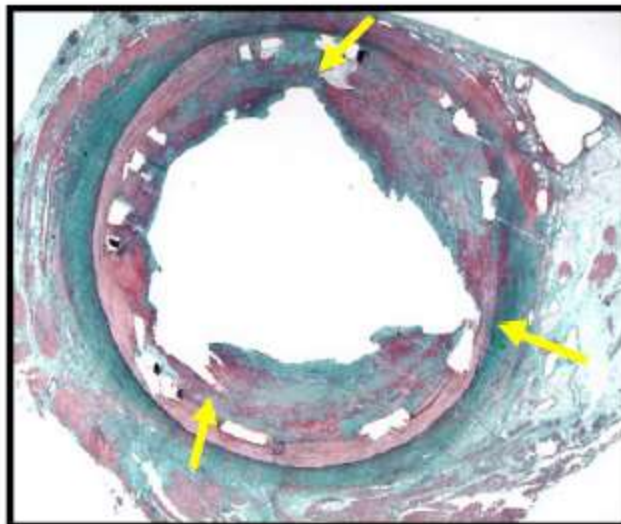


AngioSculpt – Mechanism of Action

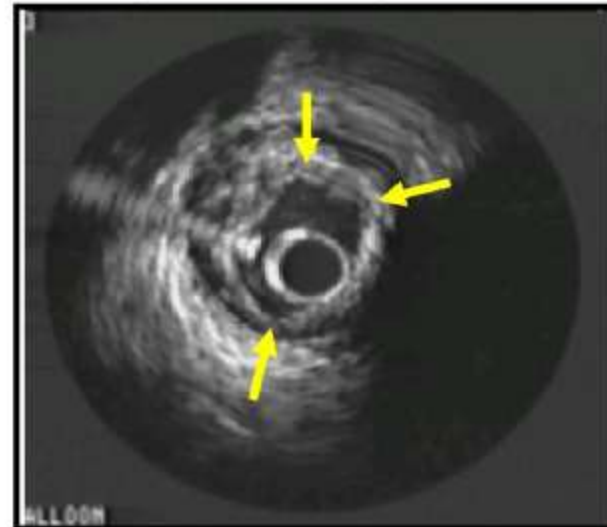
Acute histopathology specimen of a patient post-POBA demonstrating extensive dissection and laceration (yellow arrows)



Post-AngioSculpt scoring of porcine ISR (yellow arrows)



Human IVUS demonstrating scoring post-AngioSculpt (yellow arrows)



After Cutting Balloon



PE 3.5*32mm



Slow Flow



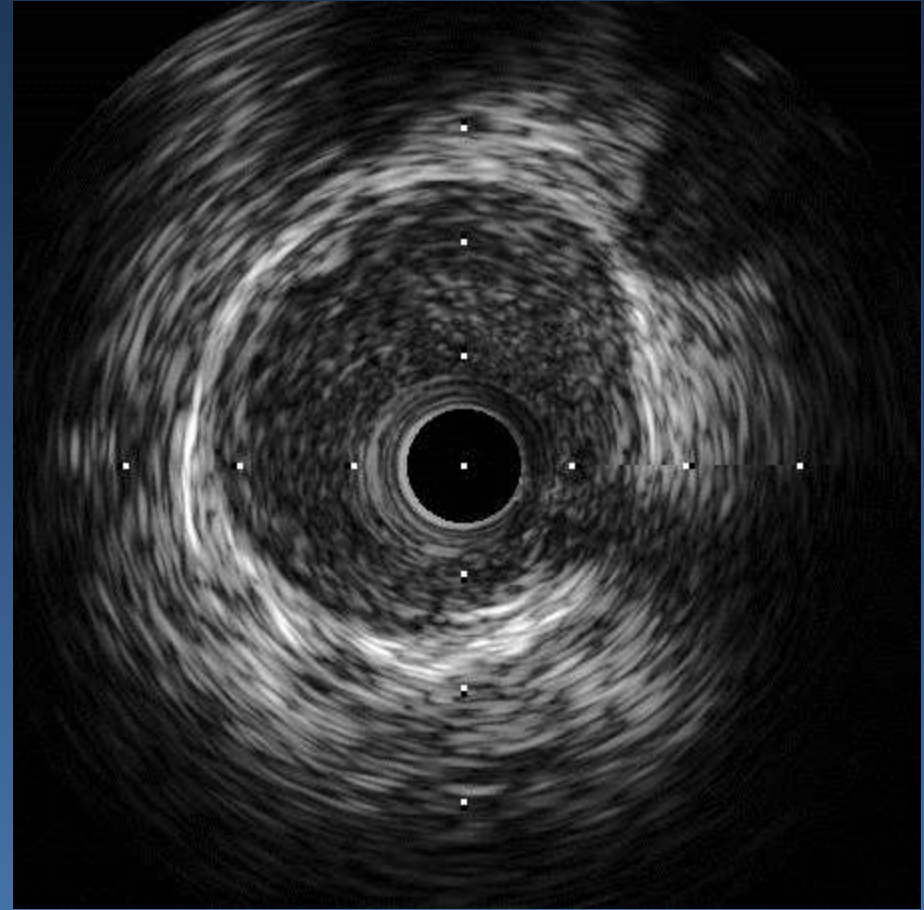
What's next?



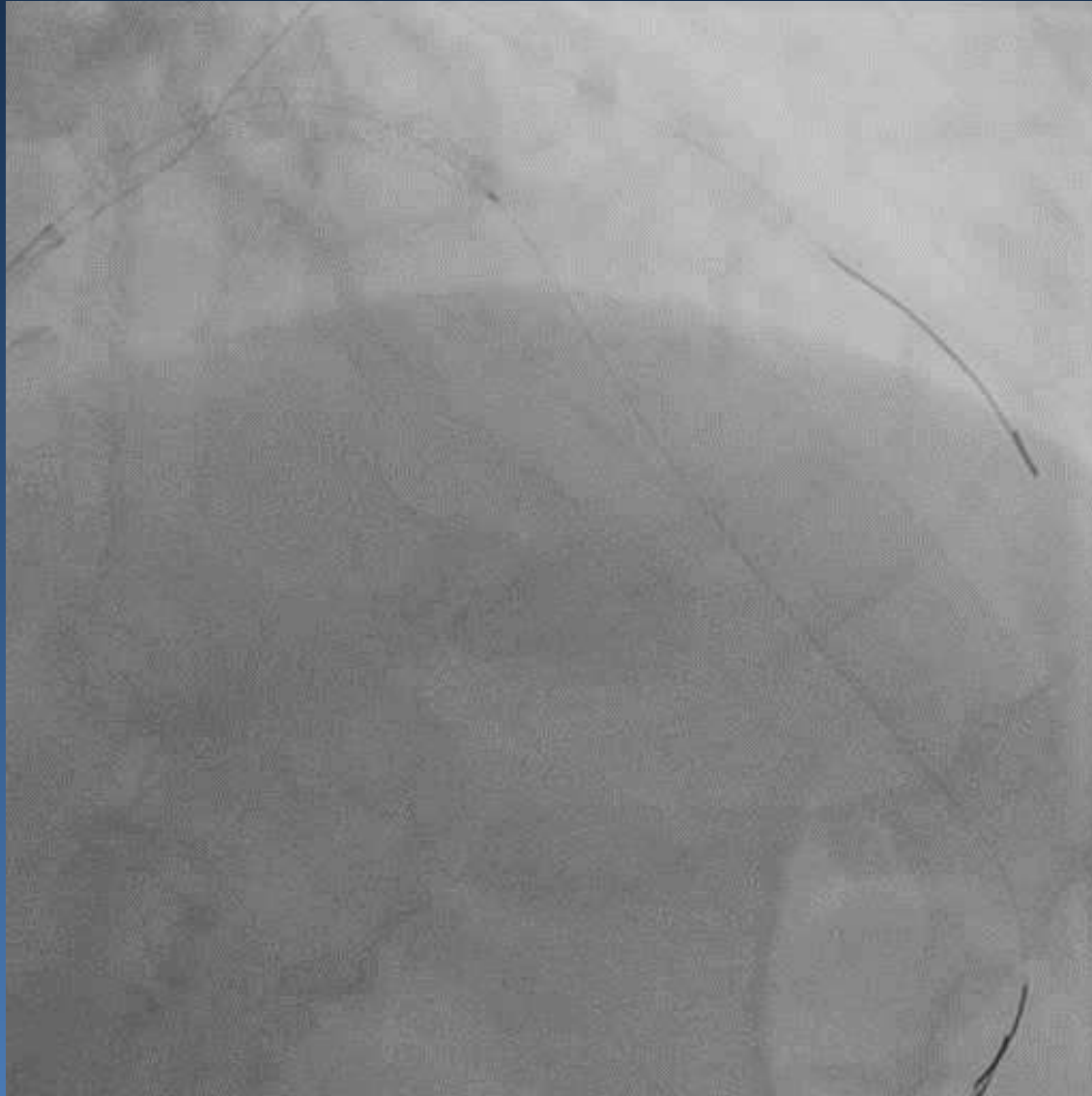
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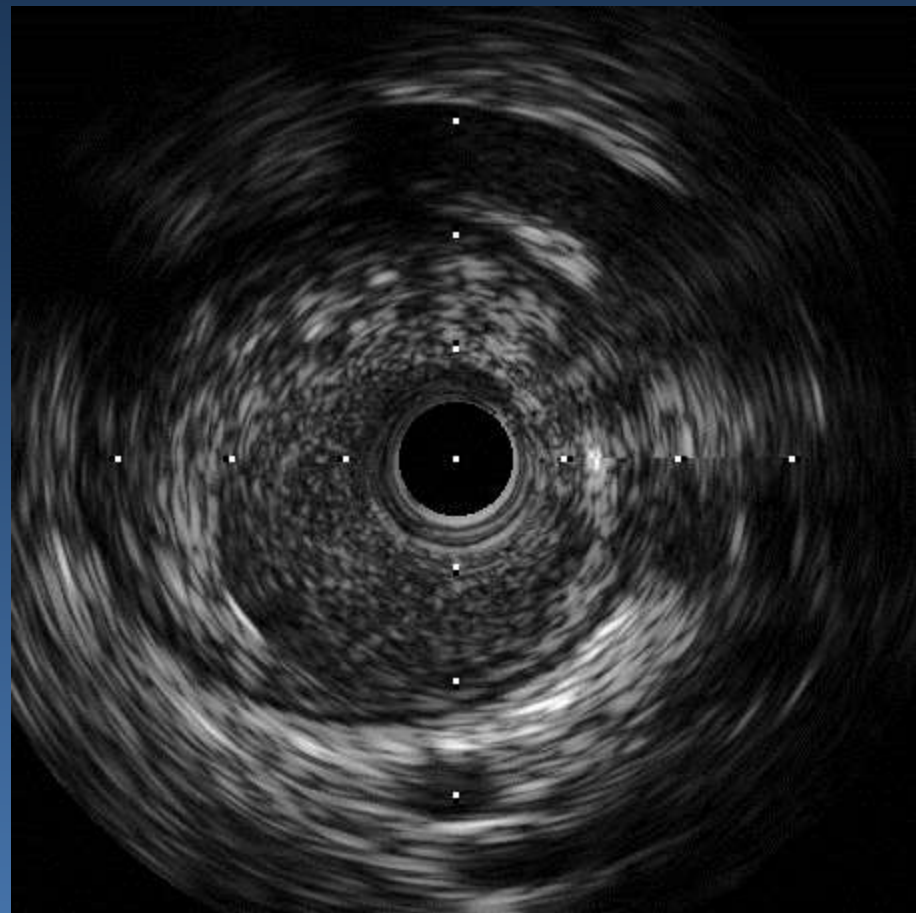
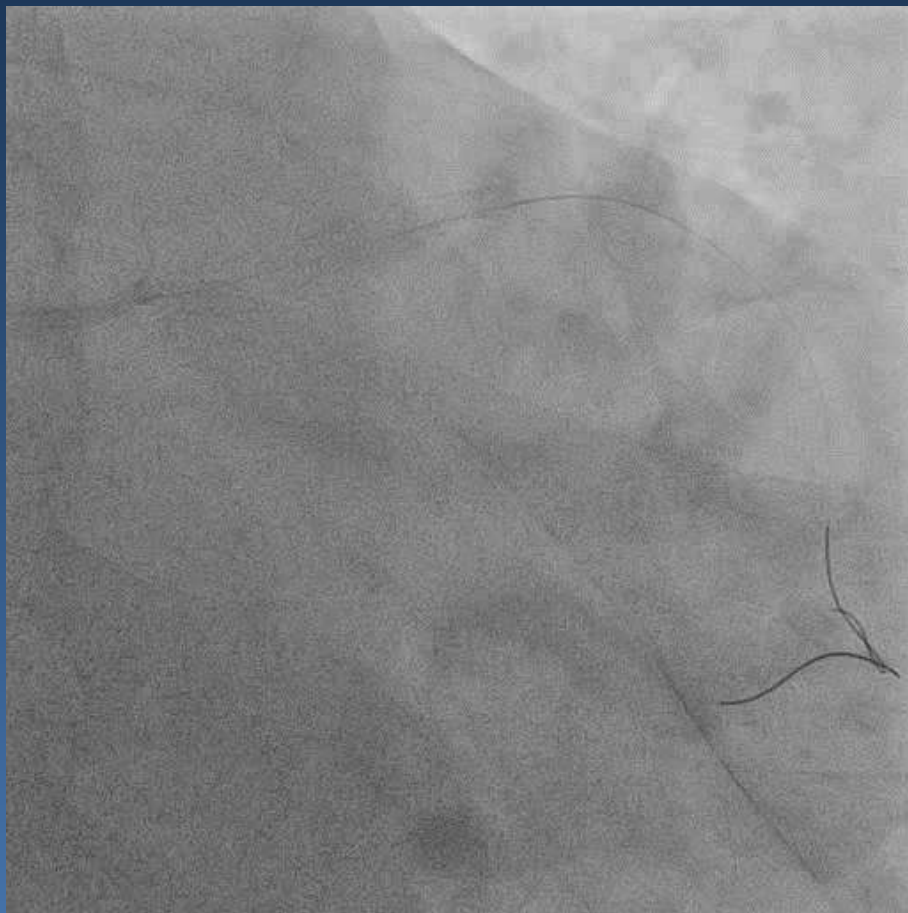
Post stent IVUS



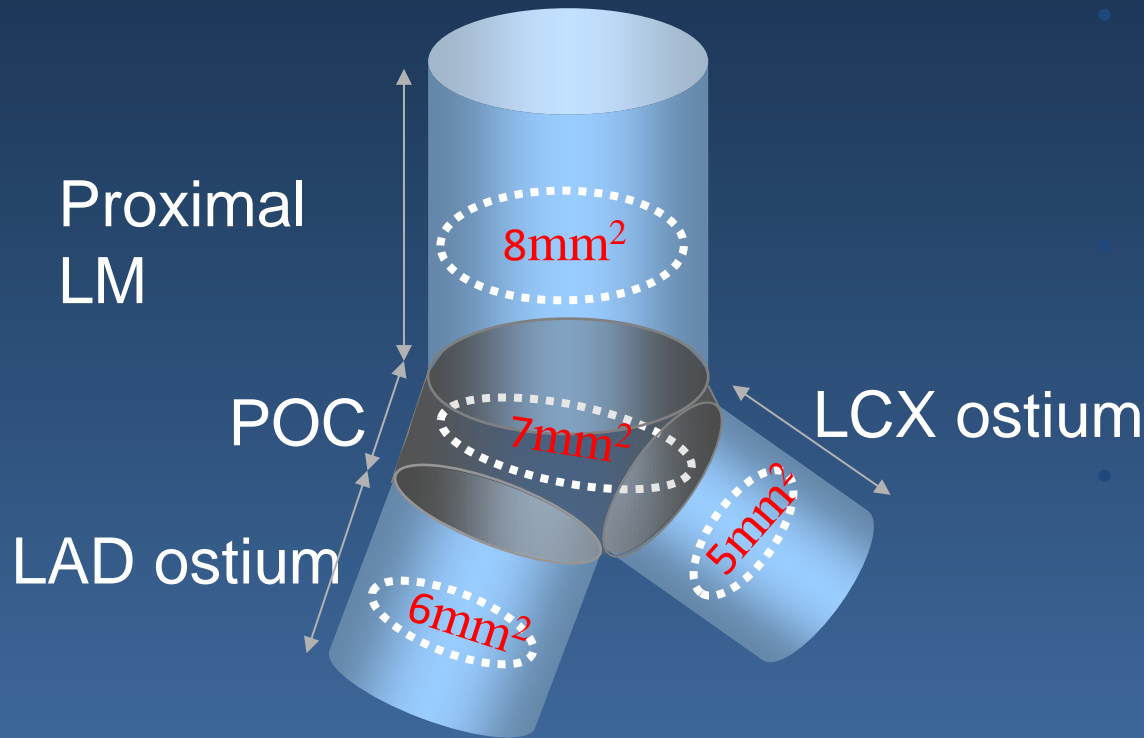
100 μ g verapamil IC



Final LCX IVUS



Criteria for stent underexpansion at the distal LMCA bifurcation (n=403)

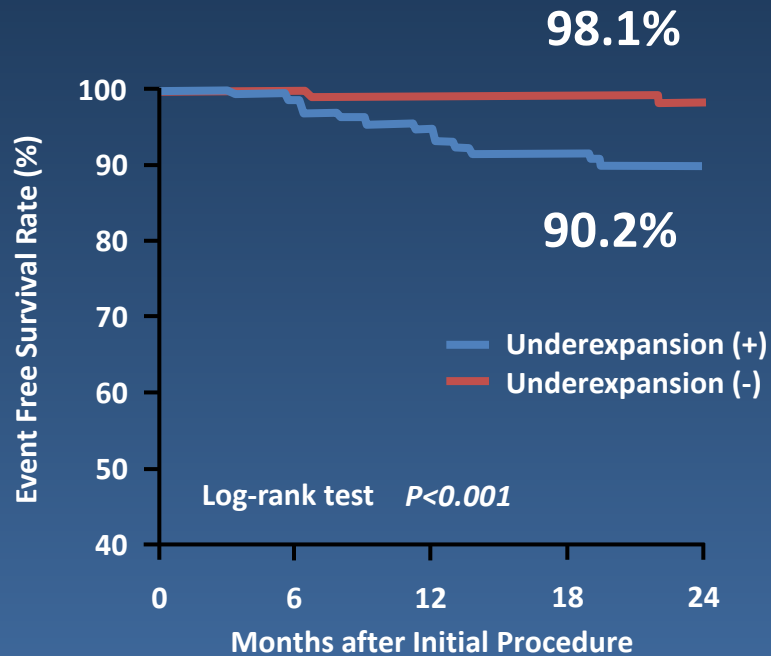


- MACE-free survival was lower in pts with underexpansion vs those without underexpansion (89.4% vs 98.1%)
- TLR-free survival was lower in pts with underexpansion vs no underexpansion (90.9% vs 98.5%).
- Although acute malapposition was observed in 28 pts, malapposition was not related to MACE at follow-up.

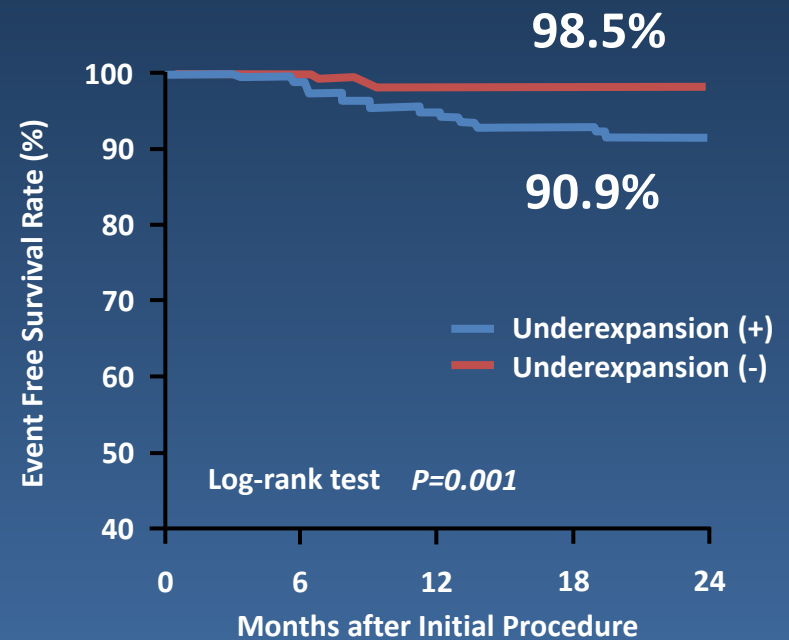
Kang et al. Circulation Cardiovasc Interv. 2011;4:562-9

MACE-free and TLR-free Survival

MACE



TLR



No. at risk

Underexpansion (+)	133	131	126	121	75
Underexpansion (-)	260	260	255	246	129

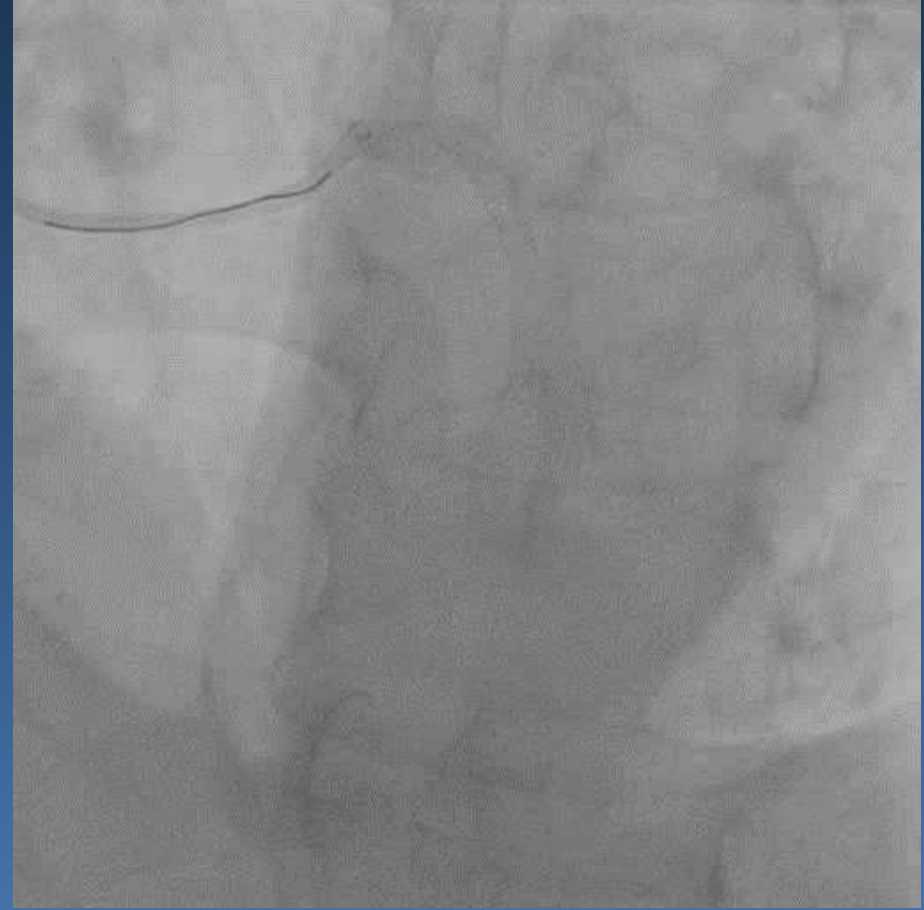
No. at risk

Underexpansion (+)	133	131	126	121	75
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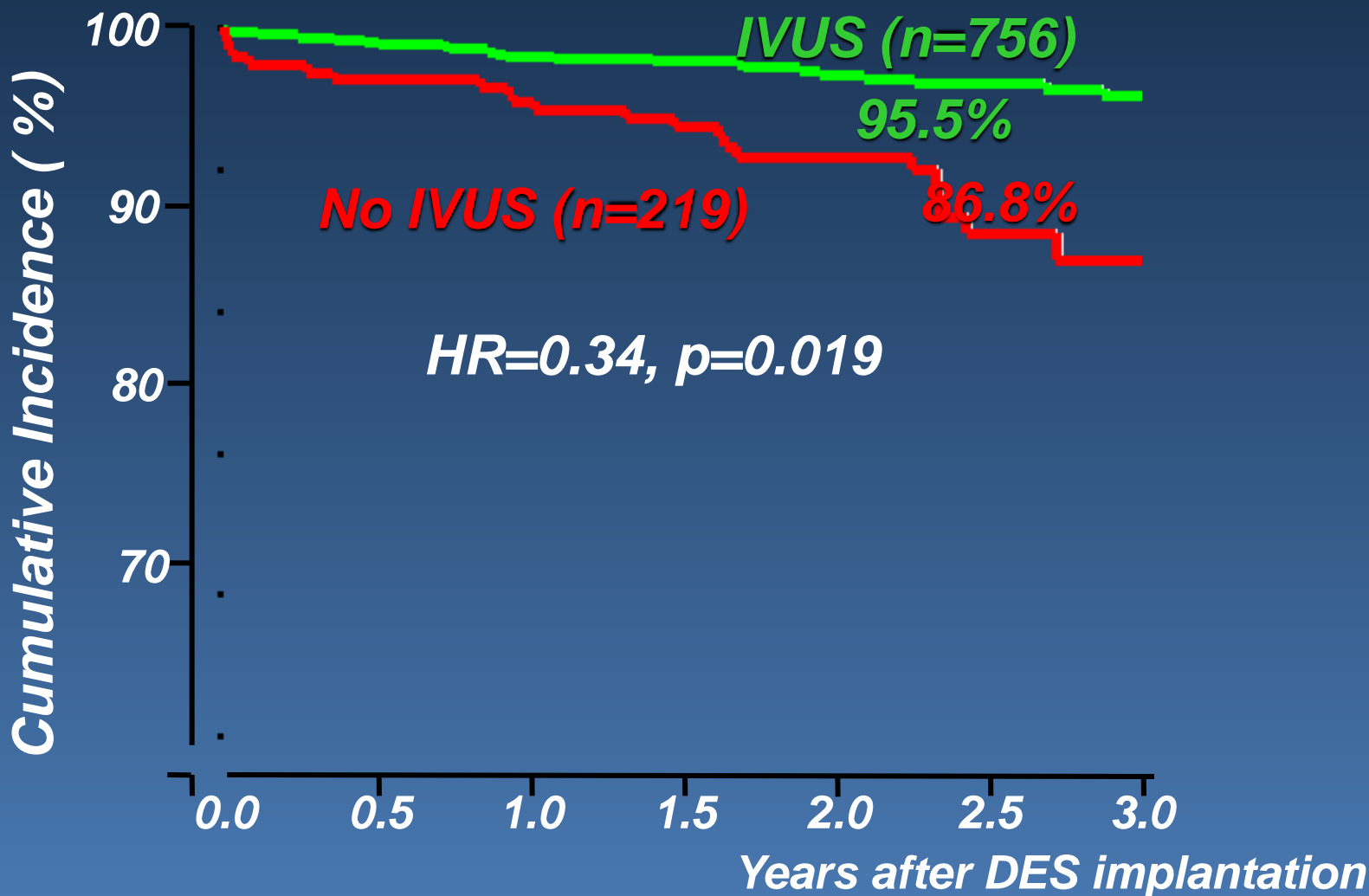
Kang et al. Circulation
Cardiovasc Interv. 2011;4:562-9



Final Result



All-cause mortality after LMCA DES implantation: Impact of IVUS guidance



Park et al. Circ Cardiovasc Intervent 2009;2:167-77

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ADAPT-DES

Assessment of Dual AntiPlatelet Therapy with Drug-Eluting Stents

8,575 pts prospectively enrolled

No clinical or anatomic exclusion criteria

Successful and uncomplicated PCI with ≥ 1 non-investigational DES



Pre-specified IVUS vs no IVUS substudy



IVUS: 3349 pts

No IVUS: 5234 pts

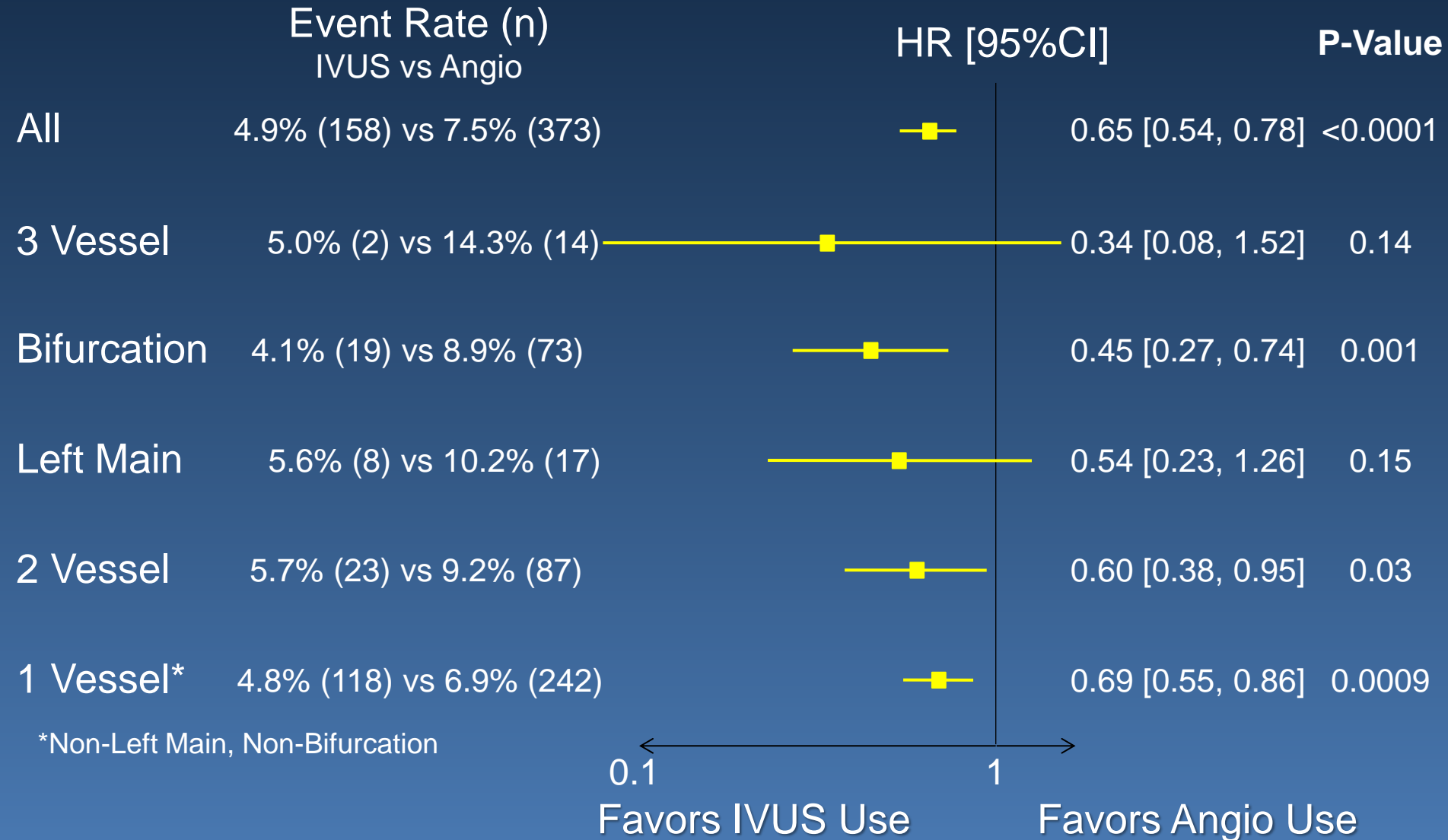


Clinical FU at 30 days, 1 year, 2 years

Witzenbichler et al. Circulation 2014;129:463-70



Association of IVUS Use with MACE (Definite/Probable ST, Cardiac Death, MI) in Relation to Lesion Complexity



Maehara et al. J Am Coll Cardiol 2013;62:B21-B22

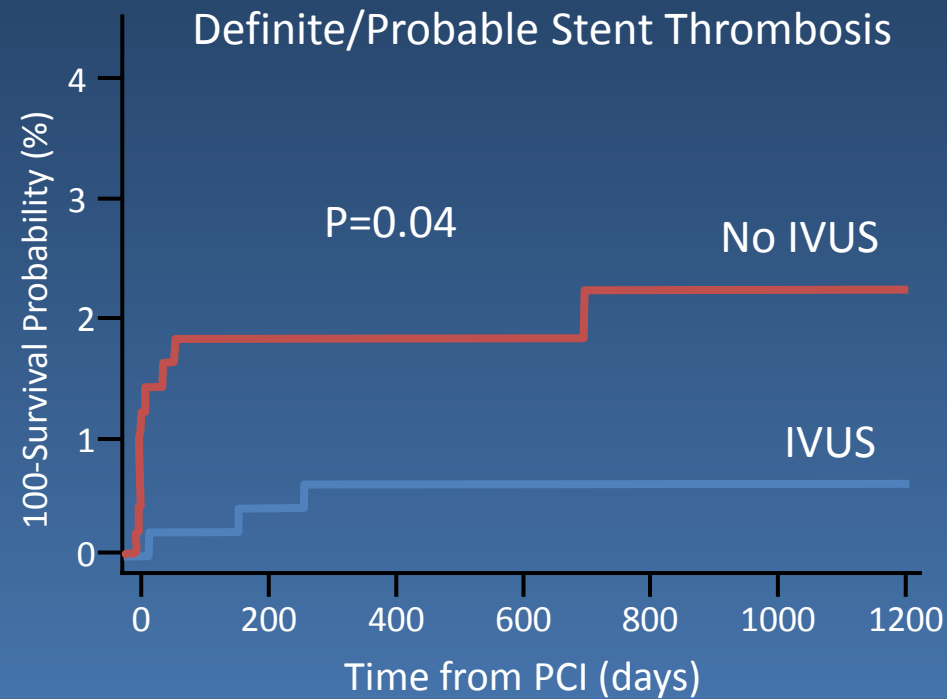
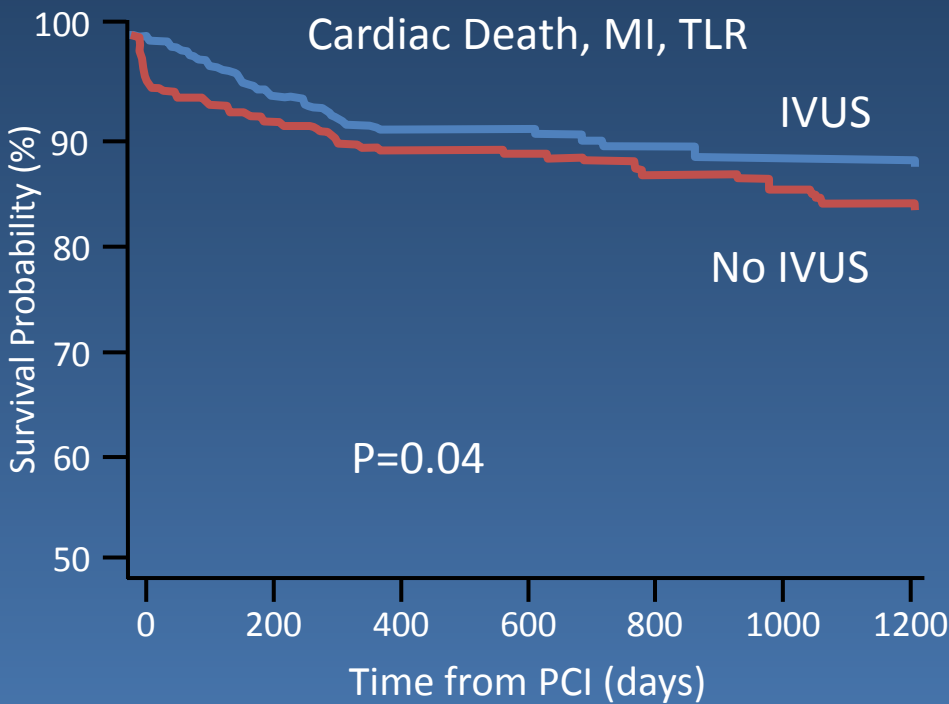
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Impact of IVUS Guidance of Unprotected LM

Propensity Matched 1010 pts from 4 Registries

- Distal LM lesion ~60%, 2 stent technique ~13%
- IVUS guidance was an independent predictor of MACE



De la Torre Hernandez et al. J Am Coll Cardiol 2014;244-54



Comparison of 1-year clinical outcomes between IVUS-guided versus angiography-guided implantation of DES for LMCA lesions: A single-center analysis of a 1,016 pt cohort

	IVUS	No IVUS	P
Overall	337	679	
Cardiac death	1.8%	6.2%	0.002
STEMI	1.2%	3.4%	0.004
TLR	2.4%	9.4%	<0.001
Stent thrombosis	0.6%	2.7%	0.026
MACE	14.8%	27.2%	<0.001
Propensity Score Matched	291	291	
Cardiac death	12.4%	15.1%	0.023
STEMI	1.0%	3.4%	0.05
TLR	2.7%	8.2%	0.004
Stent thrombosis	0.3%	2.4%	0.075
MACE	16.2%	24.4%	0.014

Gao et al. Patient Preference and Adherence 2014;8:1-11

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2014 ESC/EACTS Guidelines on myocardial revascularization

The Task Force on Myocardial Revascularization of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS)

Recommendations	Class ^a	Level ^b
FFR to identify haemodynamically relevant coronary lesion(s) in stable patients when evidence of ischaemia is not available.	I	A
FFR-guided PCI in patients with multivessel disease.	IIa	B
IVUS in selected patients to optimize stent implantation.	IIa	B
IVUS to assess severity and optimize treatment of unprotected left main lesions.	IIa	B
IVUS or OCT to assess mechanisms of stent failure.	IIa	C
OCT in selected patients to optimize stent implantation.	IIb	C

Take Home Message

- **Use IVUS to guide LM stent implantation**
 - **Strategy (one stent cross-over or two stent techniques)**
 - **Sizing – diameter and length**
 - **Expansion, lesion coverage, etc**
 - **Complications**
- **Use IVUS to assess jailed LCX before additional post-dilation or stent implantation after single stent cross-over.**



Thank you!

