

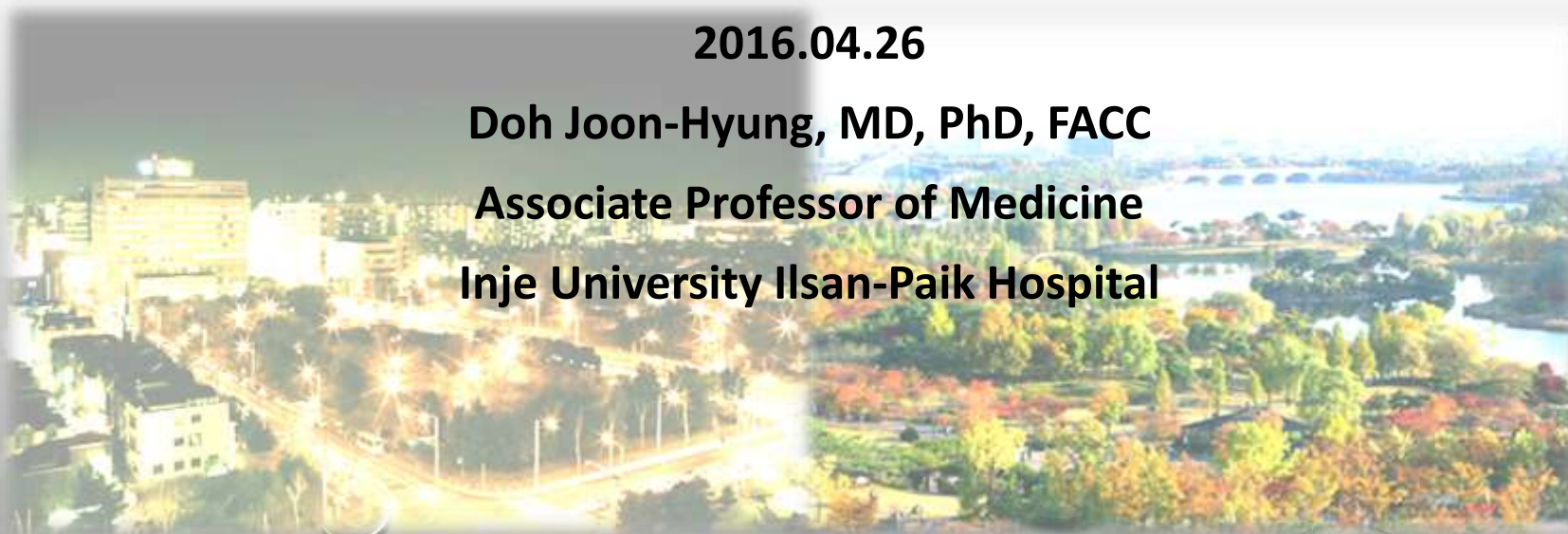
Understanding about Low Post-Stenting FFR

2016.04.26

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Inje University Ilsan-Paik Hospital



Definition of PCI Success

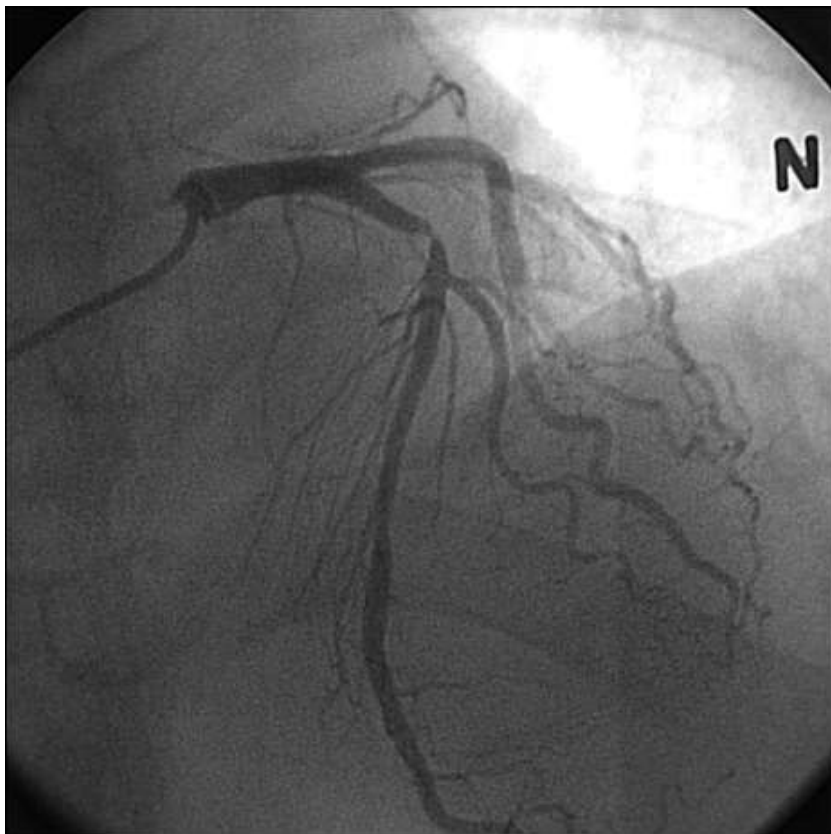
- **Angiographic success**
: <20% DS with TIMI 3 flow after stent
- **Procedural success**
: angiographic success without in-hospital MACE
- **Clinical success**
: procedural success with relief of symptom and sign of ischemia

2001 AHA/ACC guidelines for PCI

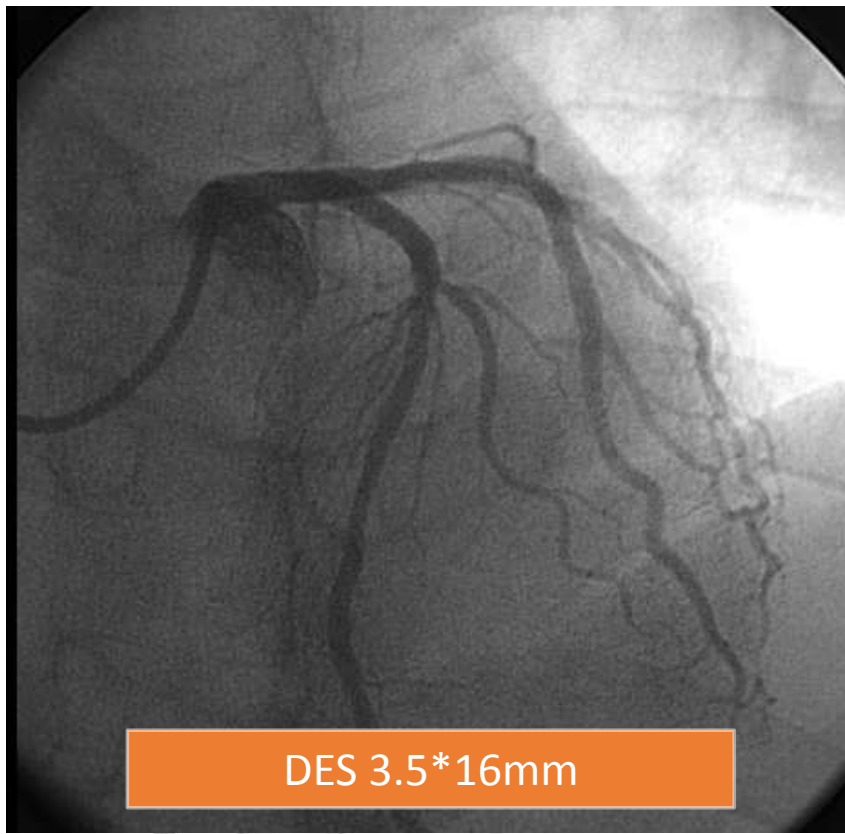
Angiographic gain after DES implantation

Case #1. Gains With PCI

Angiographic Lumen Diameter Gain



%DS 79.2%

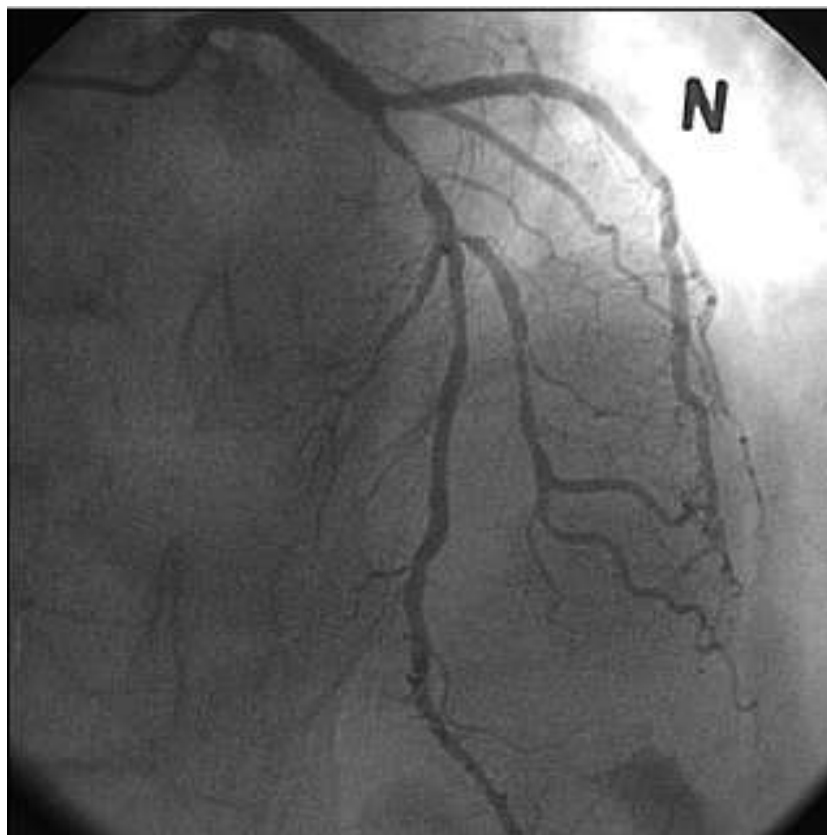


DES 3.5*16mm

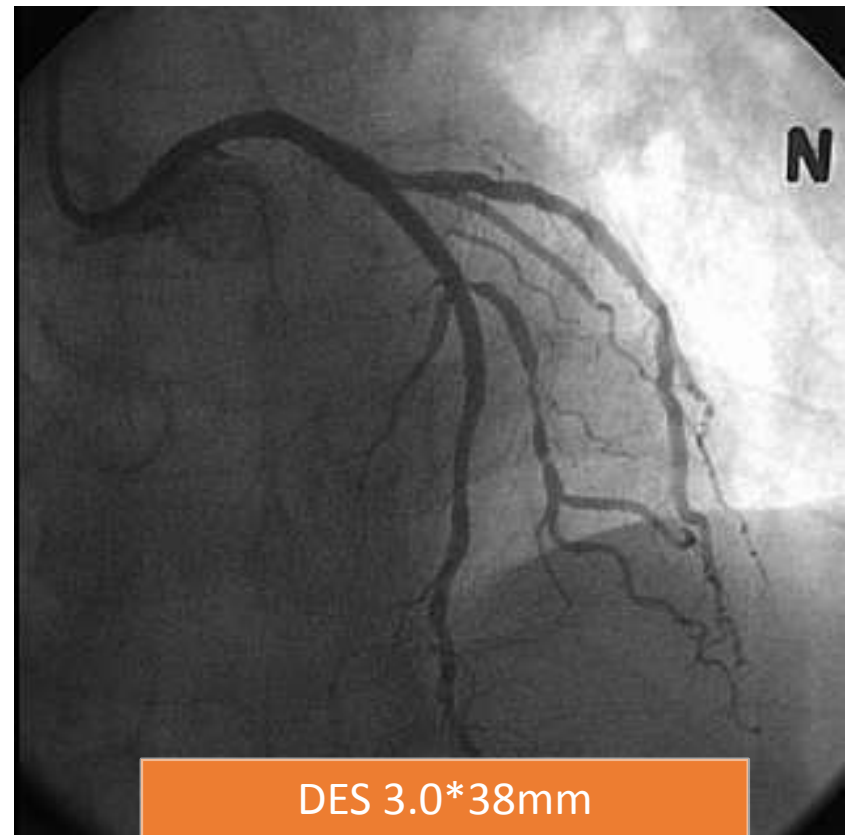
%DS 6.8%

Case #2. Gains with PCI

Angiographic Lumen Diameter Gain



%DS 81.6%



DES 3.0*38mm

%DS 5.5%

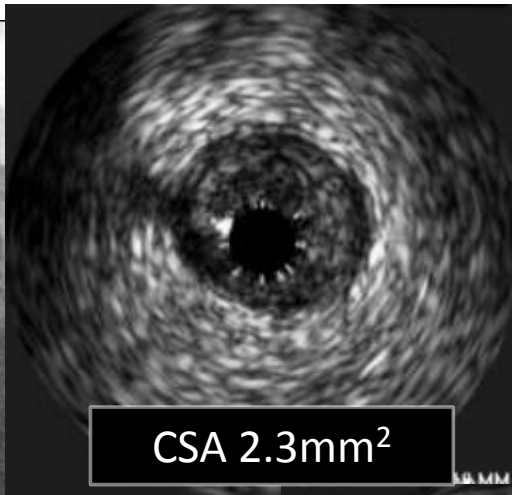
Angiographic Gain Warrant Anatomic Stent Lumen Optimization Related Better Clinical Outcome?

Case #1. Gains With PCI

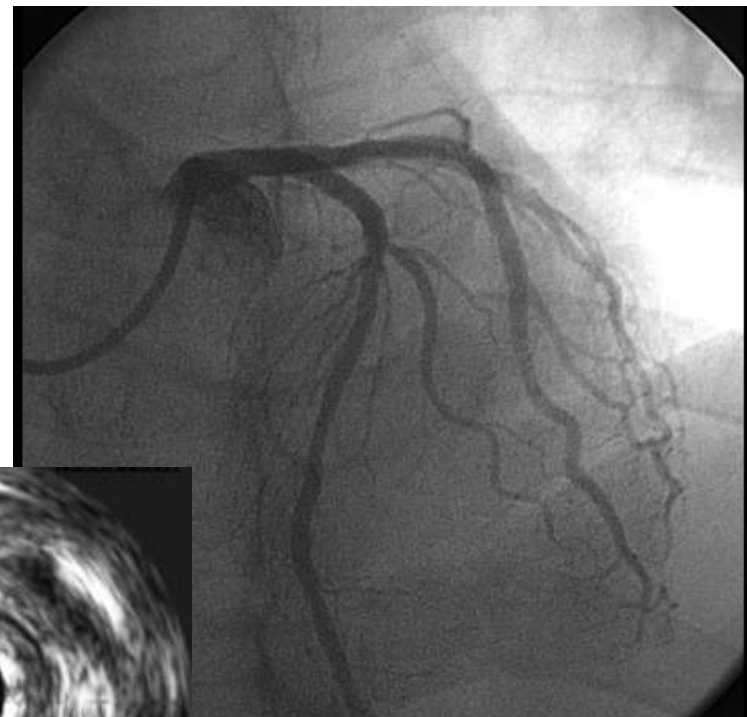
IVUS Lumen CSA Gain



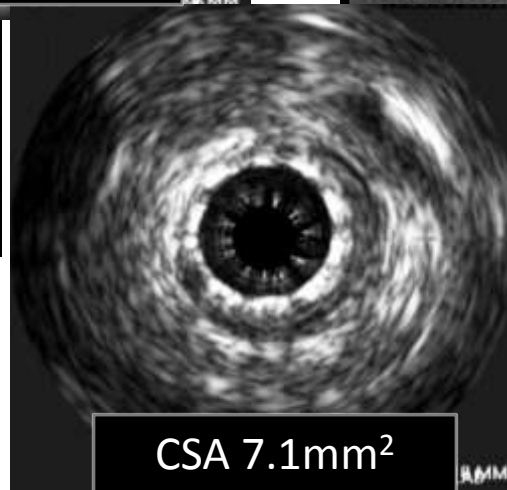
%DS 79.2%



CSA 2.3mm²



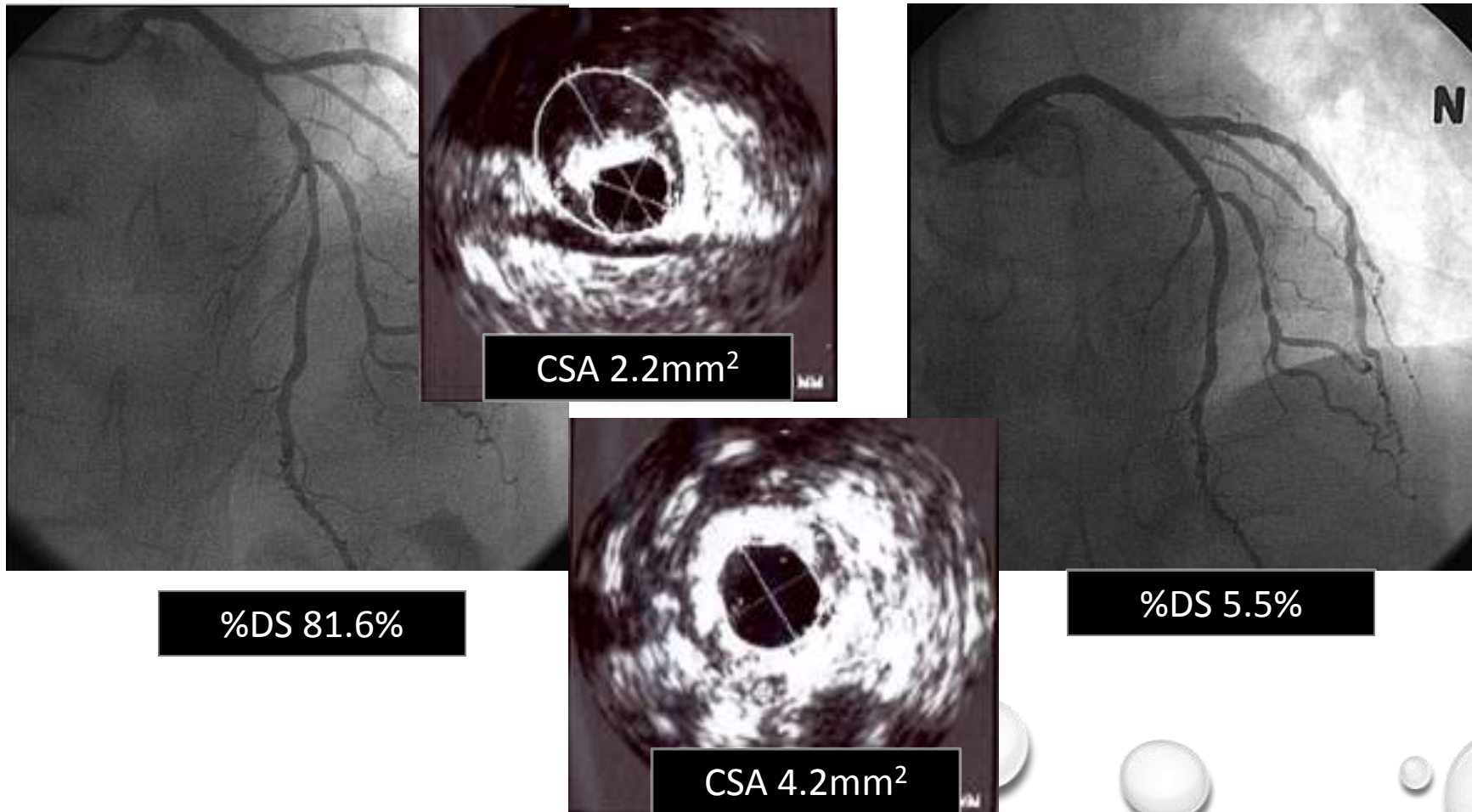
%DS 6.8%



CSA 7.1mm²

Case #2. Gains with PCI

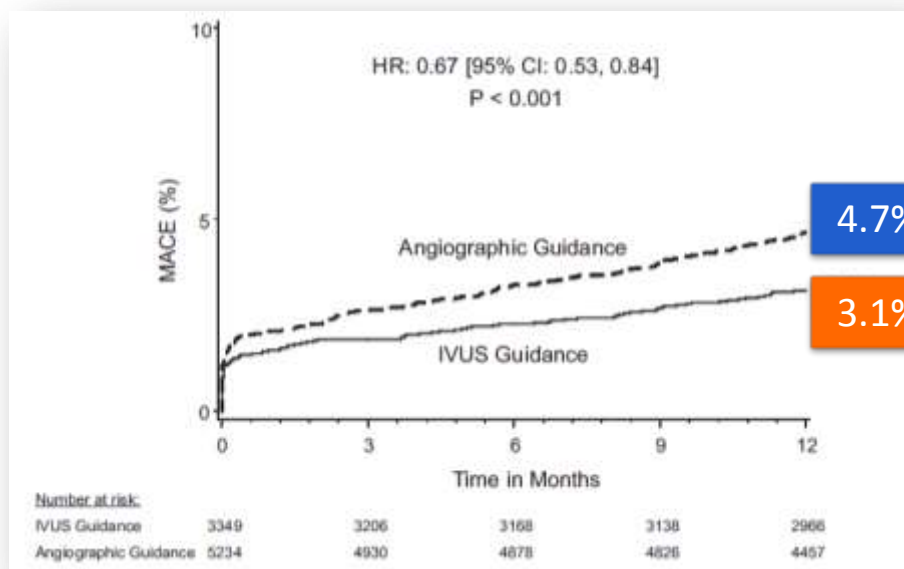
IVUS Lumen CSA Gain



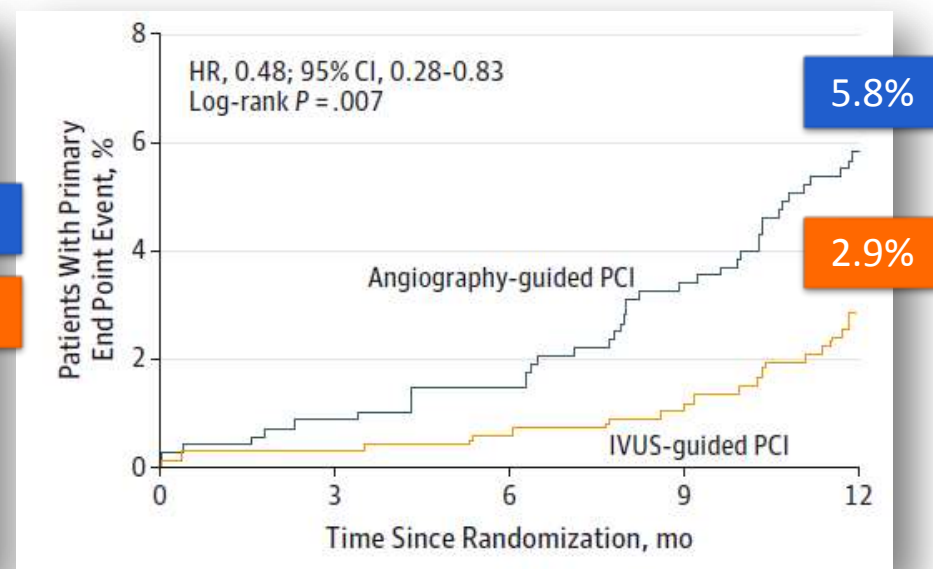
Angiographic gain is not enough! IVUS-guided stent optimization warrants better clinical outcome

ADAPT-DES study

IVUS-XPL study



Witzenbichler et al, *Circulation*. 2014;129:463-470



Hong SJ et al, *JAMA* 2015. 314(20):2155-2163

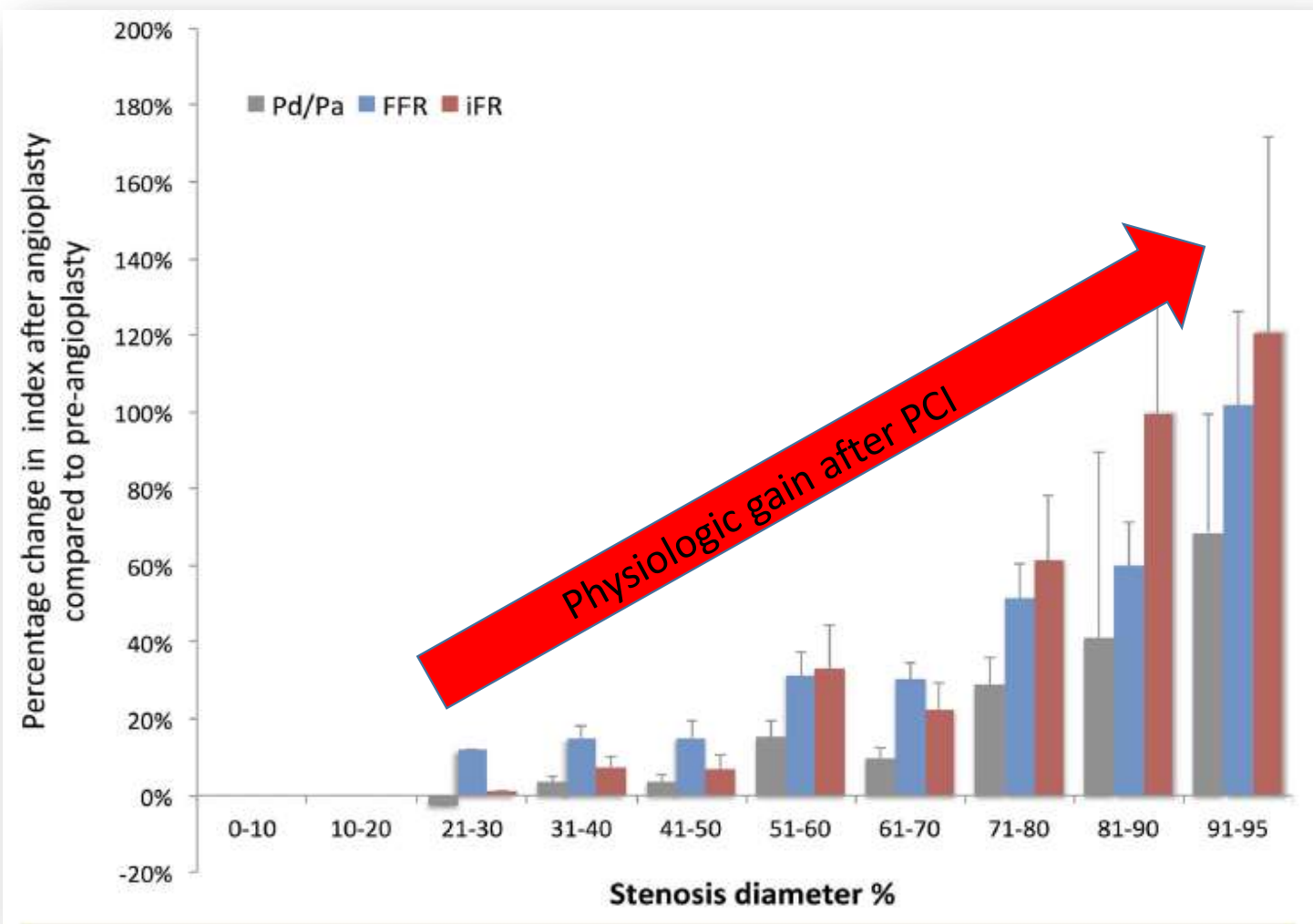
Ischemia-driven target lesion revascularization	17 (2.5)	33 (5.0)
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Hong SJ et al, *JAMA* 2015. 314(20):2155-2163

Angiographic and IVUS Gain Warrant Optimal Physiologic Gain after Stent Implantation?

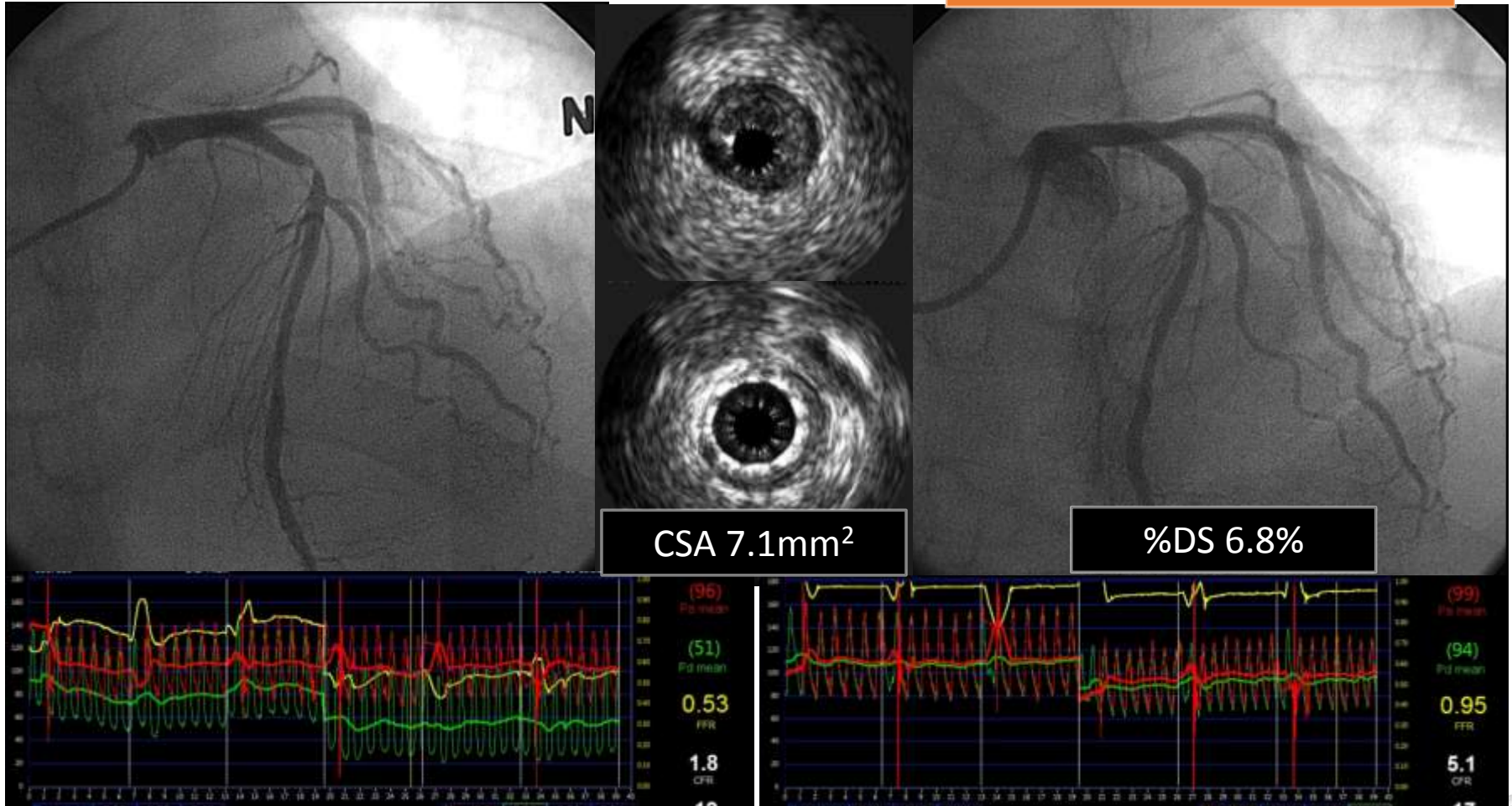
Physiologic gains of PCI

Average percent changes in Pd/Pa, iFR and FFR after PCI

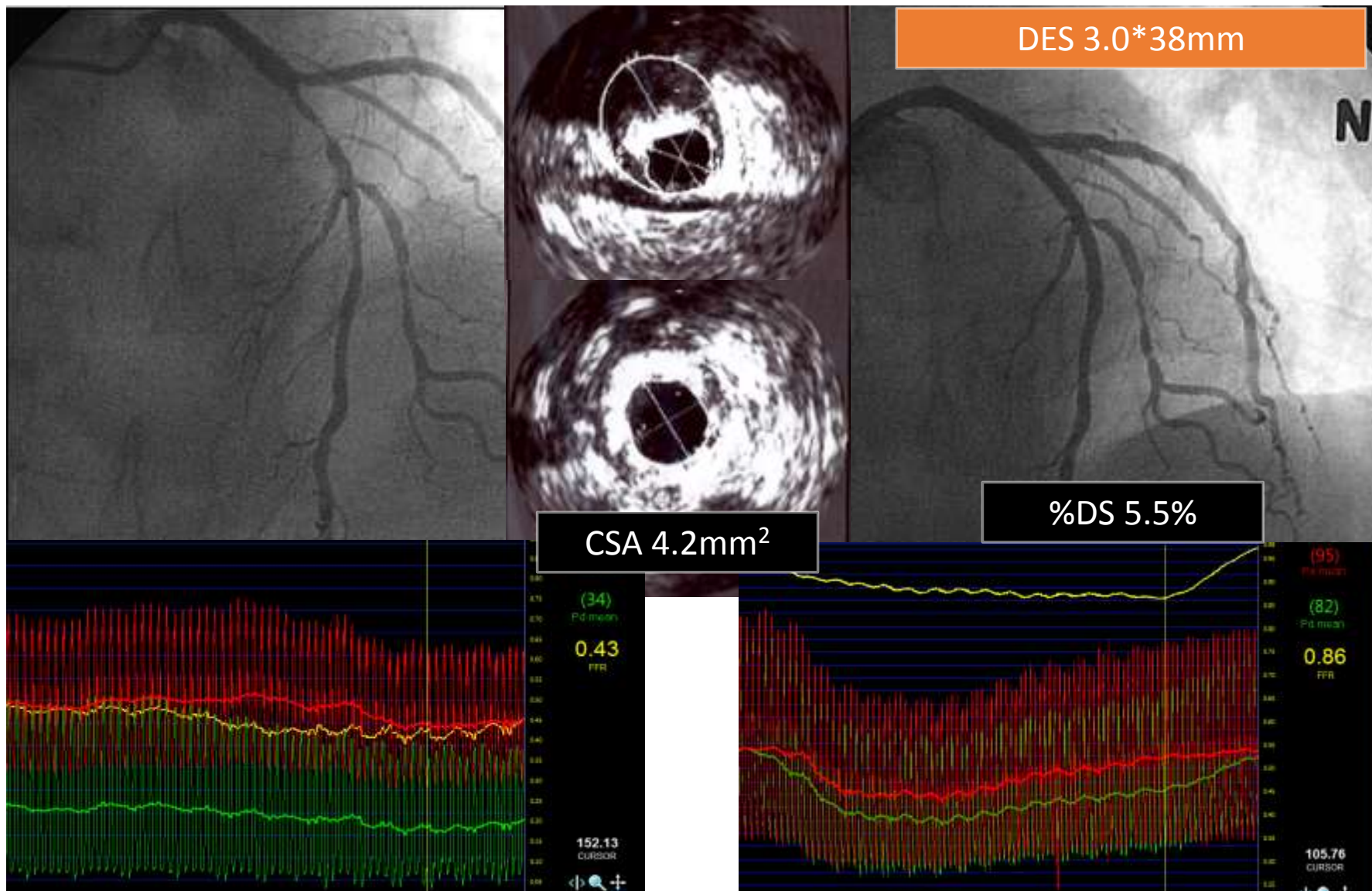


Case #1. Physiologic Gains With PCI

DES 3.5*16mm



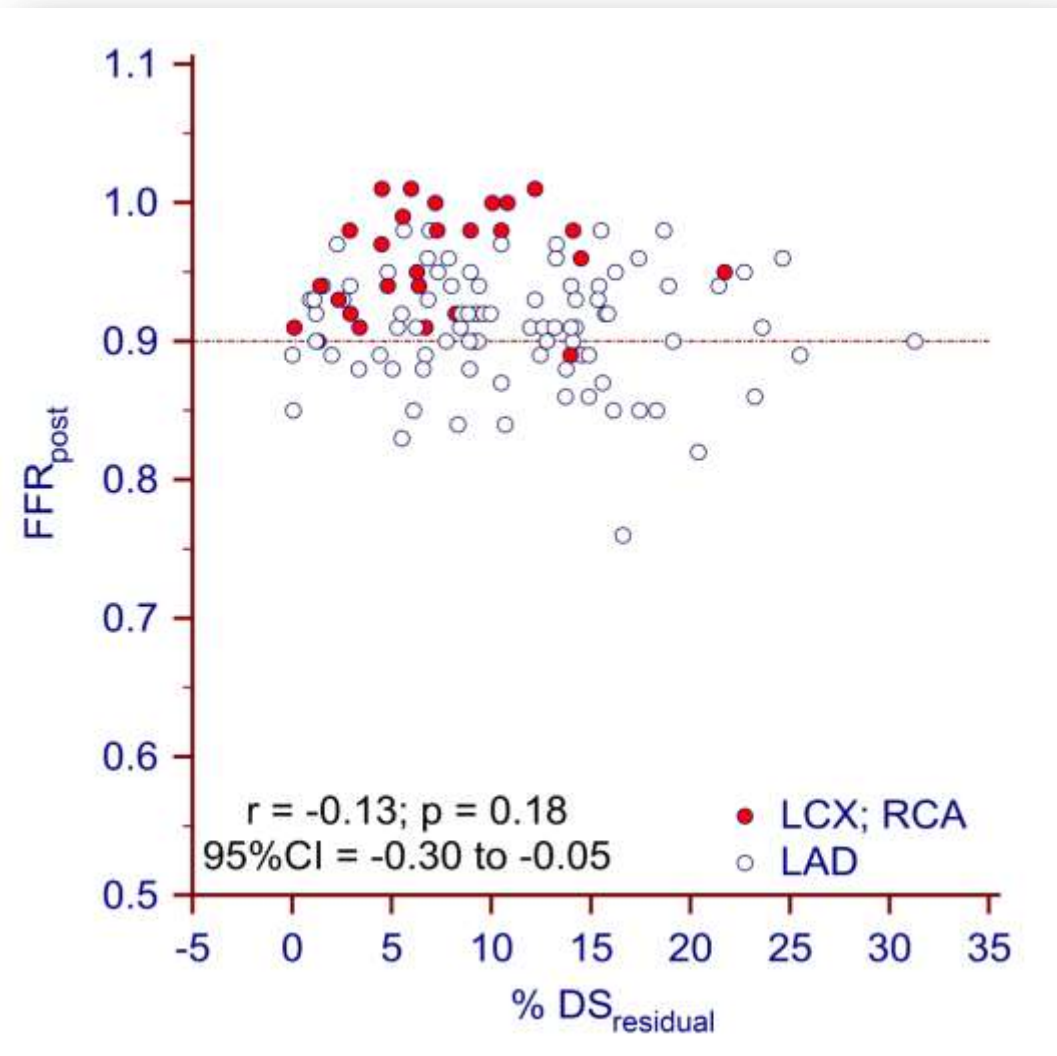
Case #2. Physiologic Gains with PCI



**Do we need to assess physiologic
stent optimization?**

Correlation Between Post-stent FFR and angiographic/IVUS parameters

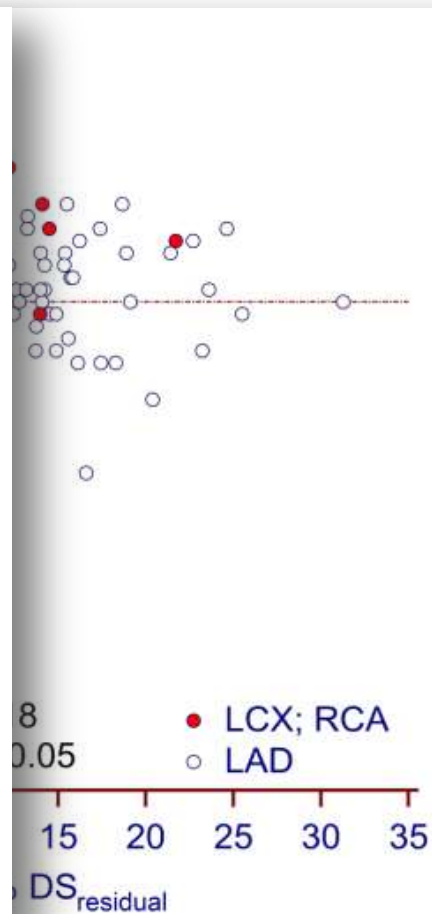
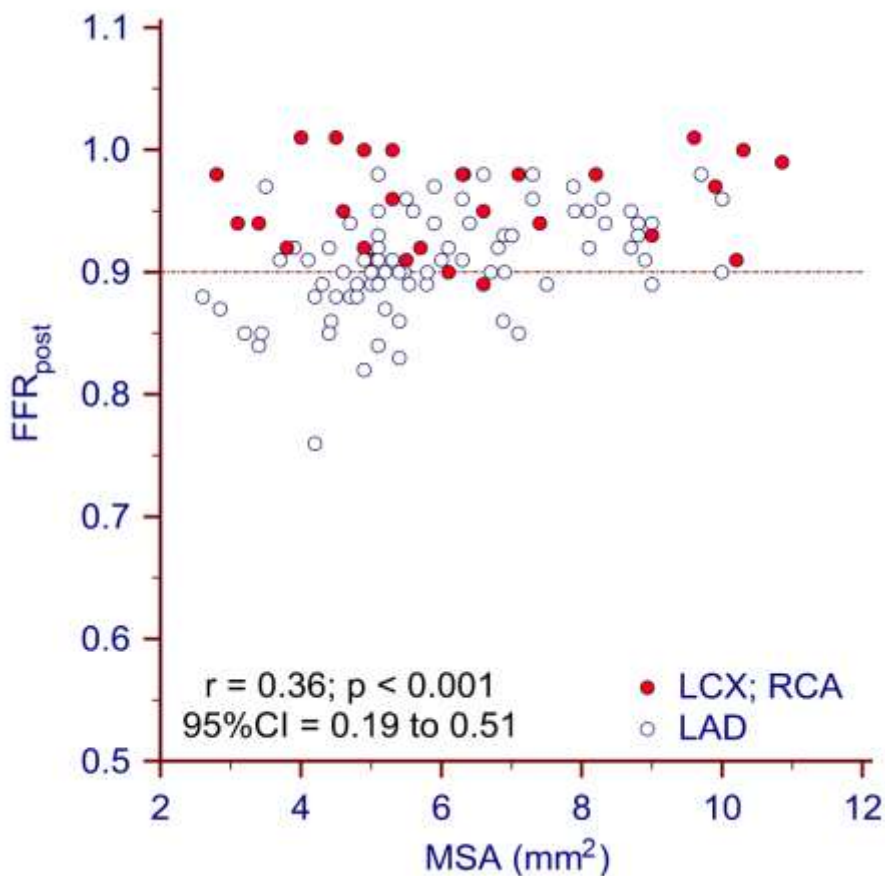
Postintervention quantitative data, mean (SD)
Total stented length
Reference vessel diameter
Minimum lumen diameter
Diameter stenosis,



Stent type	P Value
Drug-eluting PCI	.90
Bare-metal PCI	.01
PCI	<.001
PCI	.04

55-2163

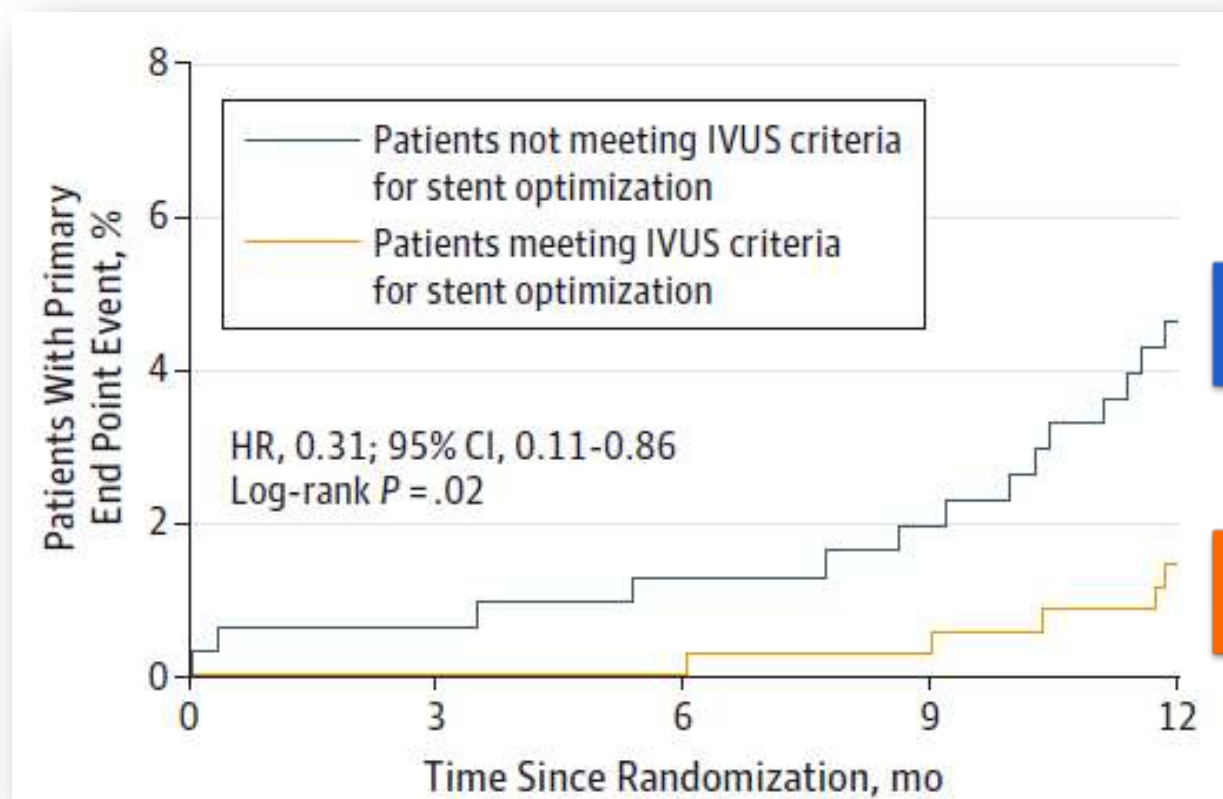
Correlation Between Post-stent FFR and angiographic/IVUS parameters



IVUS-guided stent optimization warrants better clinical outcome

IVUS-XPL randomized study

Met vs not-Met IVUS Criteria: minimal stent lumen CSA \geq distal reference segment lumen CSA

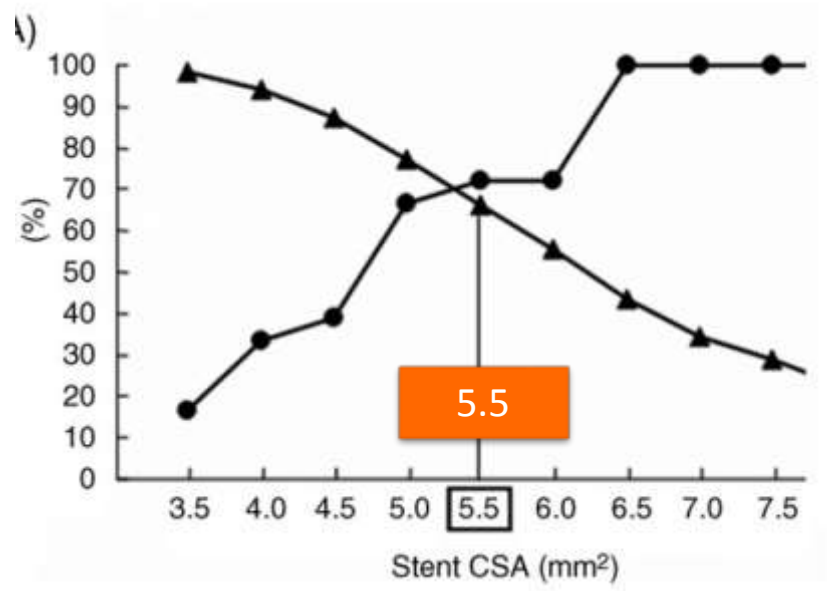


Not Met IVUS criteria

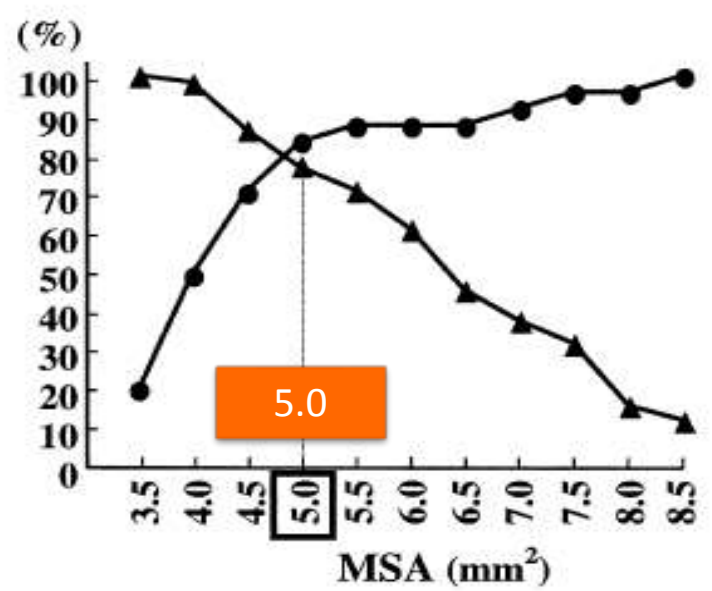
Met IVUS criteria

IVUS stent lumen CSA Criteria Predict Future MACE after DES

Binary restenosis and Long-term Patency after DES



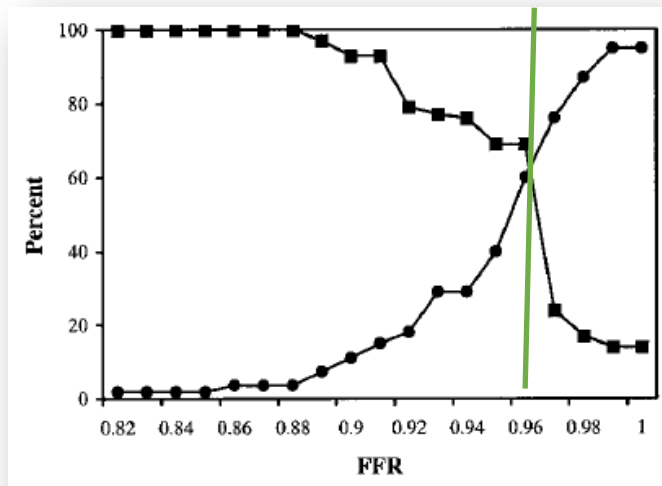
Hong MK, et al. Eur Heart J, 2006;27:1305



SES
Sonoda S et al, J Am Coll Cardiol 2004;43:1959-63

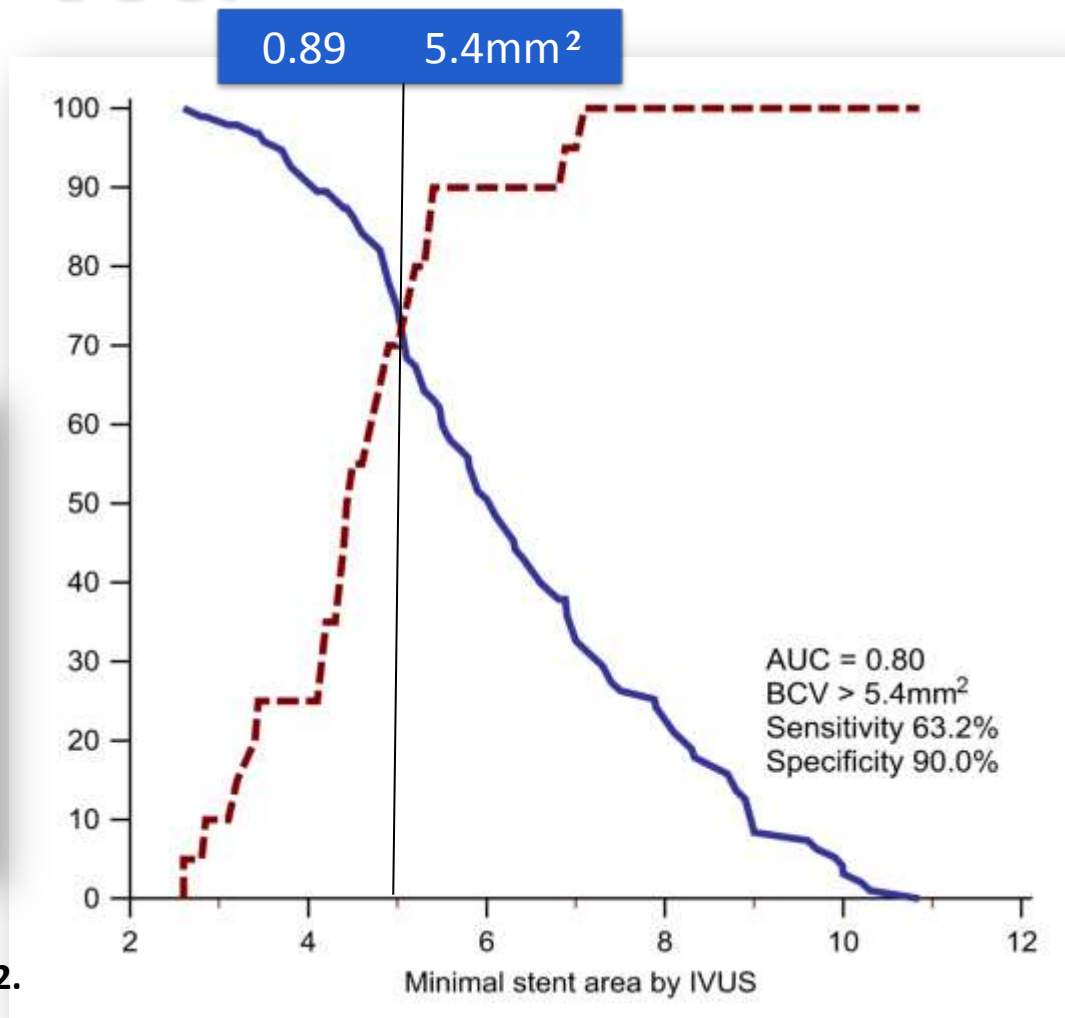
Post DES: matched IVUS minimal stent CSA to FFR

BMS



MSA: 7.0mm²

Fearon et al, Circulation. 2001;104:1917-1922.

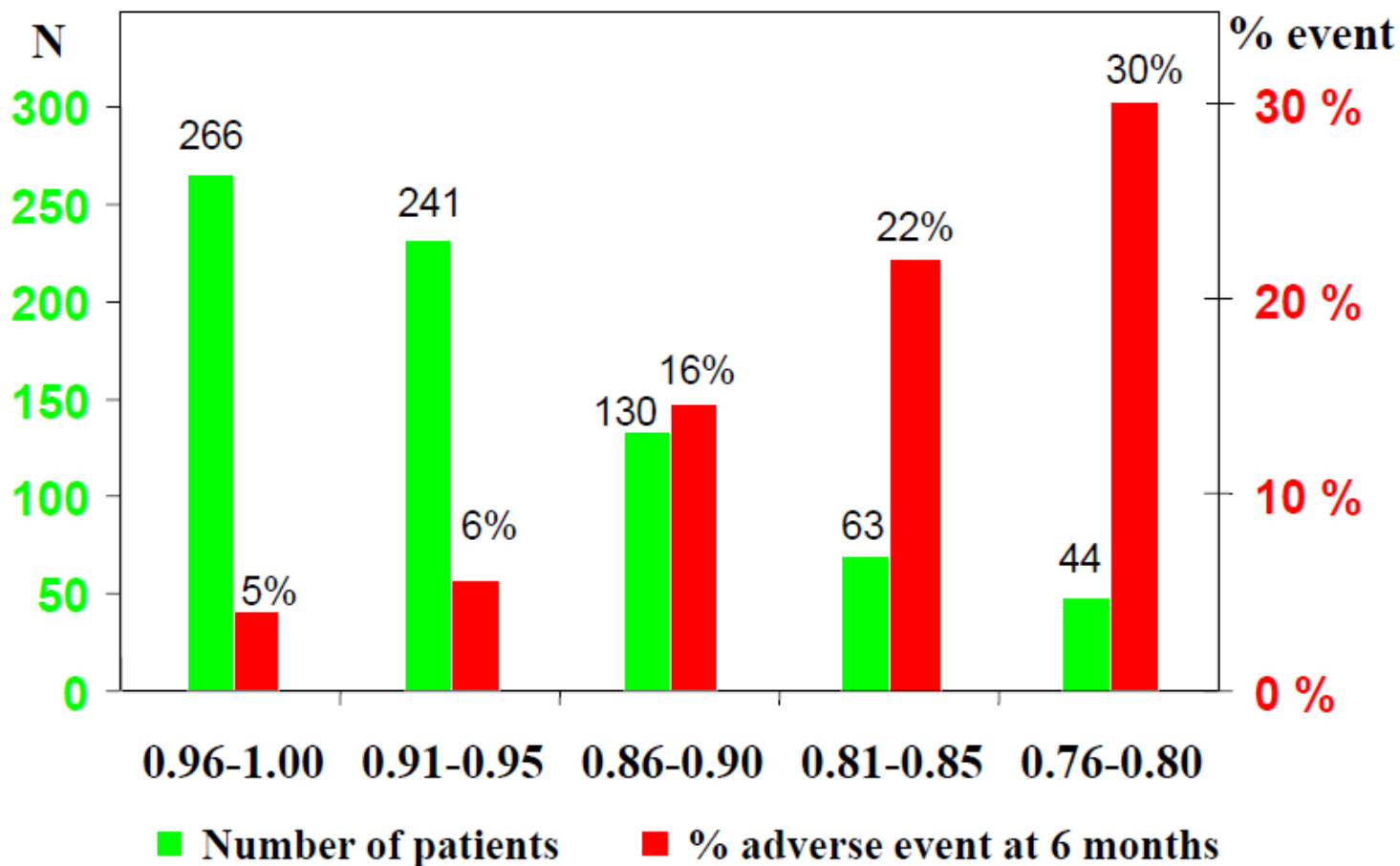


Doh JH et al, J Invasive Cardiol. 2015 Aug;27(8):346-51.

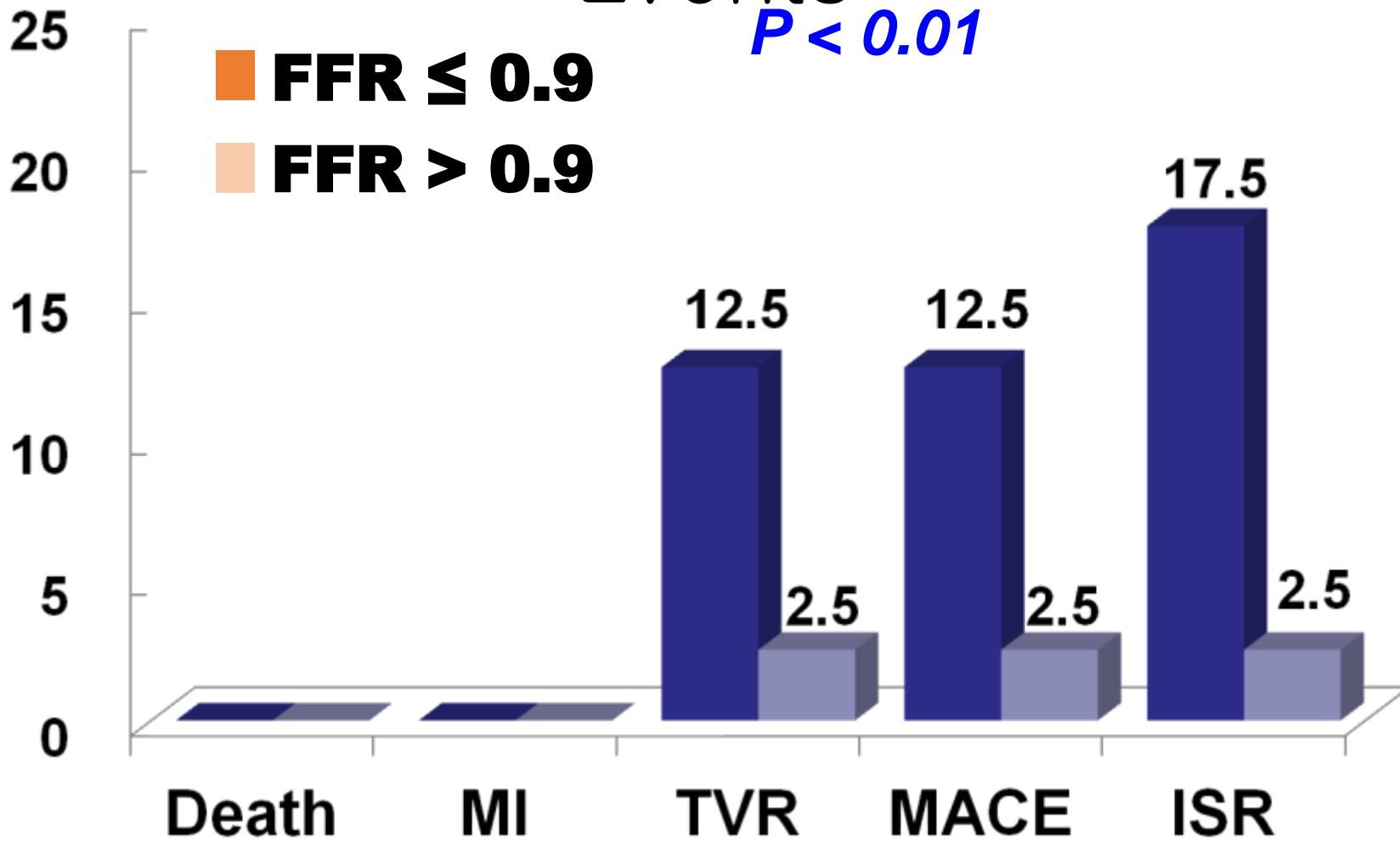
Impact of post-stent FFR on clinical outcome

Post Stent FFR registry (n=750) in BMS

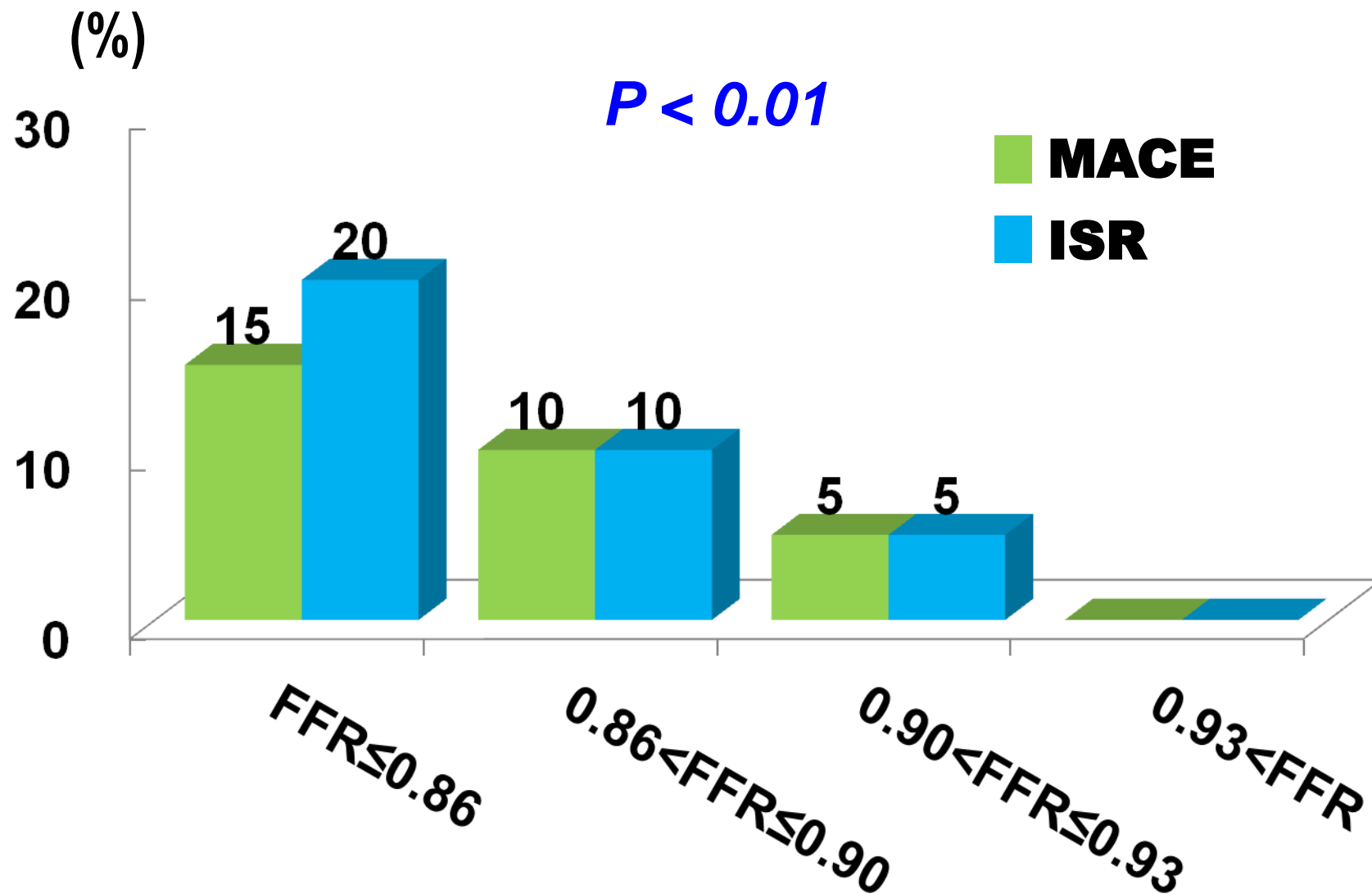
% ADVERSE EVENTS AT 6 MONTHS



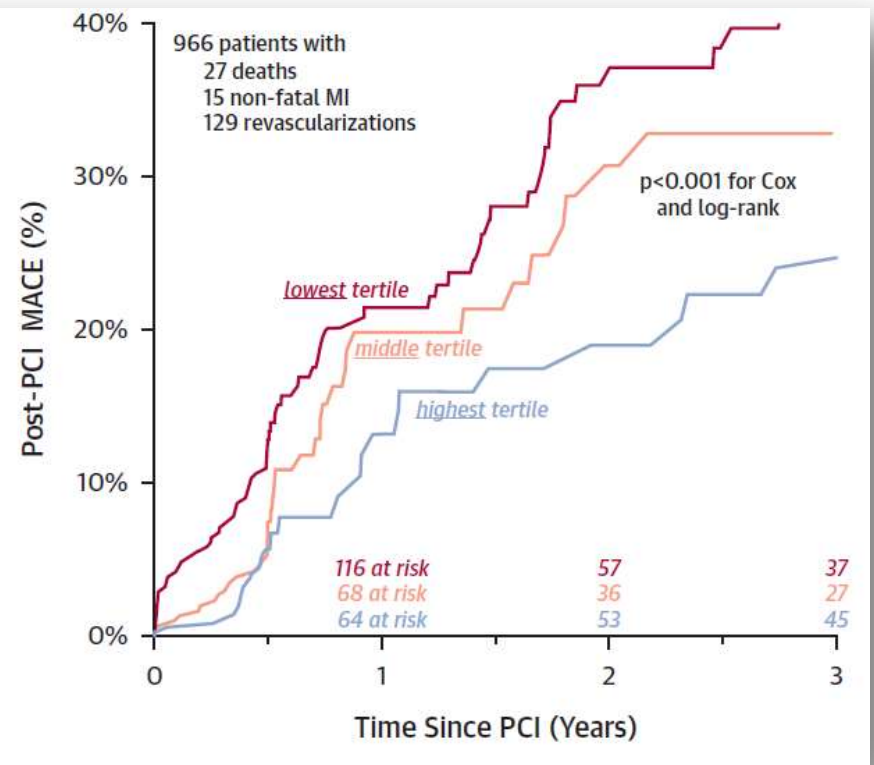
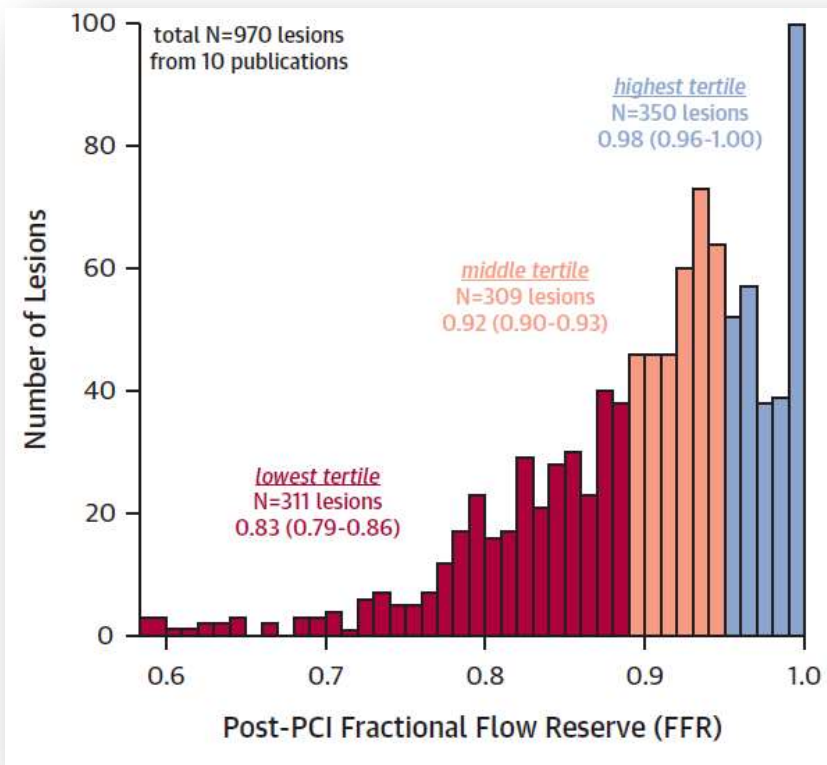
FFR after DES Predicts Adverse Events (%)



FFR after DES Predicts Adverse Events

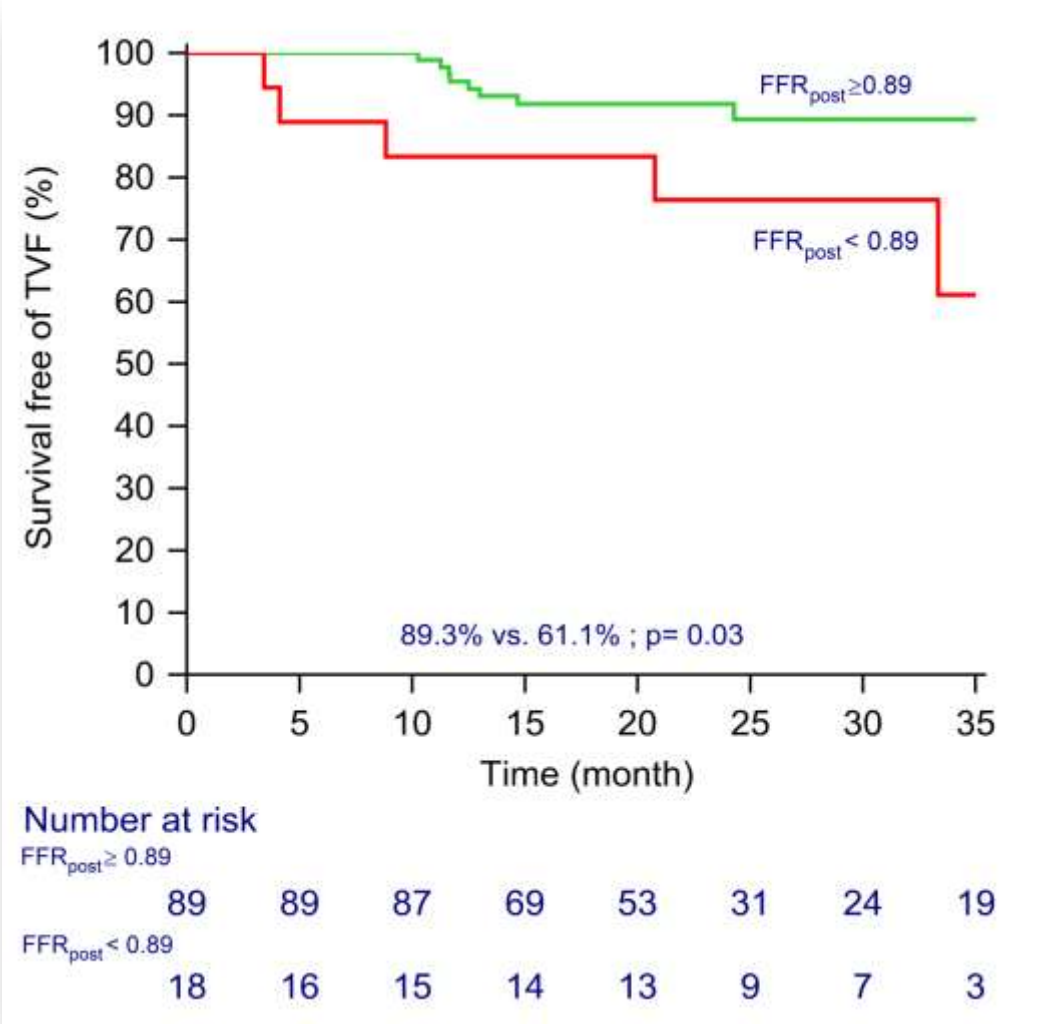


Prognostic Value of Immediate post-PCI FFR with BMS and DES



Johnson NP, JACC 2014, 1641-1654

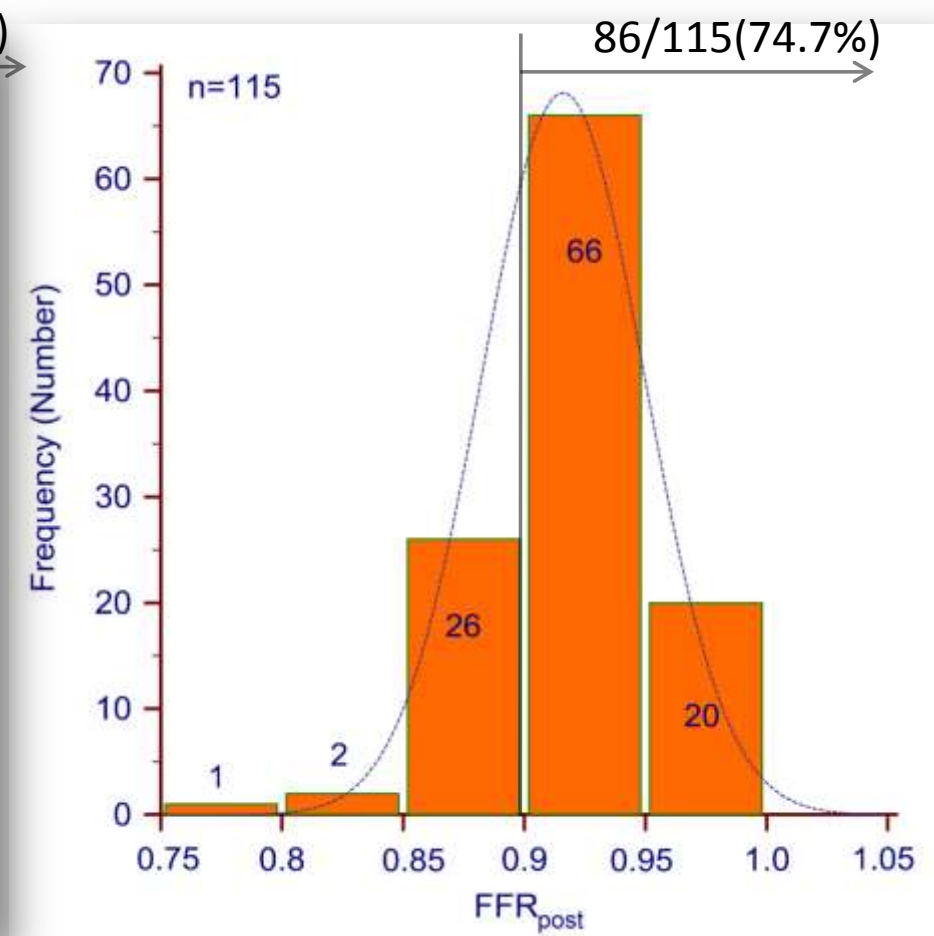
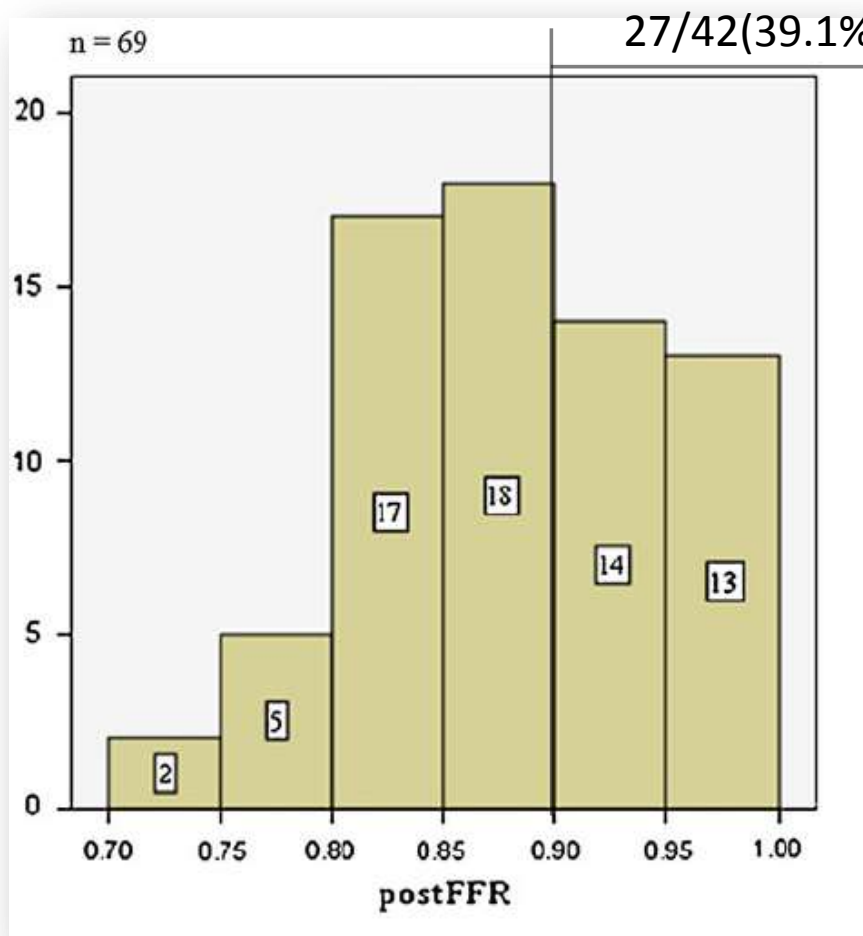
High Post-DES FFR Related with Better 3 year TVF-Free Survival



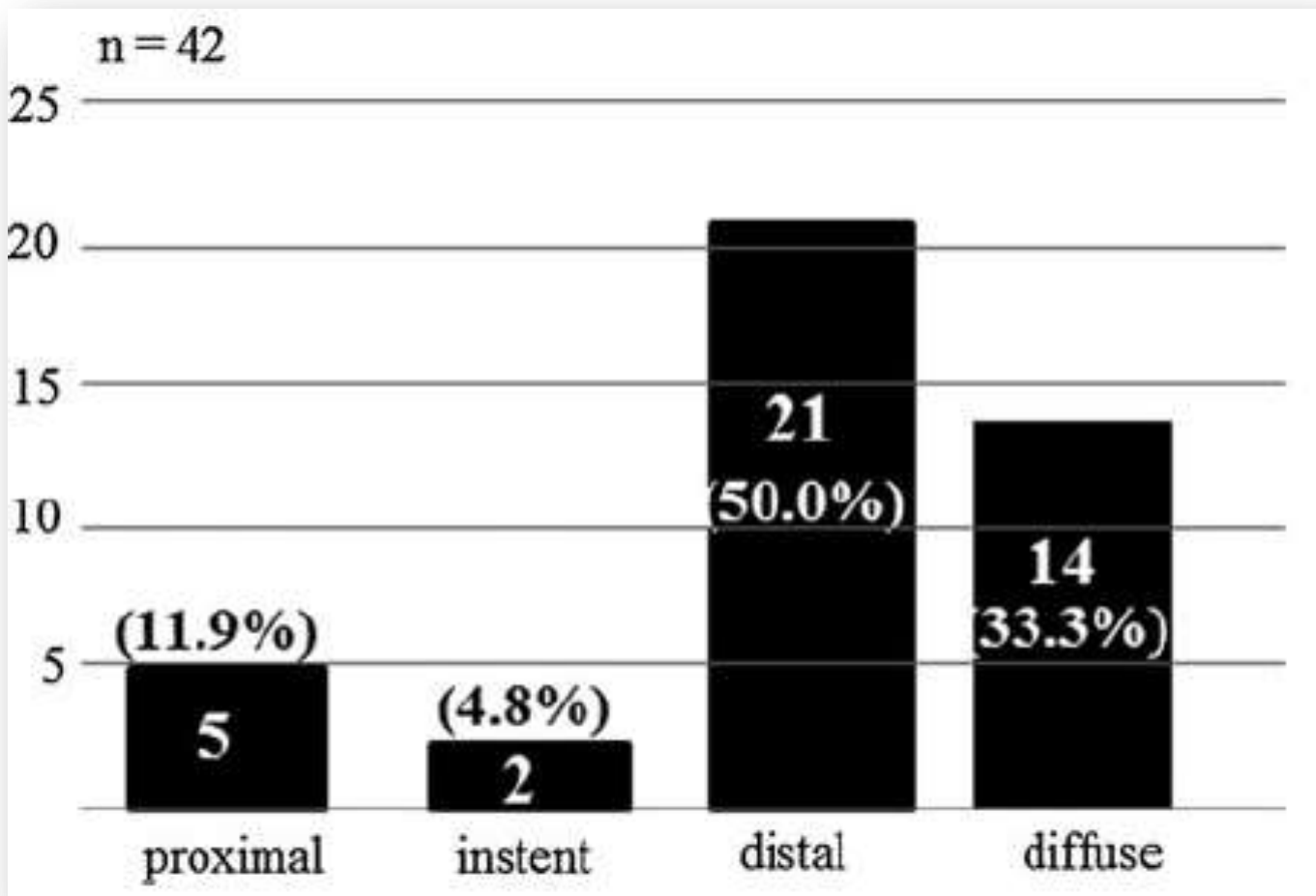
Understanding low post-stent FFR

Distribution of Post-Stent FFR

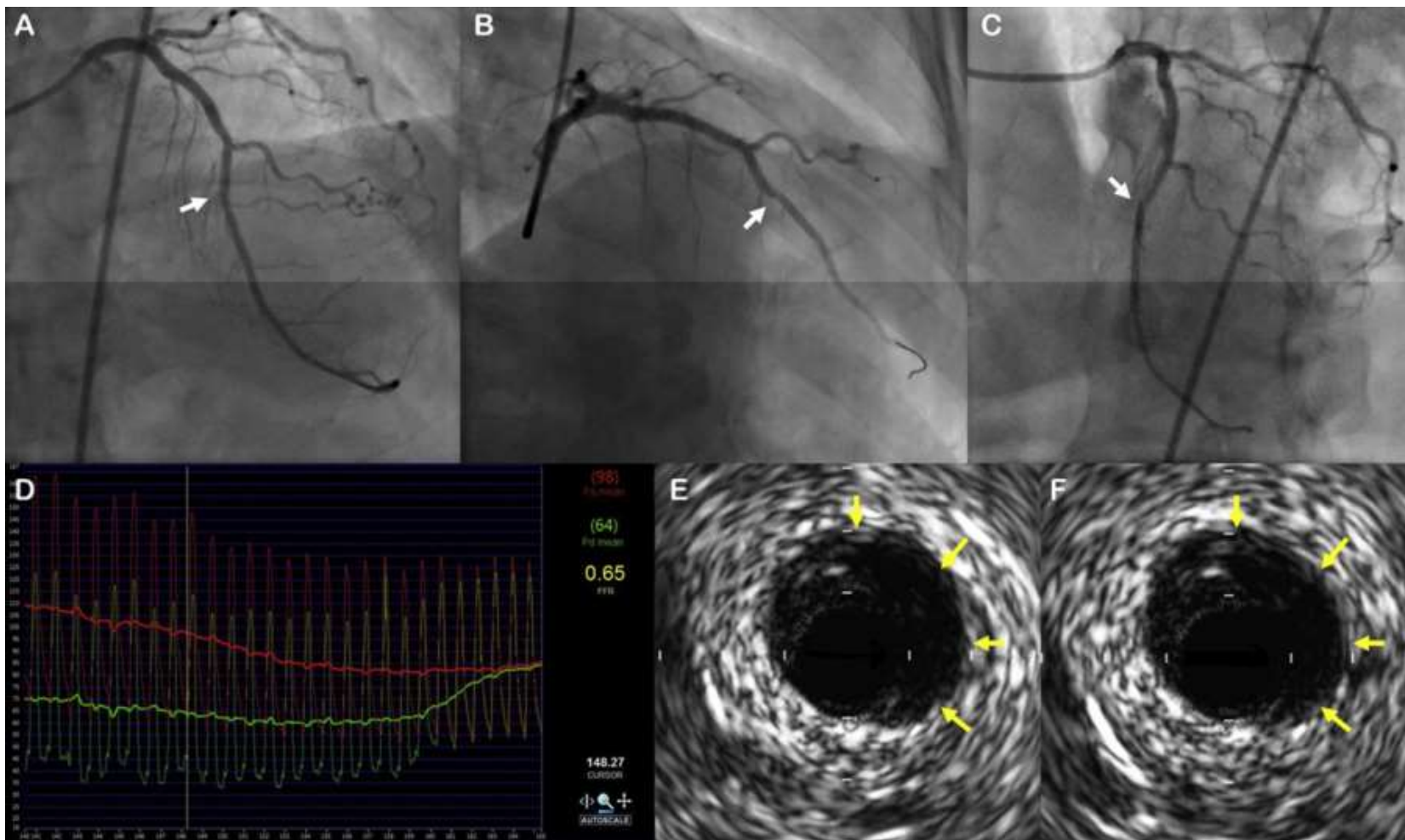
Prevalence Low post-stent FFR: 25-60%



Distribution of residual pressure gradient after PCI



Post-stent FFR can provide information about hidden anatomic problem such as dissection



Post-stent FFR can provide information about hidden anatomic problem such as dissection

	Dissection type				p Value
	A	B	C	D	
	(n = 24)	(n = 21)	(n = 1)	(n = 5)	
Proximal RD, mm	2.97 ± 0.40	2.94 ± 0.53	2.34	2.67 ± 0.42	0.290
Distal RD, mm	2.49 ± 0.56	2.50 ± 0.50	1.75	1.81 ± 0.30	0.022
MLD, mm	2.19 ± 0.43	2.10 ± 0.61	1.42	0.77 ± 0.44	0.002
DS, %	17.2 ± 8.4	22.7 ± 13.8	26.0	64.8 ± 17.4	0.002
LL, mm	7.1 ± 2.2	7.8 ± 3.8	15.0	17.0 ± 5.2	0.005
FFR	0.87 ± 0.09	0.86 ± 0.07	0.72	0.57 ± 0.08	0.002

Low FFR or residual gradient after apparently successful stenting

- Focal problem in- or peri-stent
 - Presence of diffuse disease
- FFR hyperemic pullback recording can discriminate the reason.

Physiologic stent optimization can help our practice?

Summary

- Pressure wire can be used as a primary guidewire before-, during-, and post PCI.
- After angiographic successful stenting, hyperemic pullback FFR recording can provide very useful information on physiologic stent optimization.
- In patient treated by DES, post-stent FFR ≥ 0.89 could offer physiologic cut-off value for prediction of TVF-free survival.
- post-stent FFR ≥ 0.89 was relevant to IVUS MSA $\geq 5.4\text{mm}^2$ in terms of physiologic and anatomic parameters of optimal stent deployment.

Role of post-stent FFR on physiologic stent optimization

- FFR post PCI is useful to detect residual lesions or diffuse disease
- FFR post PCI can prevent unnecessary repeat procedures as well as correct improper peri-stent problem.
- Post-stent FFR offer prognostic value as well as pre-intervention FFR in patient treated by DES.



Thank you for your
attention

