FFR, IVUS, NIRS, or OCT:

Selecting One for My Lab Or Should I Have It All

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ACC 2017

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Scorecard

Modality	*Intermediate lesion*		*Optimize PCI*			*Logistics*	*Cost*
	LM	*Non-LM*	*Stent*	*Bifurc*	*Lesion*		
FFR							
IVUS							
OCT							
NIRS							

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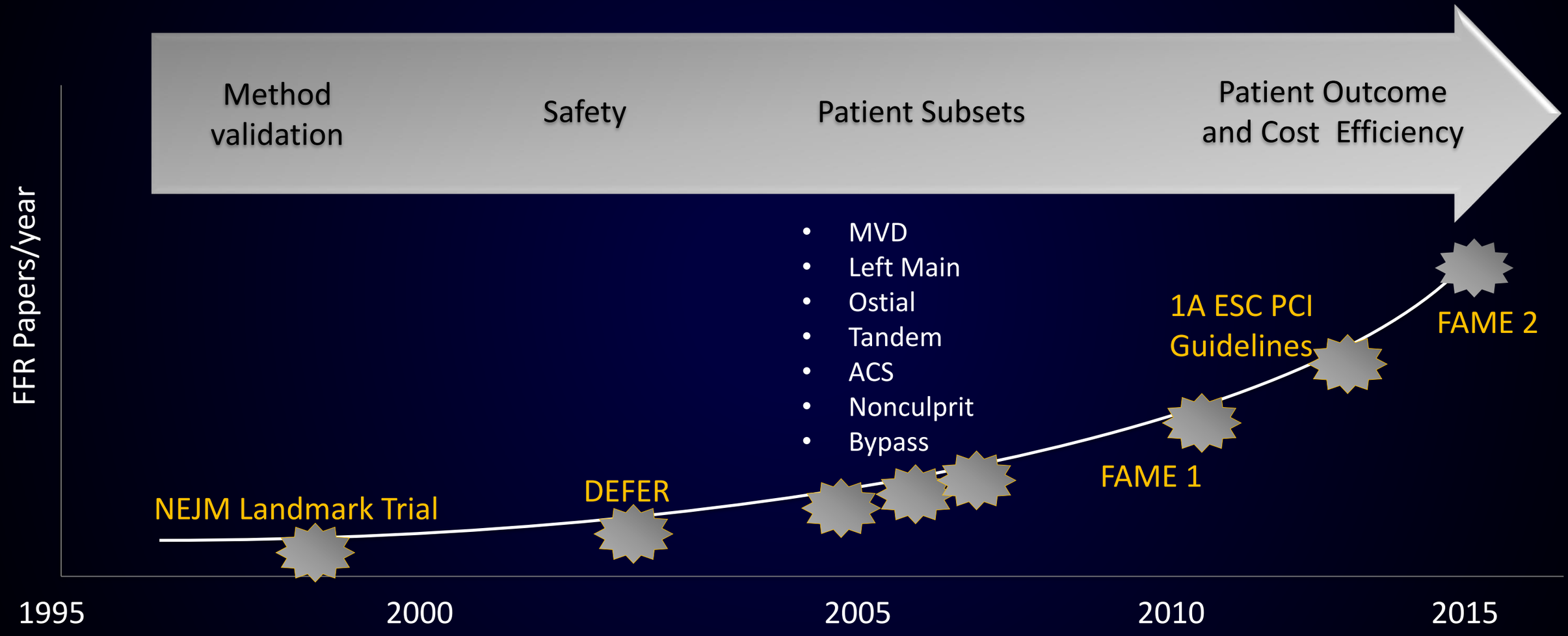
Major Clinical Trials: Growing Clinical Support



IVUS Criteria for a ‘Significant’ LMCA Stenosis

Suggested criteria for significant LMCA stenosis

Lumen MLA $<6.0mm^2$ (or MLD $<3.0mm$)

- Correlates with a LMCA FFR<0.75
- Does not depend on finding a disease-free reference segment
- Long term data (LITRO registry)

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

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FFR	**++**	**+++**					
IVUS	**++**	**+**					
OCT		**+**					
NIRS	**+**	**+**					

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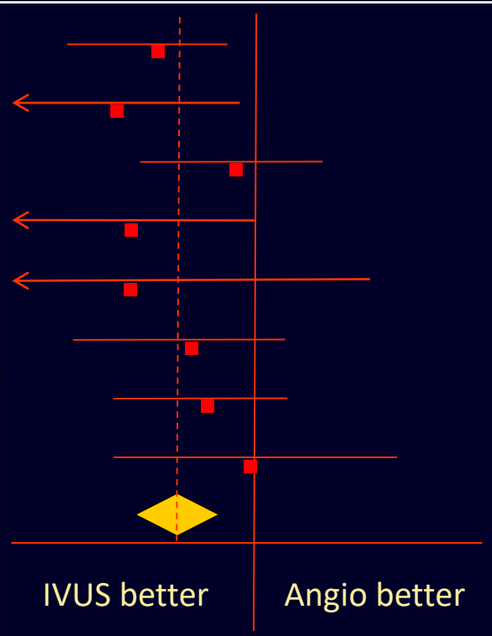
Meta-analysis of 8 Randomized Trials of IVUS vs Angio-Guided DES Implantation

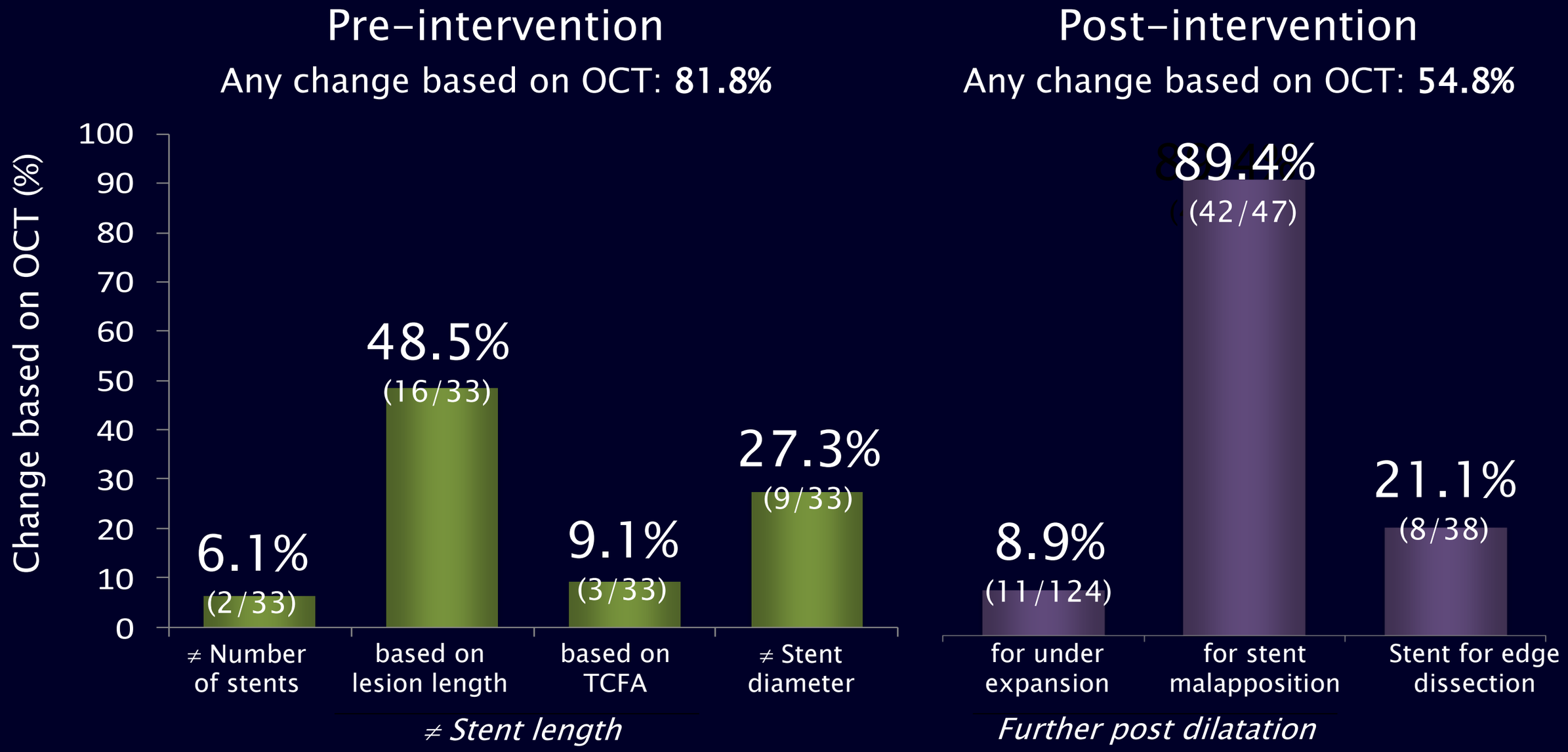
Elgendy et al. Circ Cardiovasc Interv 2016

Study	Year	#	OR	IVUS MACE	Angio MACE
IVUS-XLP	2015	1400	0.49	19/700	39/700
CTO-IVUS	2015	402	0.37	5/201	14/201
AIR-CTO	2015	230	0.82	25/115	29/115
Tan-LM	2015	123	0.42	8/61	17/62
MOZART	2014	83	0.41	2/41	5/42
RESET	2013	543	0.60	12/269	20/274
AVIO	2013	284	0.67	24/142	33/142
Home-DES	2010	210	0.91	11/105	12/105
OVERALL		3275	0.59	106/1634	169/1641
				6.5%	10.3%



Event	IVUS events	Angio events	OR	95% CI	P-value
MACE	6.5%	10.3%	0.59	0.46-0.76	<0.0001
CV mortality	0.5%	1.2%	0.46	0.21-1.00	0.05
MI	0.9%	1.6%	0.58	0.30-1.11	0.10
TLR	4.1%	6.6%	0.60	0.43-0.84	0.003
TVR	5.5%	8.7%	0.61	0.41-0.91	0.02
ST	0.6%	1.3%	0.49	0.24-0.99	0.04

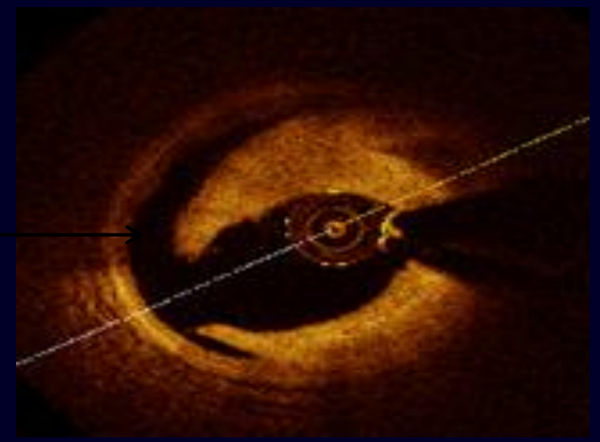
Impact of OCT on PCI management



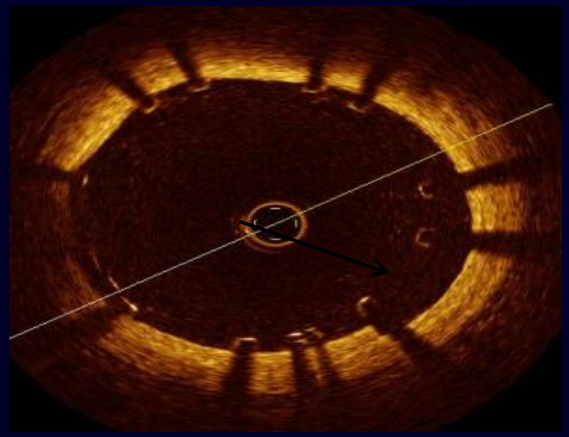
Stefano GT, et al. Int J Cardiovasc Imaging. 2013; 29: 741-752

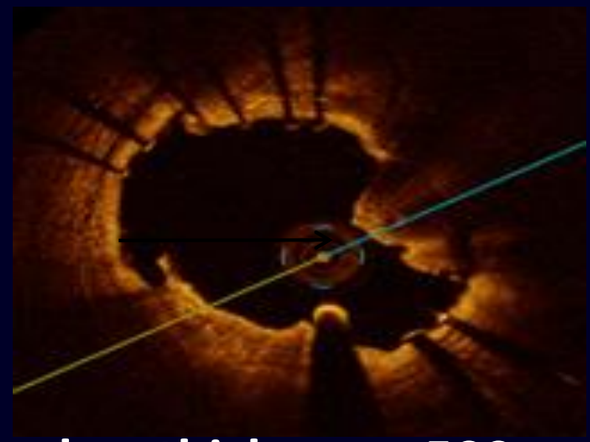
OCT Criteria Tested in the CLIO-PCI III Registry

Edge dissection width >200µ



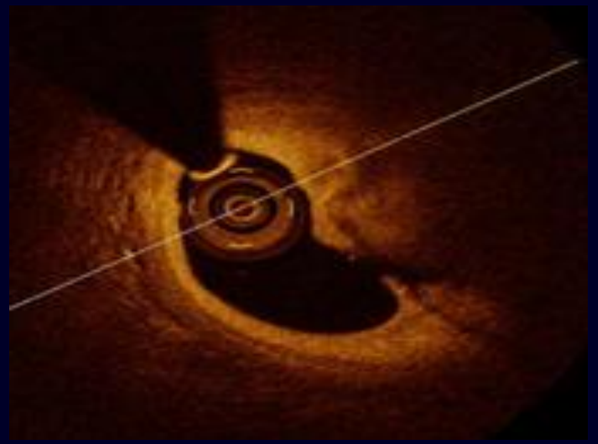
Stent malapposition distance >500µ

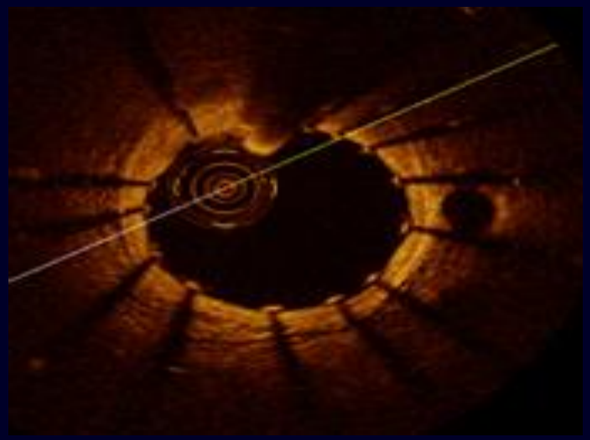




Thrombus thickness >500µ

Residual stenosis adjacent to stent edge: MLA <4.5mm^2 in presence of plaque

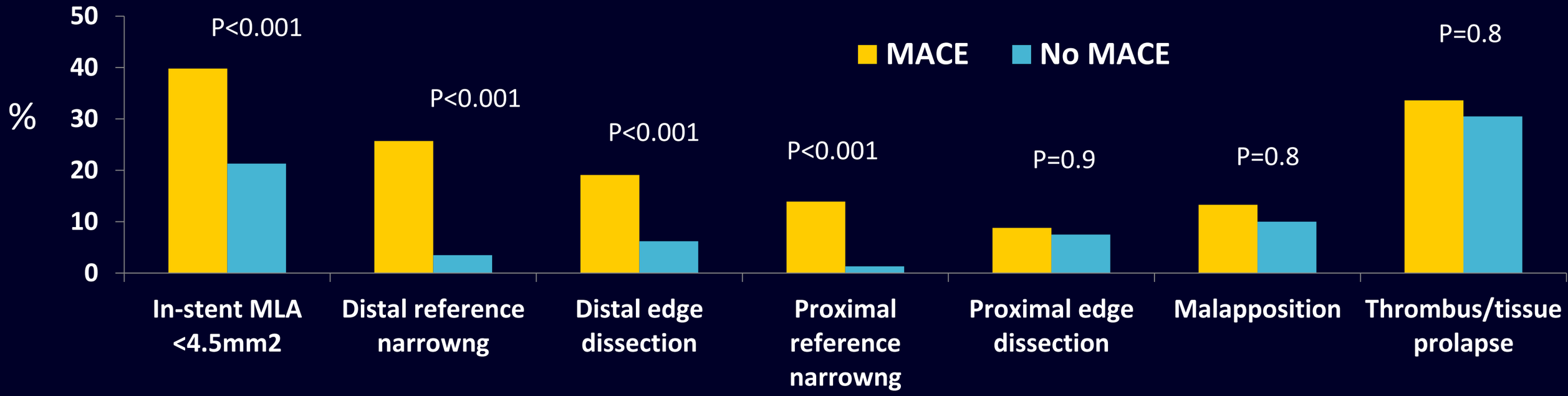




In-stent MLA <4.5mm^2

Prati et al. JACC Cardiovasc Imaging 2015

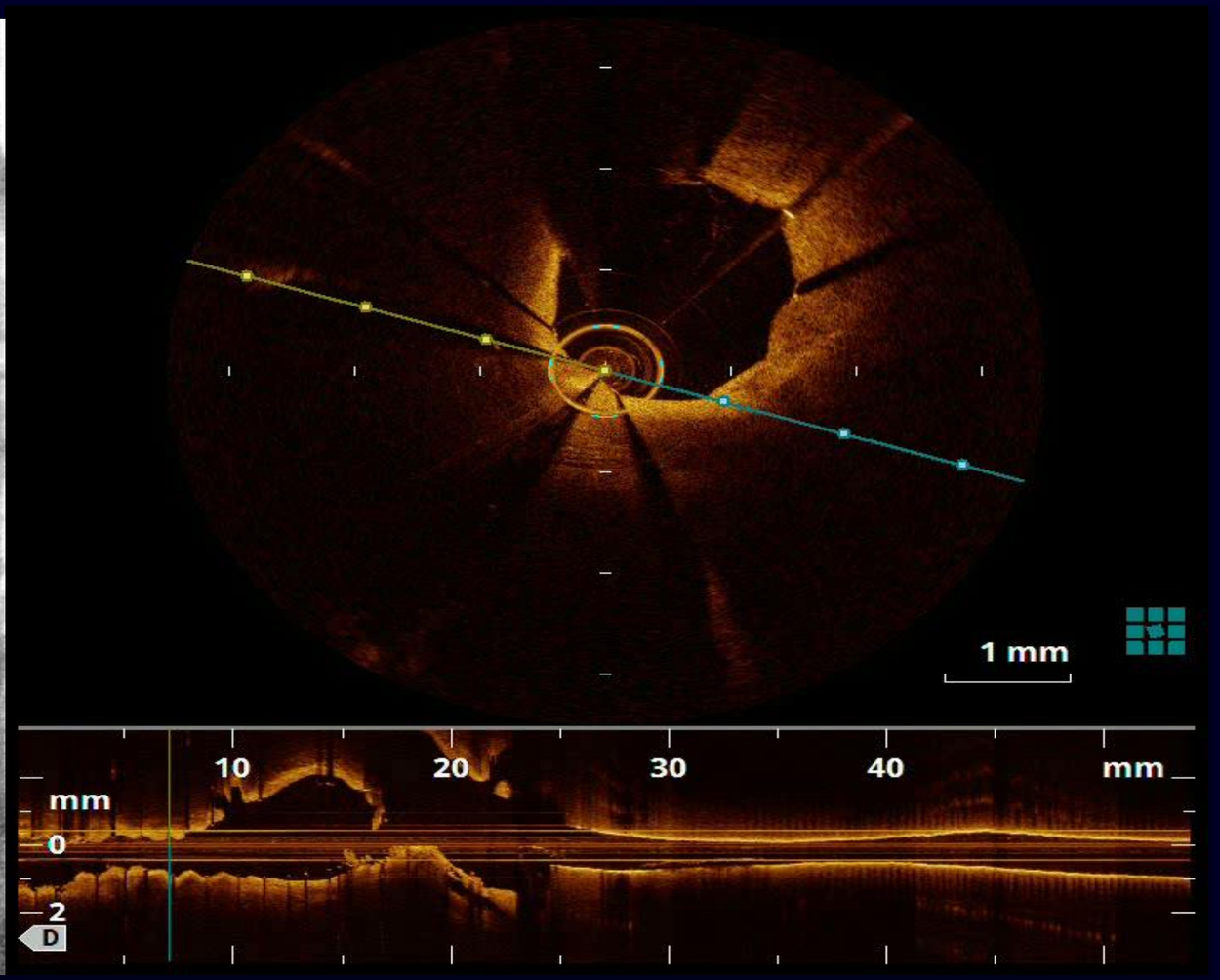
929 pts (989 lesions) in CLI-OPI II registry
MACE (death, MI, ST, or TLR in 12.2%) @ 1 yr



Independent predictors of MACE were in-stent MLA <4.5mm^2, proximal or distal reference narrowing, or distal edge dissection

Prati et al. JACC Cardiovasc Imaging 2015

Post-PCI Left Main Interrogation: OCT



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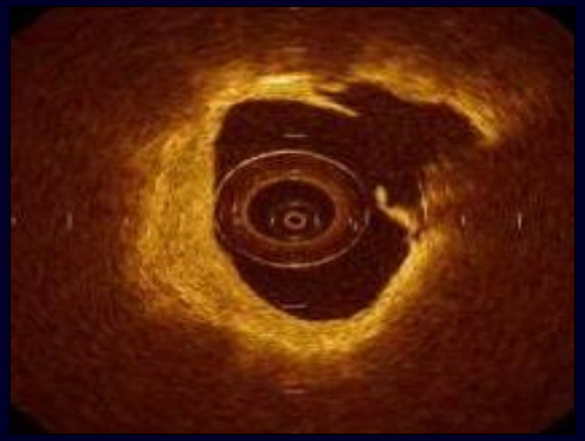
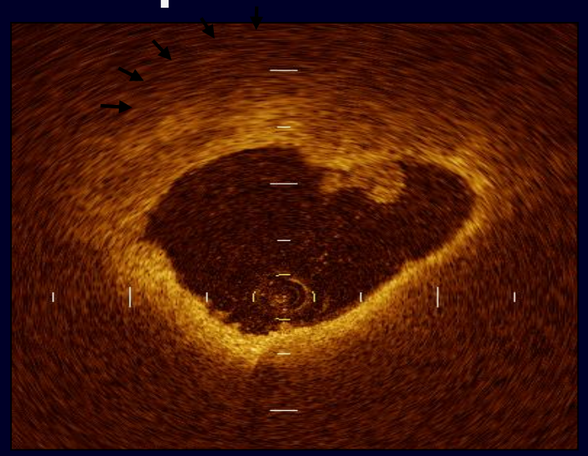
What is the culprit lesion?

Plaque rupture

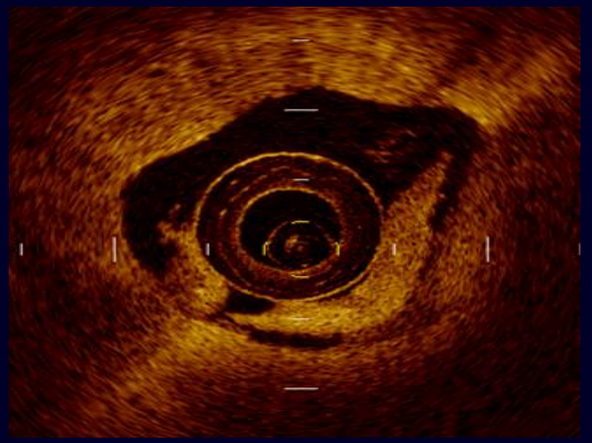


Red thrombus

Plaque erosion

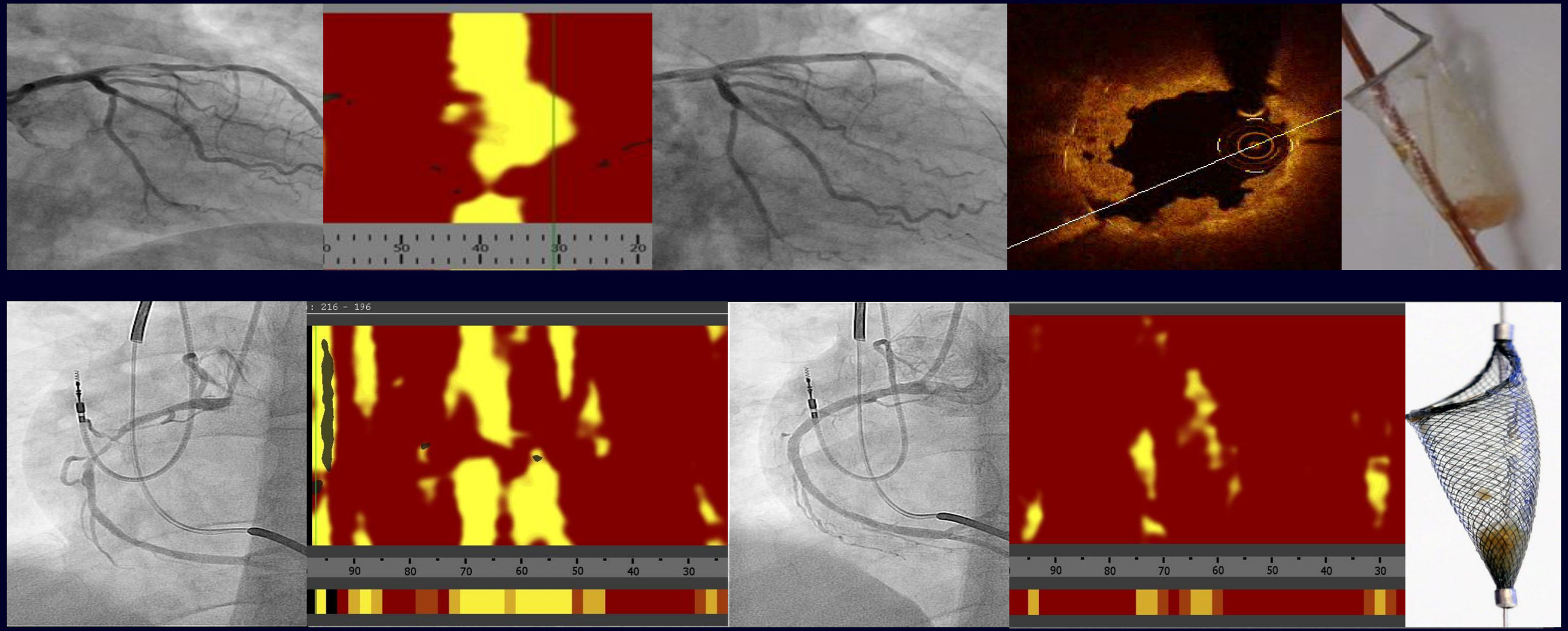


White thrombus



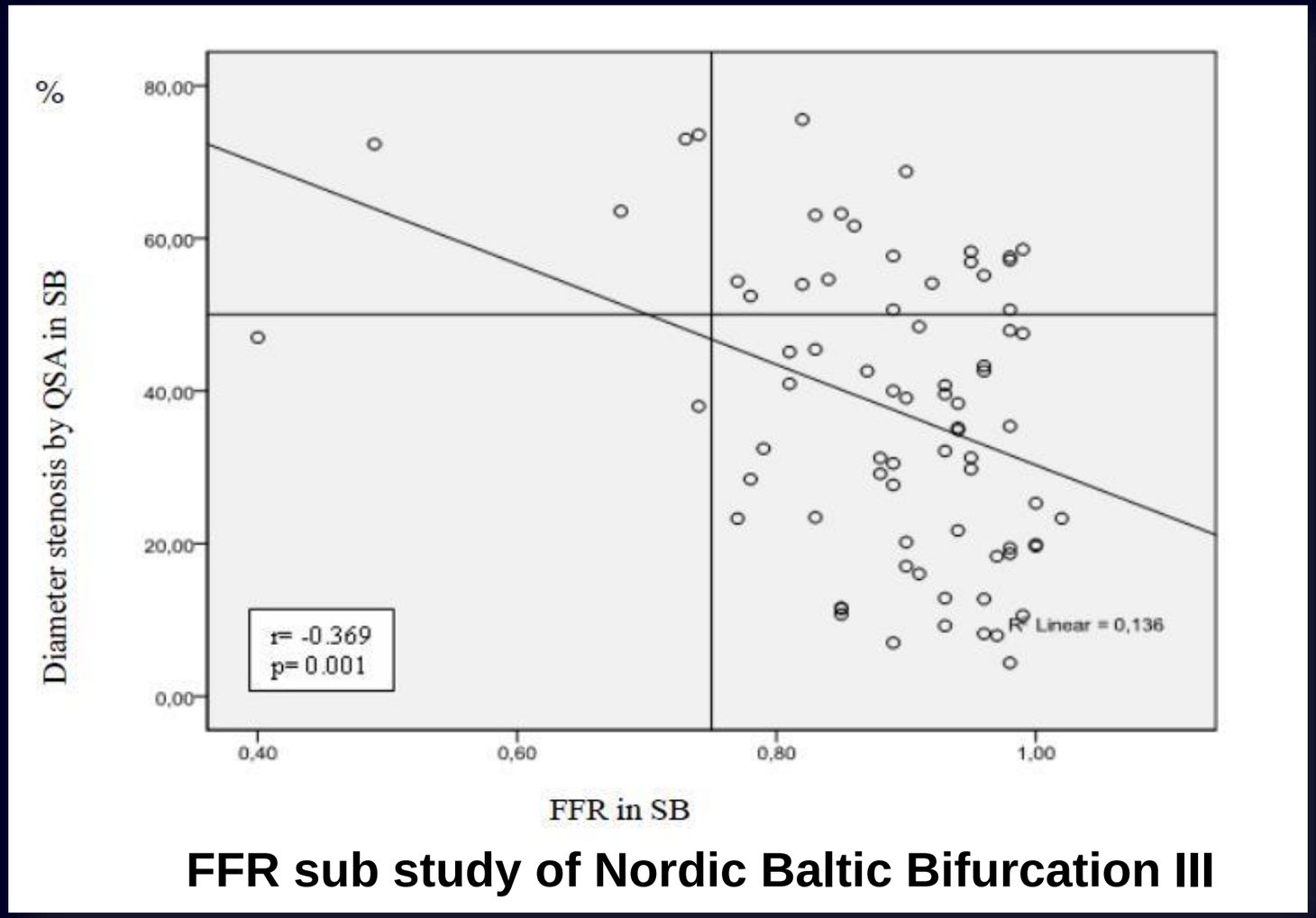
Kubo et al. J Am Coll Cardiol 2007;50:933-9; Kume et al. Am J Cardiol 2006;97:1713-7

NIRS

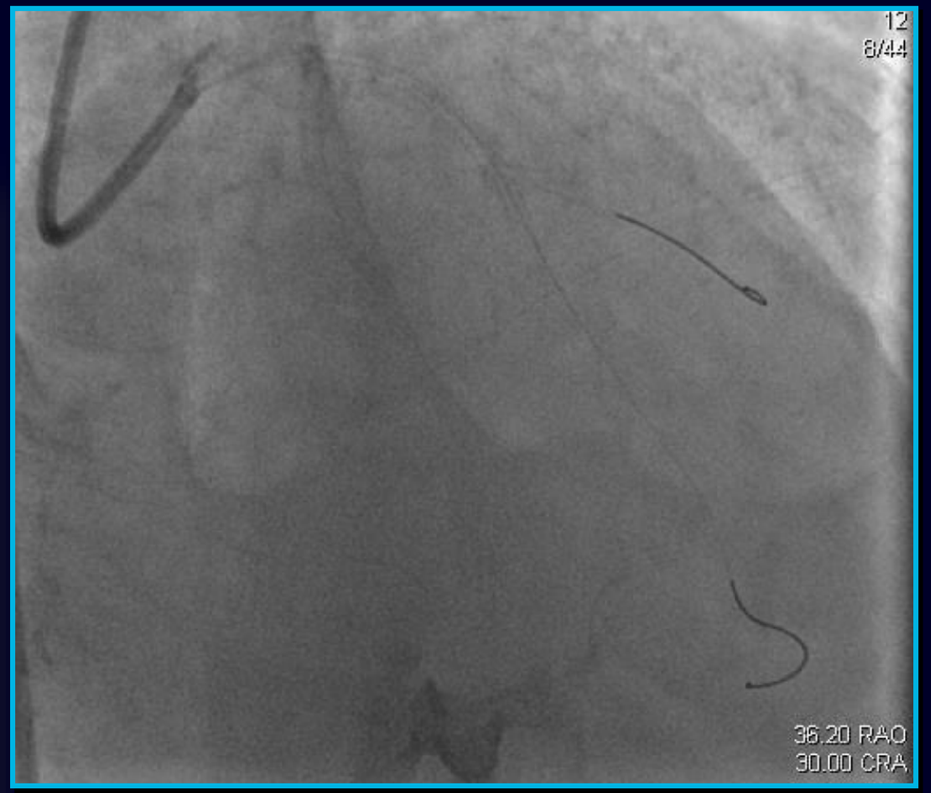


Brilakis et al. CCI 2012

FFR vs. Angiographic in Assessing Side Branch Lesions



FFR sub study of Nordic Baltic Bifurcation III



Angiography frequently Overestimates physiologic severity of side branch narrowing >50%

Kumsars I et al. *EuroIntervention*. 2012 Feb;7(10):1155-61

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FFR	++	+++		+			
IVUS	++	+	++	+	++		
OCT		+	+++	+	+++		
NIRS	+		+		++		

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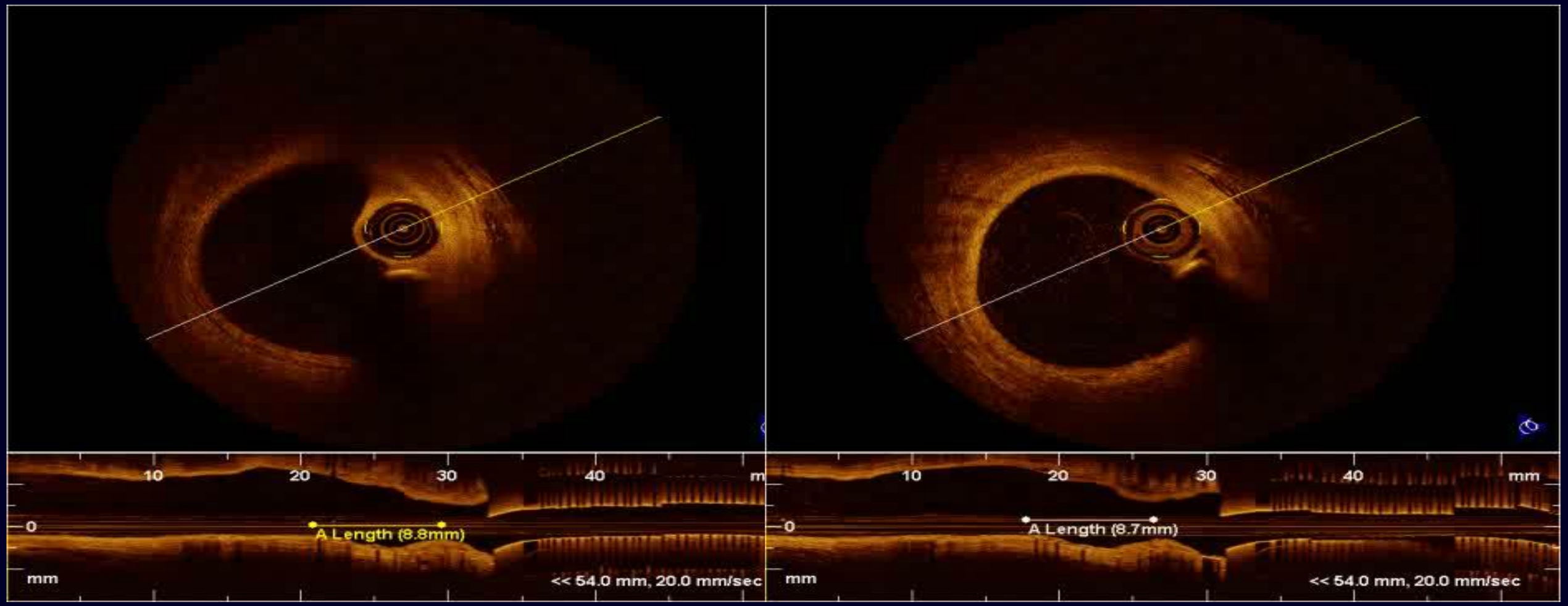
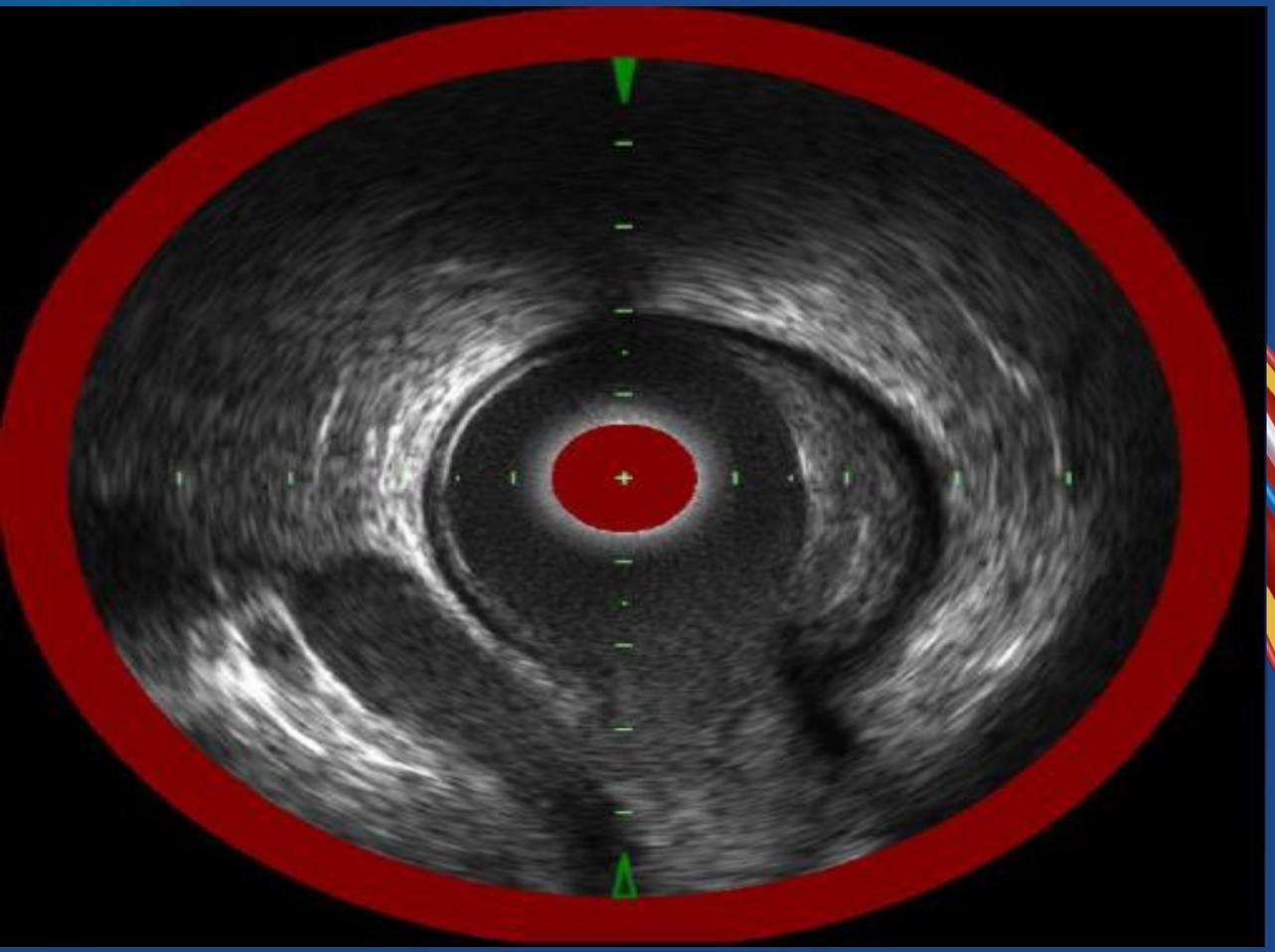
CONTRAST

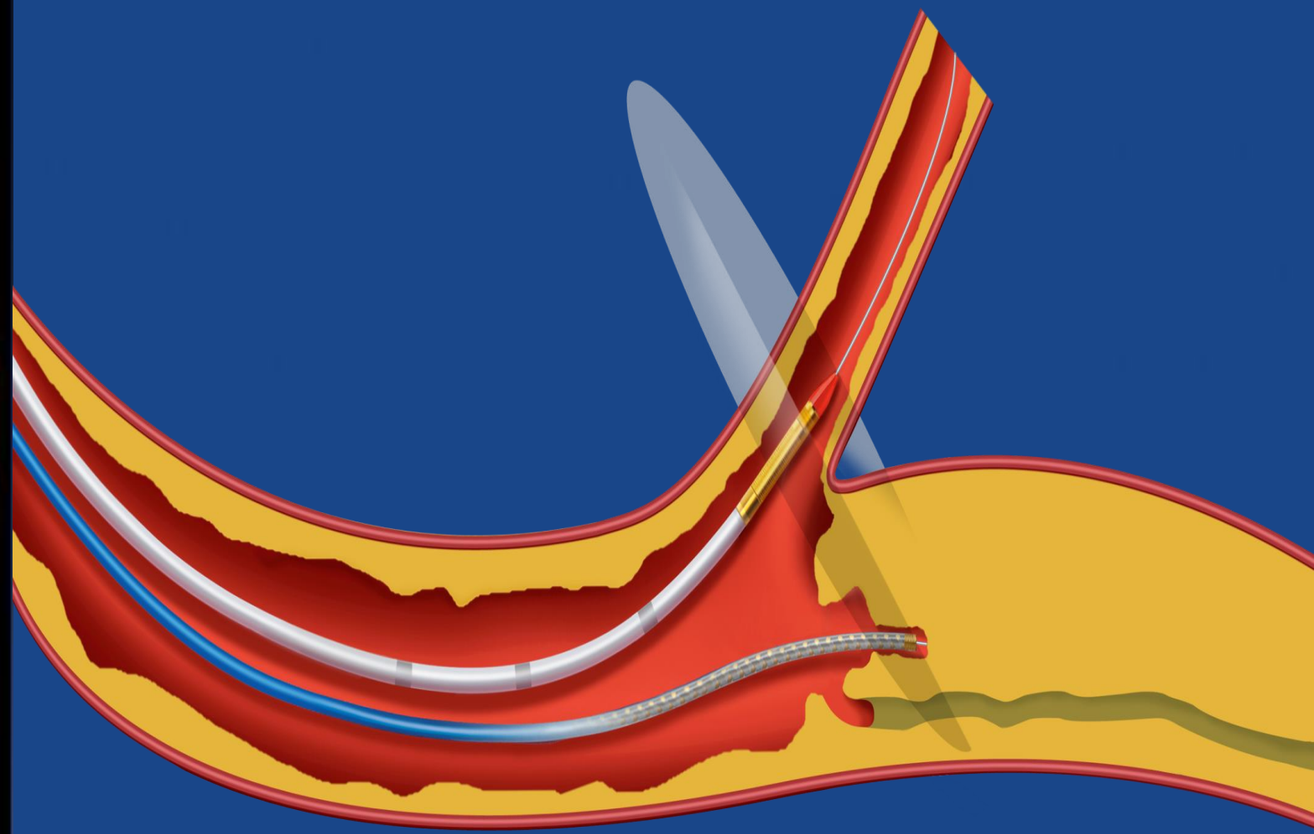
DEXTRAN



Frick et al. CCI 2013

High Definition & Short Tip IVUS





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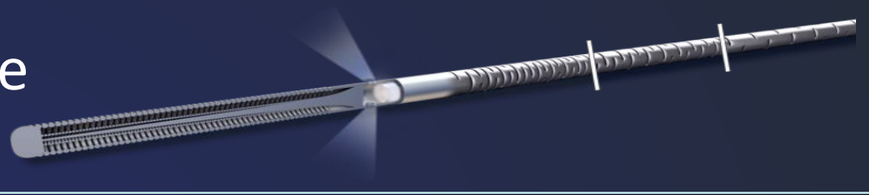
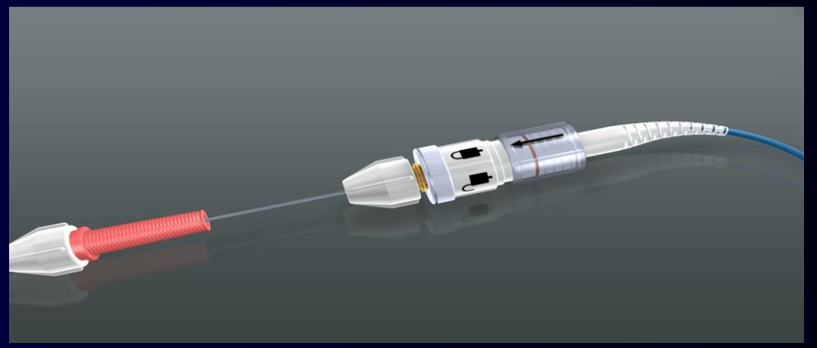
Pressure Guidewire: Design Goals

- Performance to enable utilization as workhorse wire



- Provide an intelligent connection with
  - Free spinning handle
    - Less need to disconnect
    - Less resistance on torque
  - Reliable connection and reconnection



- Allow for easy integration of FFR and IVUS into the cath lab

IMPACT: Comparing Microcatheter vs. GW FFR

Volcano combo wire and microcatheter FFR comparison in 28 stenoses

Measure	*Microcatheter FFR*	*GW FFR*	*p*
Baseline distal pressure	95.1±16.1	92.6±15.6	0.115
iFR	0.94±0.04	0.91±0.05	0.002
FFR	0.86±0.06	0.82±0.07	<0.001

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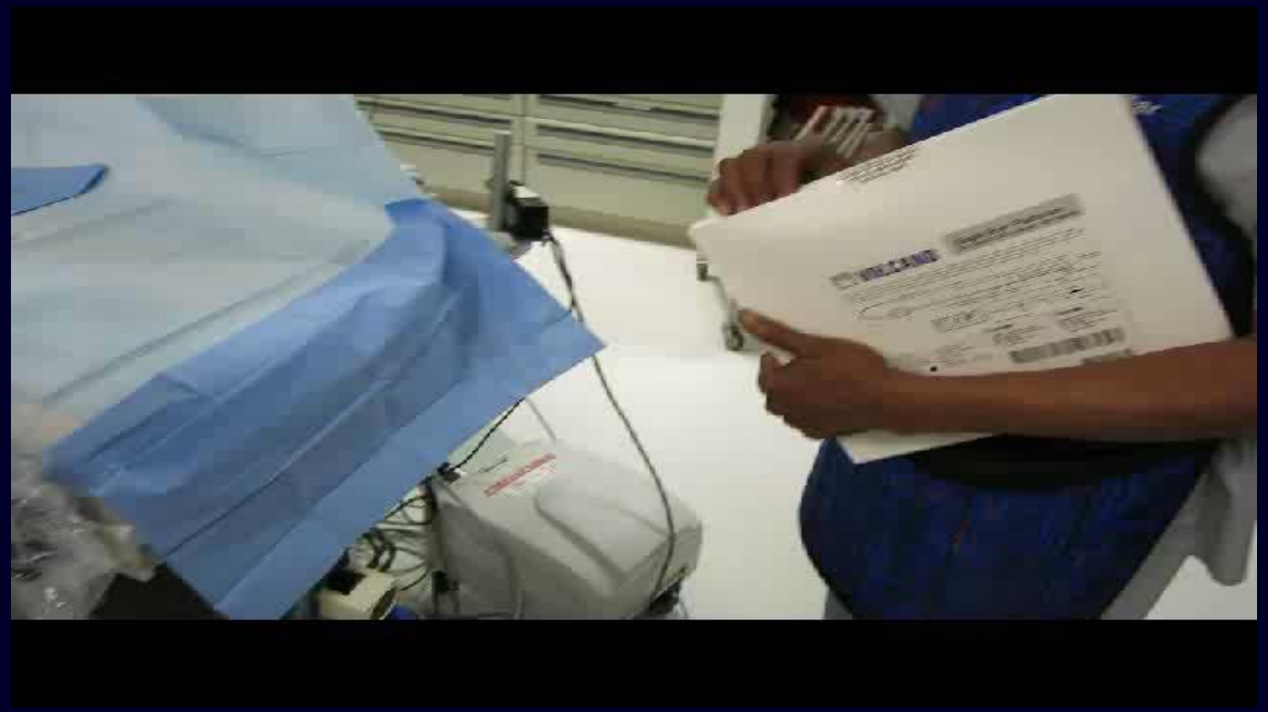
Circ Cardiovasc Interv. 2016

Preparation times

Solid state IVUS



27 seconds

OCT

129 seconds

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IVUS	++	+	++	+	++	+++	
OCT		+	+++	+	+++	++	
NIRS	+		+		++	-	

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FFR, IVUS, NIRS or OCT: Disposable Device Cost

Modality	*Cost (US$)*	*Cost-effectiveness*	*Reference*
IVUS	$725	++	Gaster *et al.* Heart 2003
OCT	$950	-	-
NIRS	$945	-	-
FFR	$600	+++	Fearon *et al*. Circulation 2010

IVUS: CPT Code: +92978; RVU: 2.58; professional=$88.00
FFR: CPT Code: +93571; RVU: 2.57; professional=$87.00

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FFR	++	+++		+		+++	+++
IVUS	++	+	++	+	++	+++	++
OCT		+	+++	+	+++	++	-
NIRS	+		+		++	-	-

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Conclusions:

- ‘All in one solution does not exist’
- Commit to learn, perform, interpret & train
- Seamless integration of FFR, IVUS & OCT into a contemporary cath lab practice