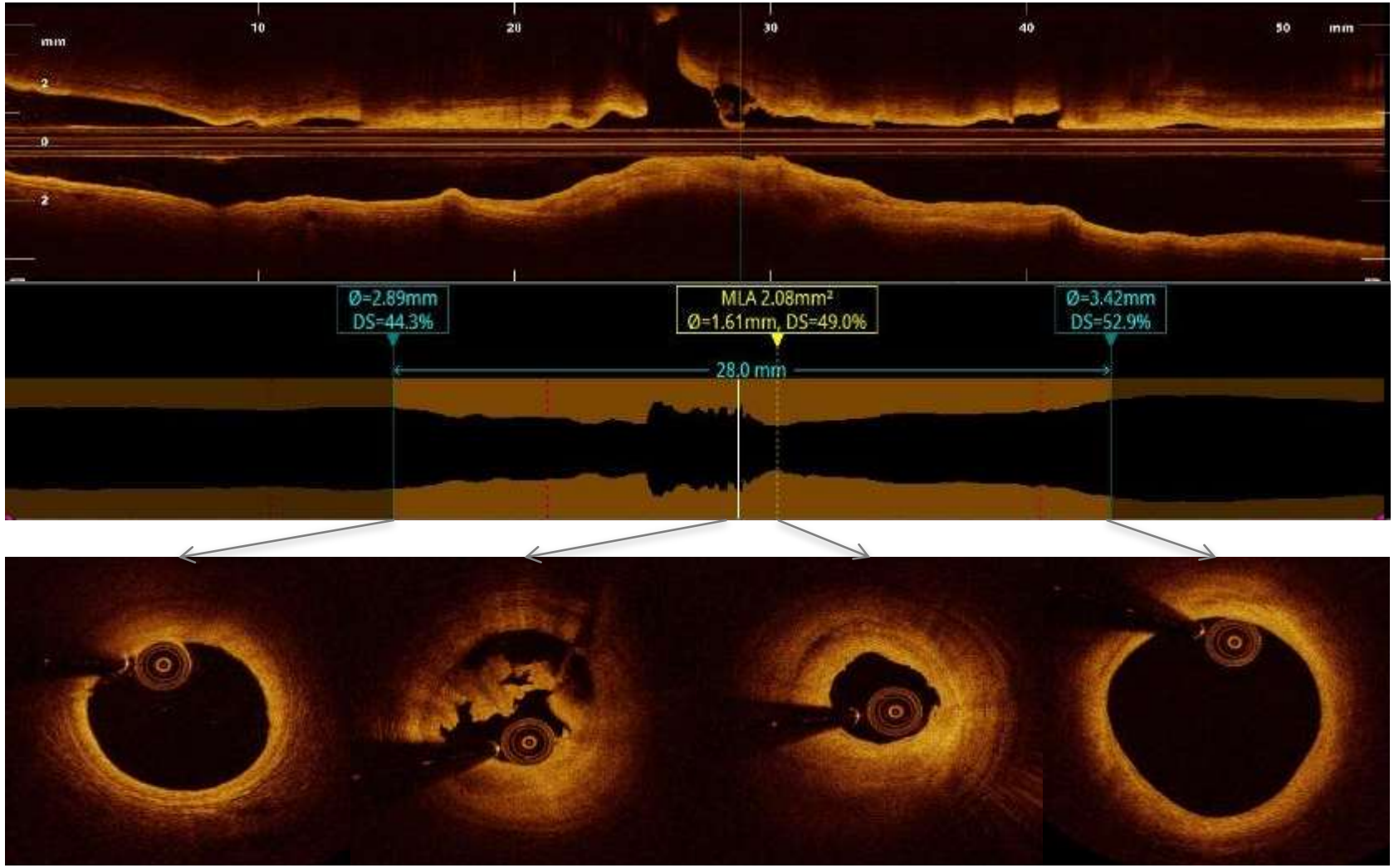
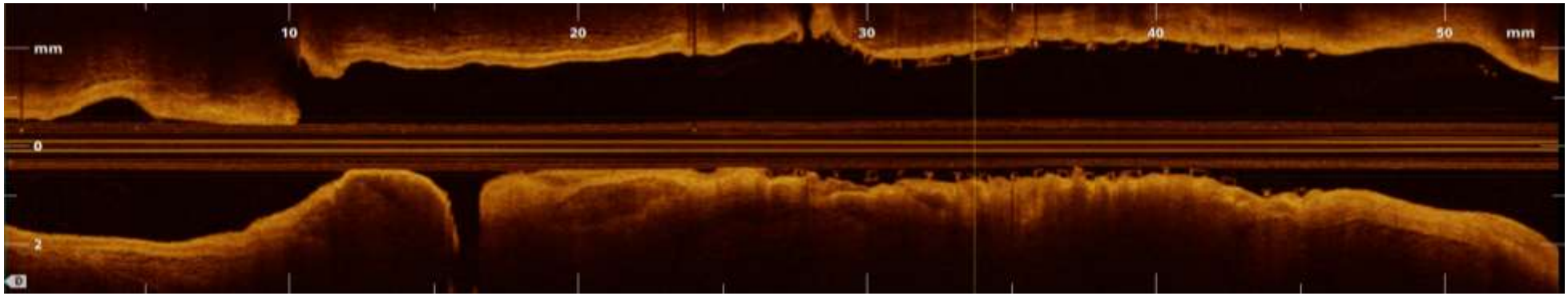
OCT Procedure Guidance in the CathLab Today and Tomorrow



G. Guagliumi, MD, FESC

Azienda Ospedaliera
Papa Giovanni XXIII
Bergamo
Sistema Sanitario Regione Lombardia



Speaker’s name: Giulio Guagliumi

Potential conflicts of interest to report:

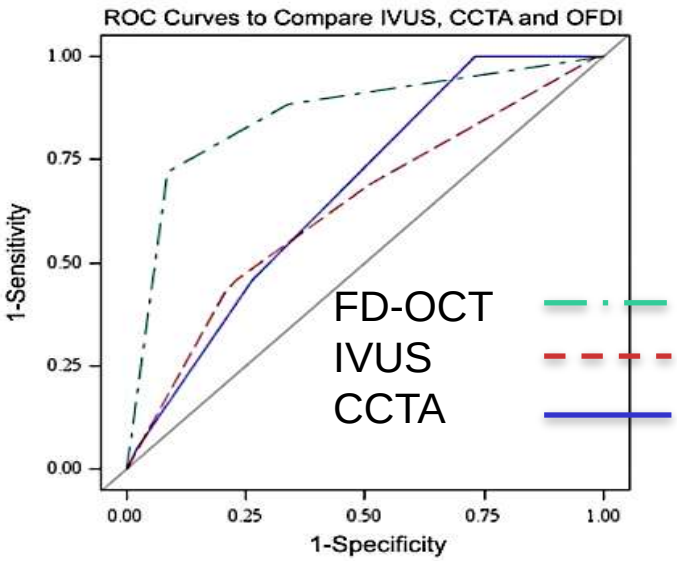
Research Grants through the Hospital : Abbott Vascular
Boston Scientific
St. Jude Medical

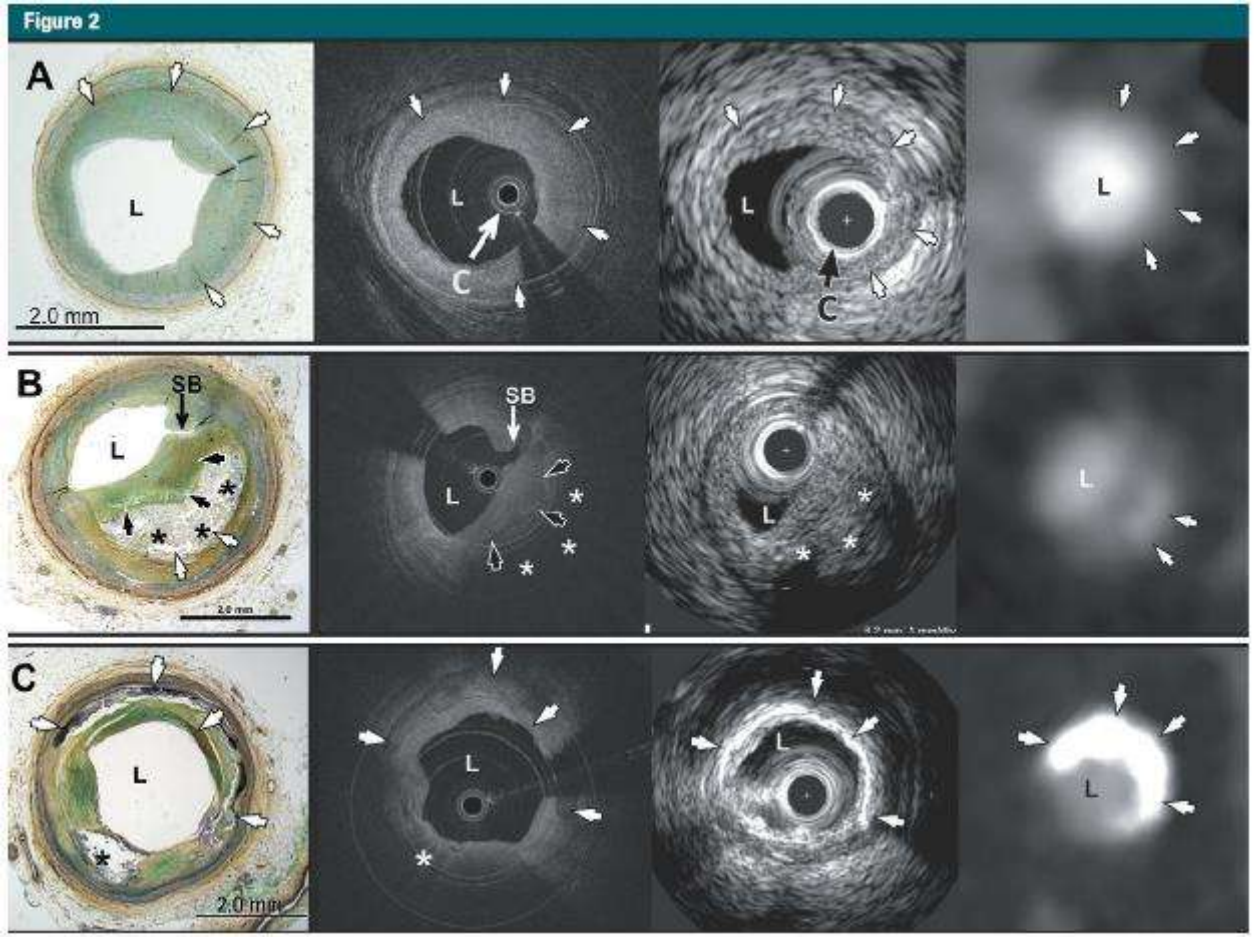
Consulting: Boston Scientific, St. Jude Medical.

Differentiation of Early from Advanced Coronary Atherosclerotic Lesions
Ex-vivo Comparison of CT, IVUS and OCT

Implications for Patient Care:

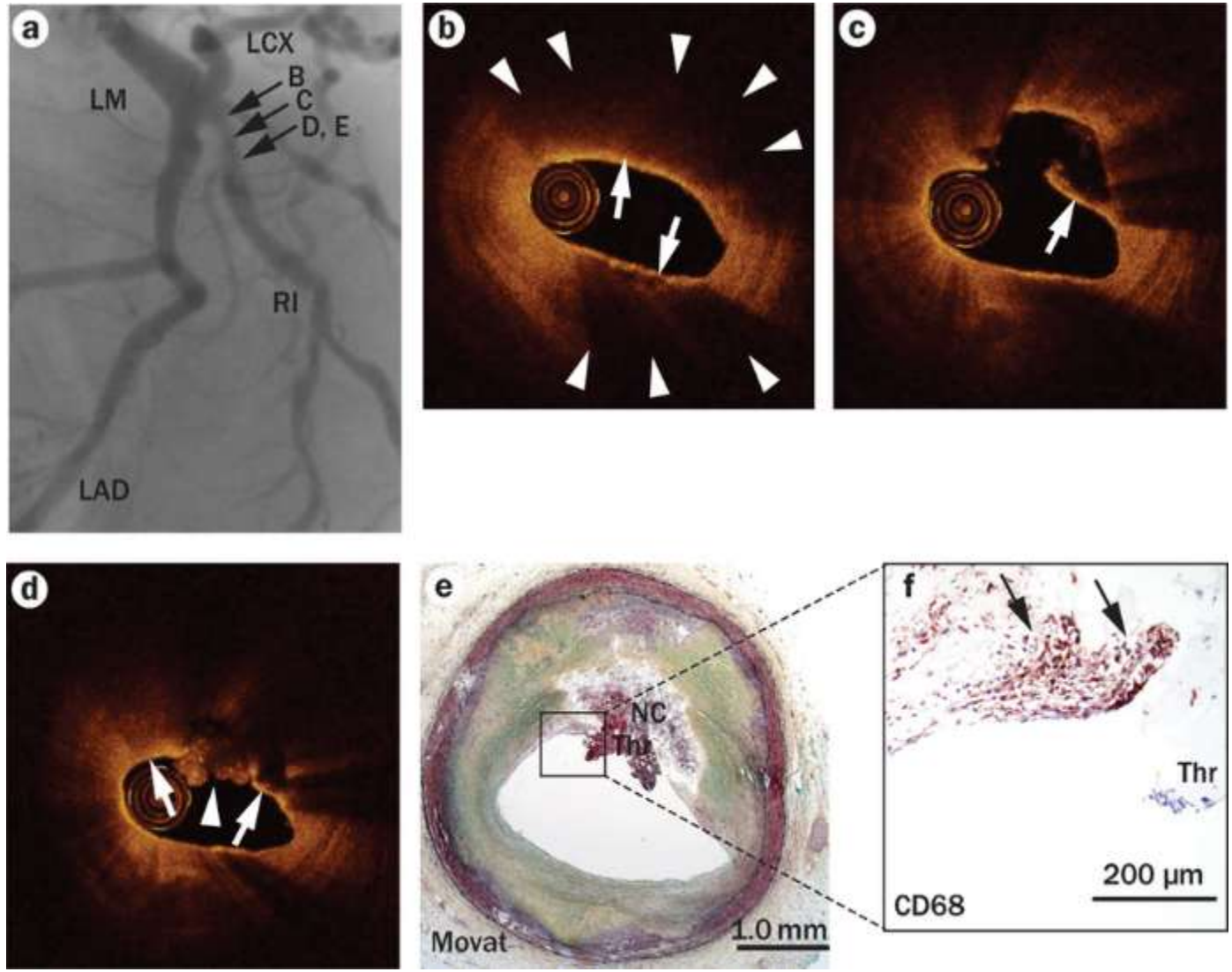
The diagnostic performance of OCT for differentiating early from advanced coronary atherosclerotic lesions is significantly better.





Maurovich-Horvat P, Minz G, Virmani R et al *Radiology 2012; 265: 393-401*

Pathologically Distinct Types of Advanced Coronary Plaques

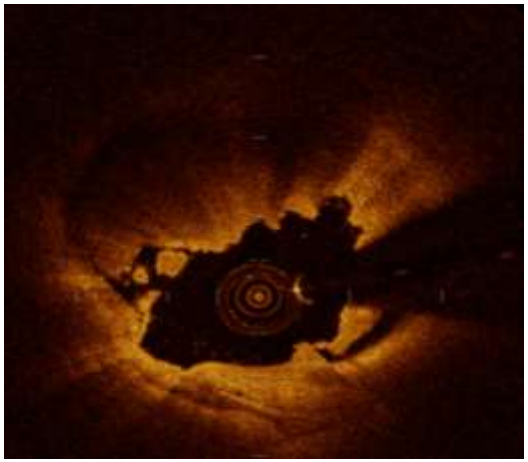


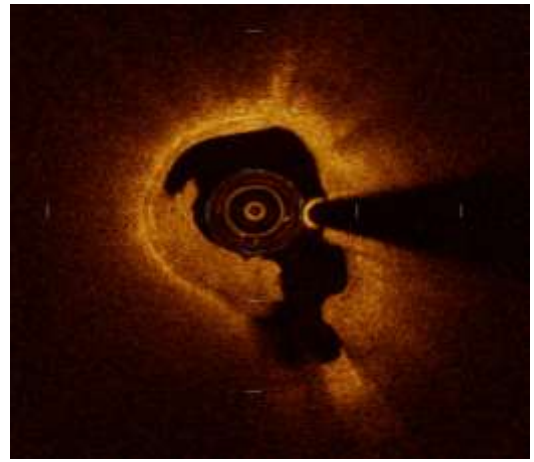
Otsuka F *et al.* Nature Reviews Cardiology, 2014, vol. 11

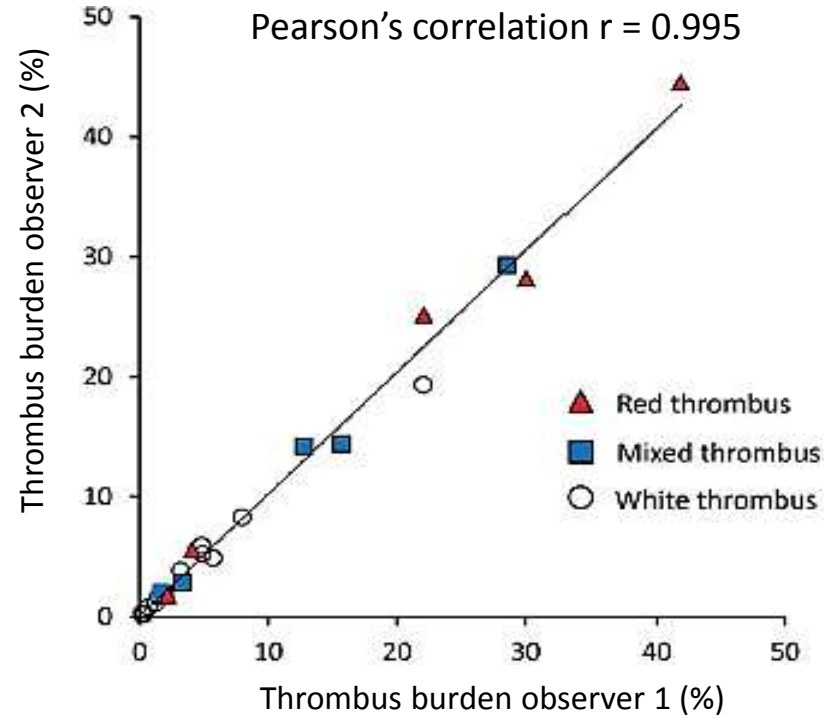
European Heart Journal – Cardiovascular Imaging (2015) **16**, 96–107
doi:10.1093/ehjci/jeu175

Feasibility and repeatability of optical coherence tomography measurements of pre-stent thrombus burden in patients with STEMI treated with primary PCI

Olli A. Kajander[1]*, Laura S. Koistinen[1], Markku Eskola[1], Heini Huhtala[2], Ravinay Bhindi[3], Kari Niemelä[1], Sanjit S. Jolly[4], and Tej Sheth[4], for the TOTAL-OCT Substudy Investigators†







r = 0.993 for red thrombi r = 0.993 for white thrombi r = 0.997 for mixed thrombi

2011 ACCF/AHA/SCAI Guideline for Percutaneous Coronary Intervention

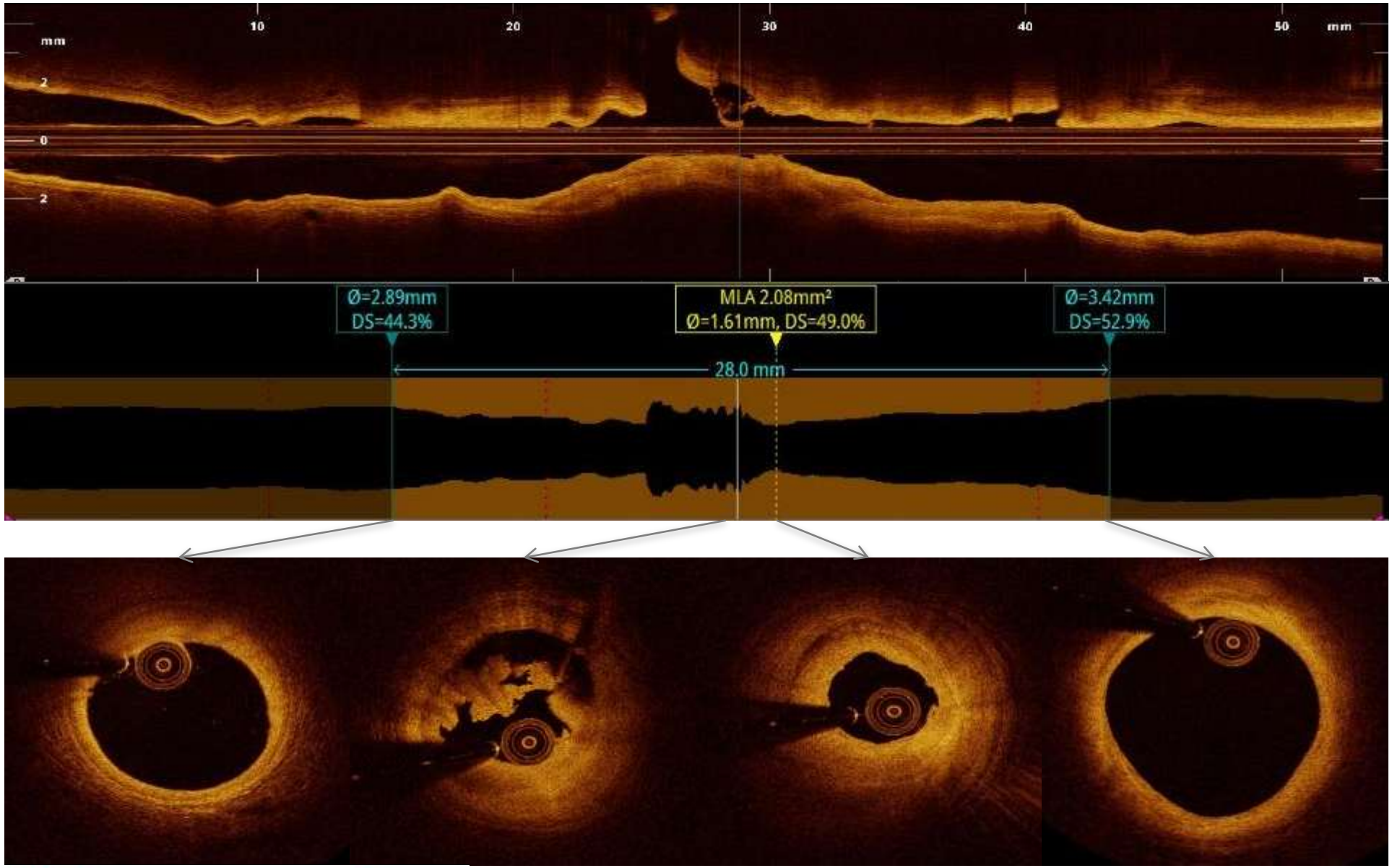
TABLE I. 2011 PCI Guideline Recommendations

5.4.3 Optical Coherence Tomography

The appropriate role for OCT in routine clinical-decision making has not been established

Levine GN, et al. Circulation 2011;124:e574–e651.

STEMI culprit vessel: 75 mm in 2 sec, prompt automatic lumen measures



Reproducibility for Lumen Area and Length Measurements

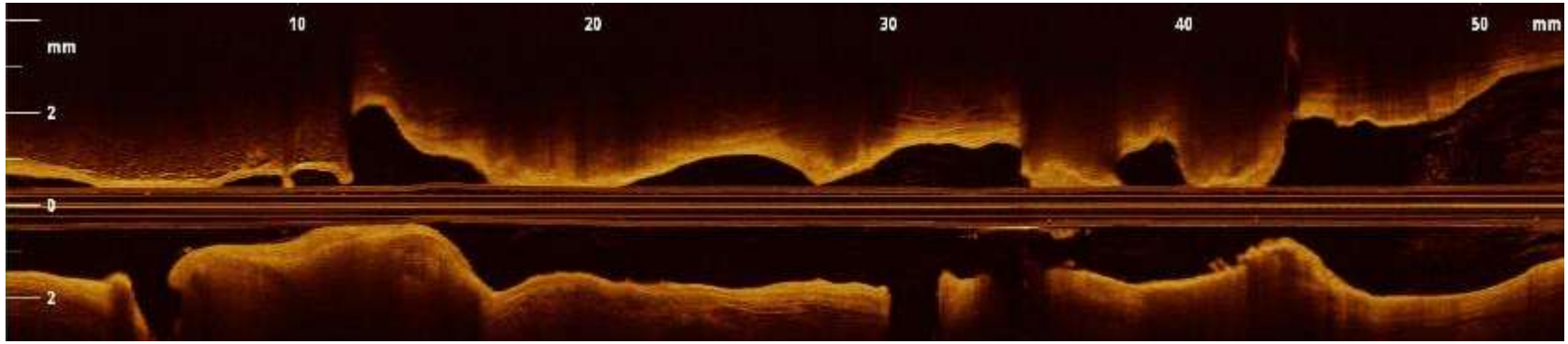
Fedele S *et al.* Am J Cardiol 2012, 110(8): 1106-12

Variable	Bland-Altman Bias	Regression Analysis (R Value, P Value)
Lumen Area (mm^2)		
Per-segment analysis		
Interobserver	0.001(-0.012,0.009)	1.0, <0.001
Intraobserver	0.003 (-0.002,0.009)	1.0, <0.001
Interpullback	0.150 (-0,371,0.086)	0.982, <0.001
Per-frame analysis		
Interobserver	0.001 (-0.001,0.002)	1.0 <0.001
Intraobserver	0.002 (0.001,0.003)	1.0 <0.001
Interpullback	-0.091 (-0.139, -0.040)	0.959, <0.001
Length (mm)		
Per-segment analysis		
Interpullback	-0,200 (-3.00,2.00)	0.990, <0.001

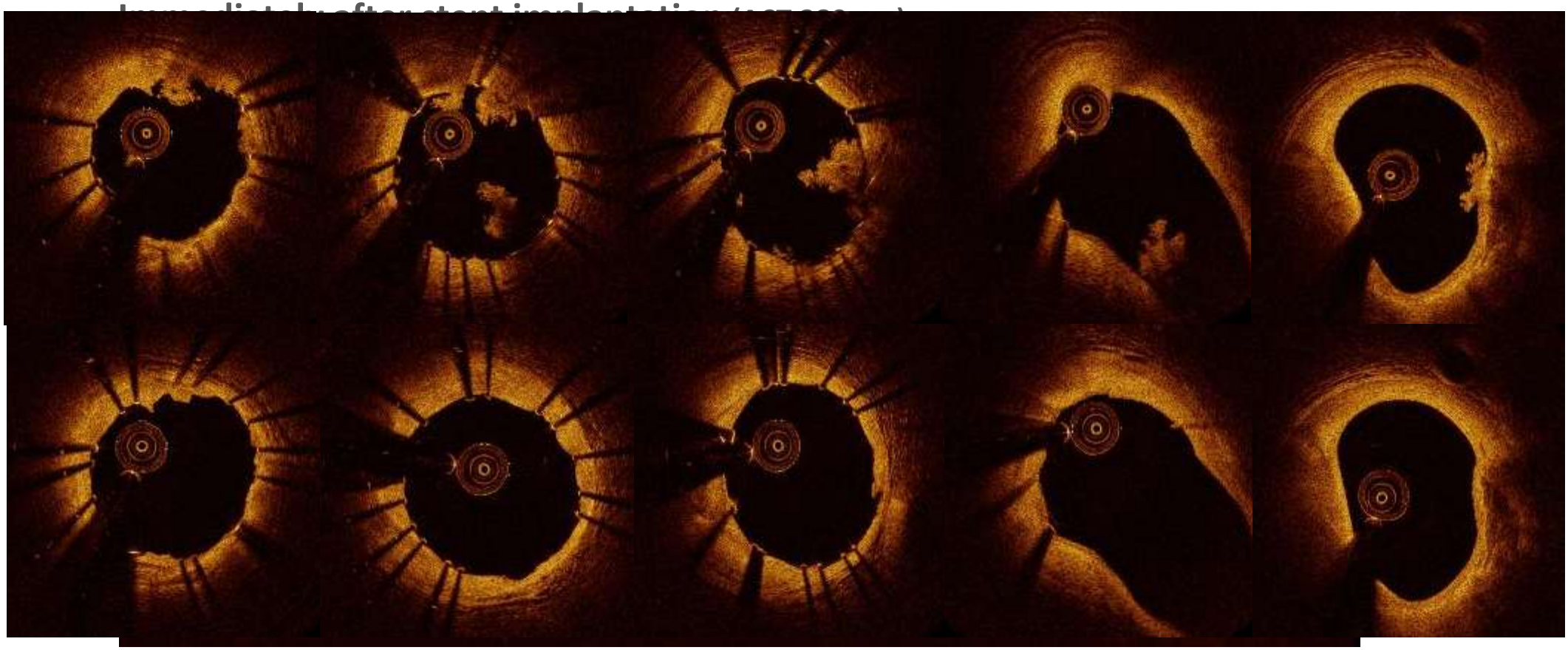
High sensitivity to thrombus formation

Azienda Ospedaliera Papa Giovanni XXIII Bergamo

Baseline



Immediately after stent implantation (4x27 mm)



2014 SCAI Expert Consensus Statement on the Use of Fractional Flow Reserve, Intravascular Ultrasound and OCT

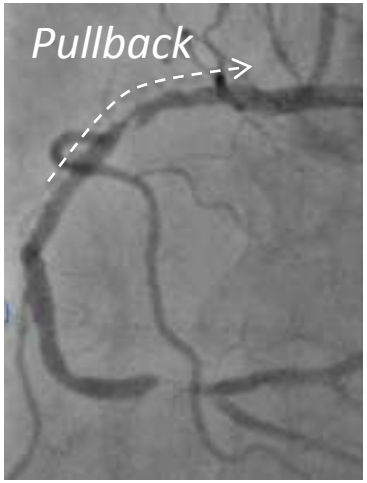
Recommendations for Optical Coherence Tomography

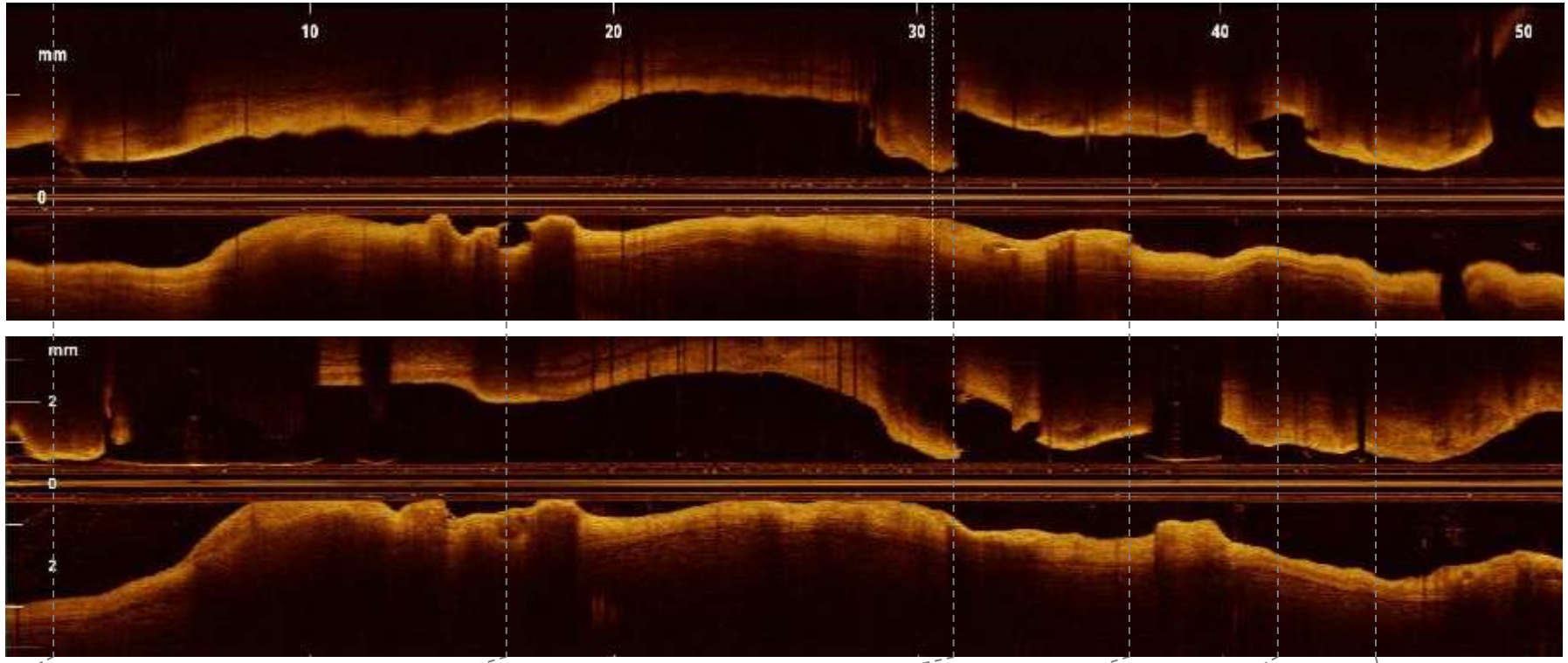
- Probably Beneficial. Determination of optimal stent deployment (sizing, apposition, and lack of edge dissection), with improved resolution compared with IVUS.
- Possibly Beneficial. OCT can be useful for the assessment of plaque morphology.
- No Proven Value/Should be Discouraged. OCT should not be performed to determine stenosis functional significance.

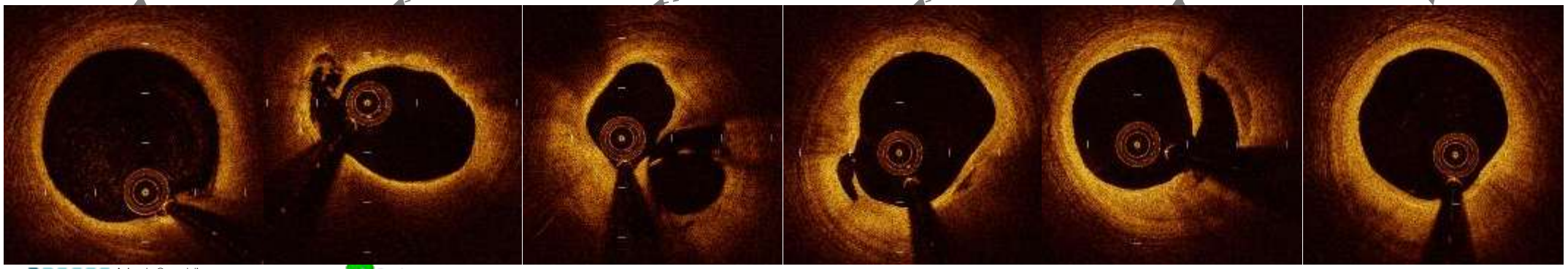
ACC.15
64th Annual Scientific Session & Expo

Catheterization and Cardiovascular Interventions 83:509–518 (2014)

Possible beneficial: not only lesion severity but plaque types





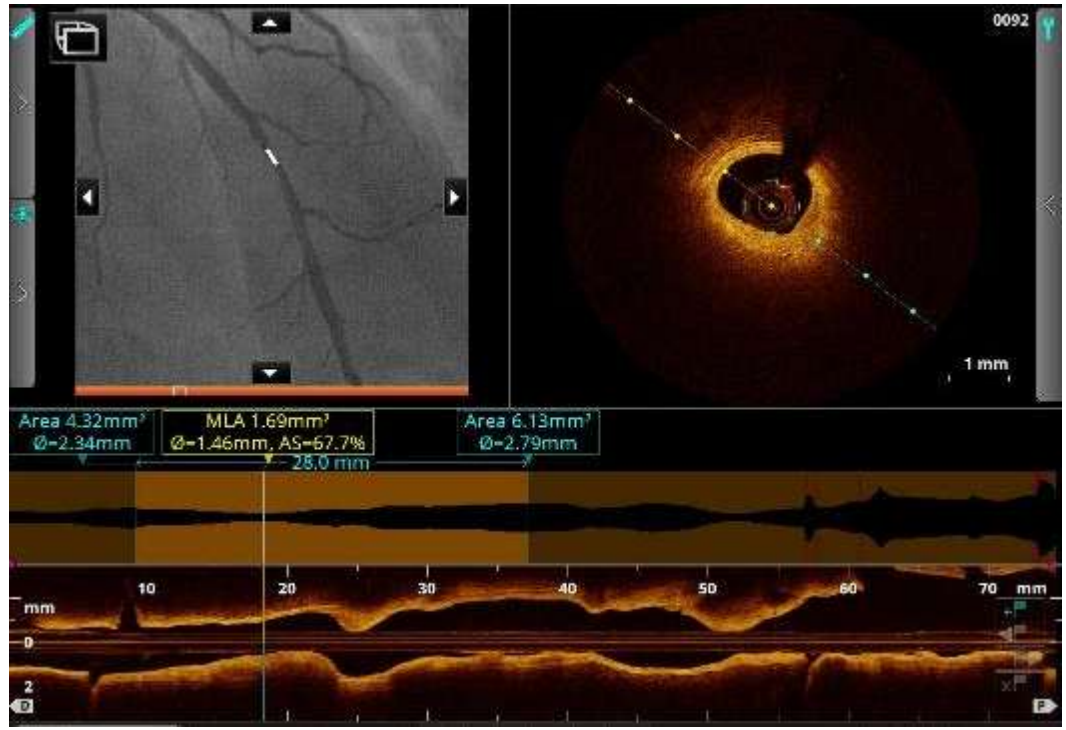


Integrated Angio-OCT Co-Registration

Basic rules

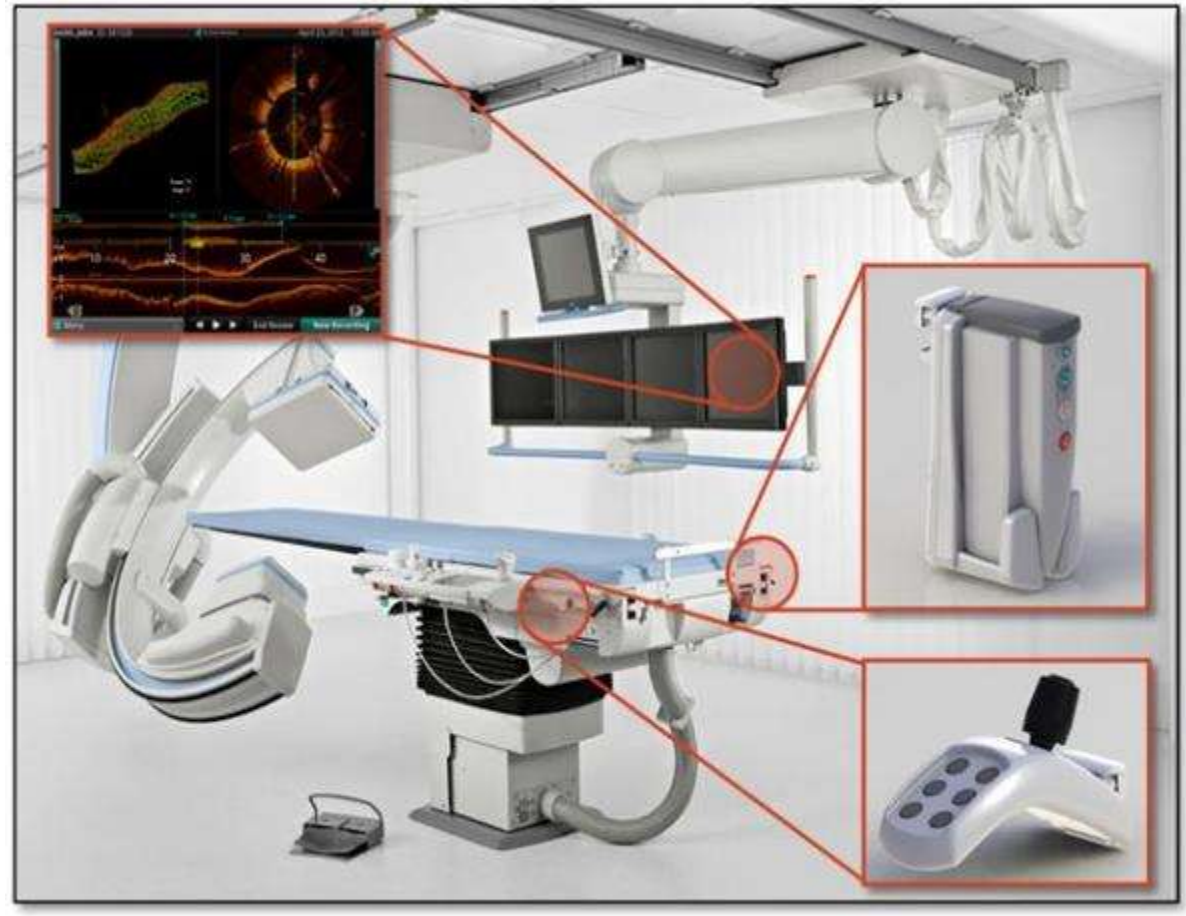
Angio Co-Registration (ACR) works by tracking the radiopaque (RO) lens marker on the Dragonfly™ OPTIS™ or Dragonfly™ DUO catheter on a cine acquired during an OCT pullback.

- **Clinical Benefits**
  - Quick overview of pullback
  - Highlight of areas of interest
  - Display of key stent planning metrics
  - Improved stent planning workflow



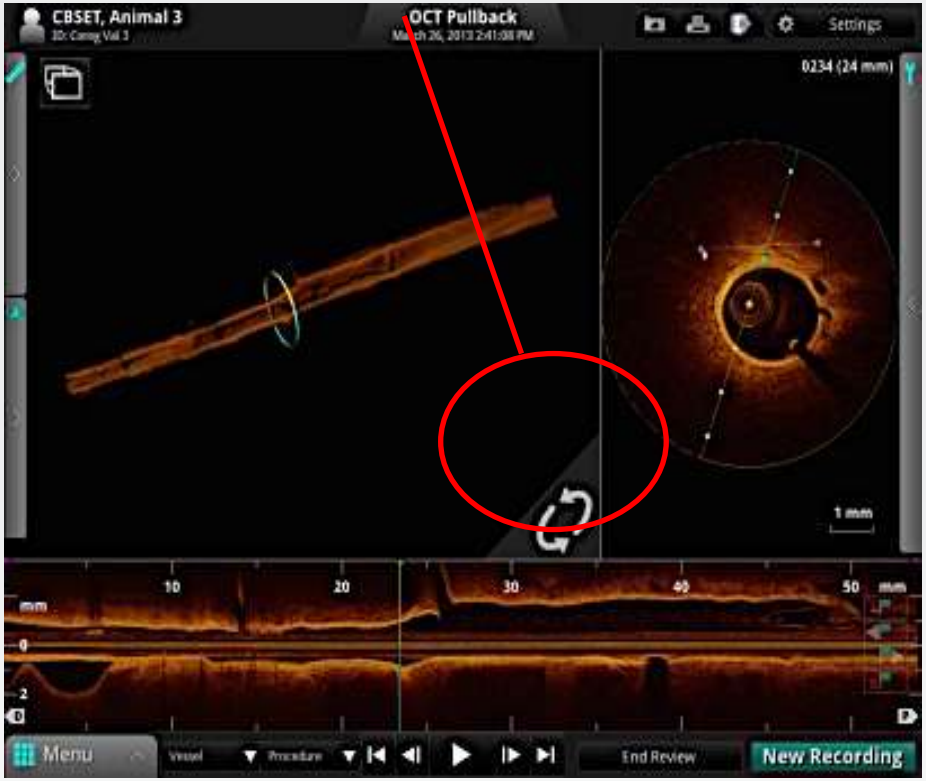
Integrated System Co-Registration

- Enable better integration of OCT in PCI workflow
  - Immediate availability during PCI procedure
  - Direct tableside control of acquisition and analysis by physician (no needs of additional experts!)
  - Enables real-time angio co-registration with OCT for planning and optimizing stent implantation

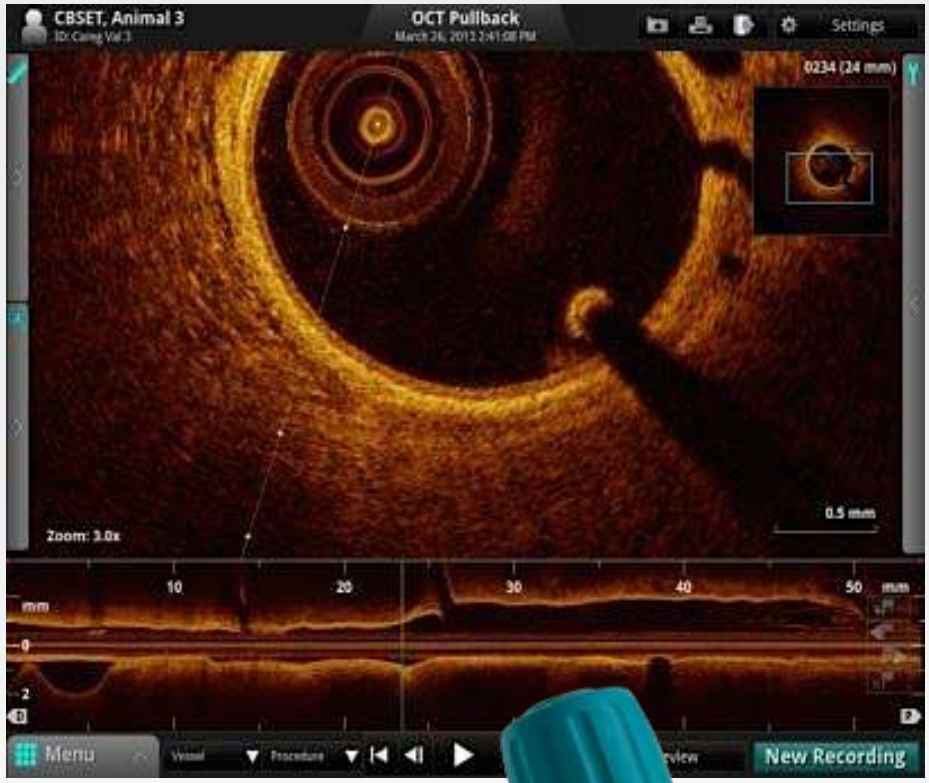


INTERACTIVE FEATURES

Cut Plane Rotation Hot Spot



Single Click Zoom



Navigation Controller

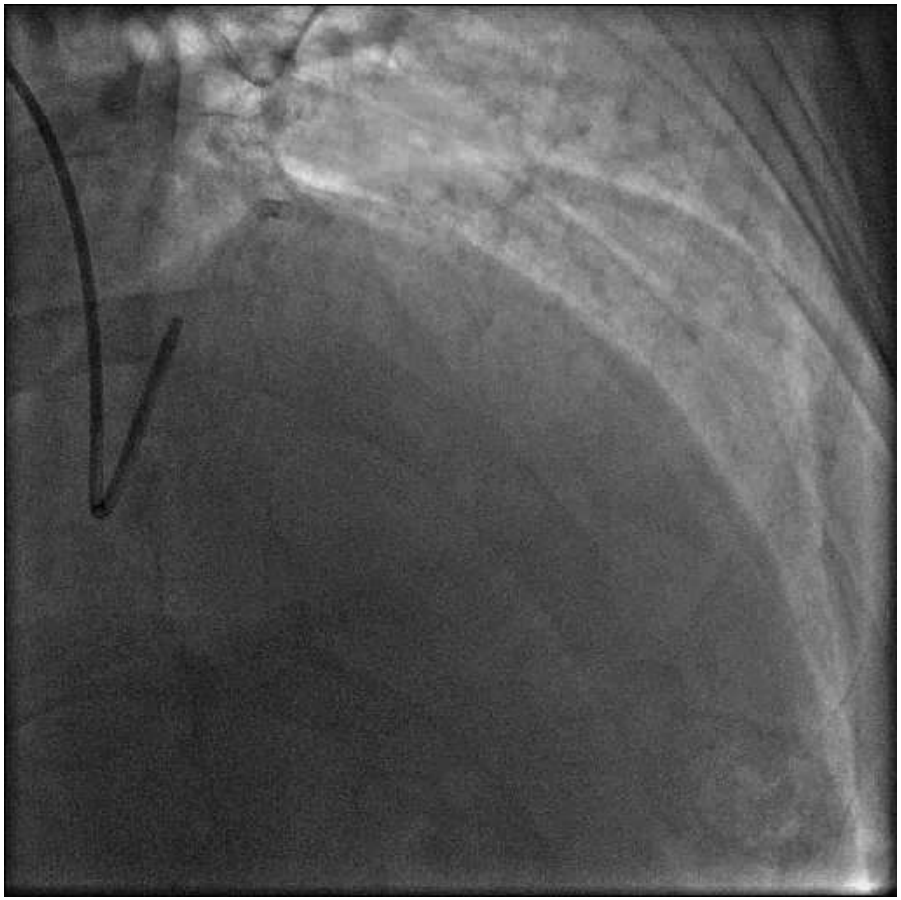
Lumen Profile

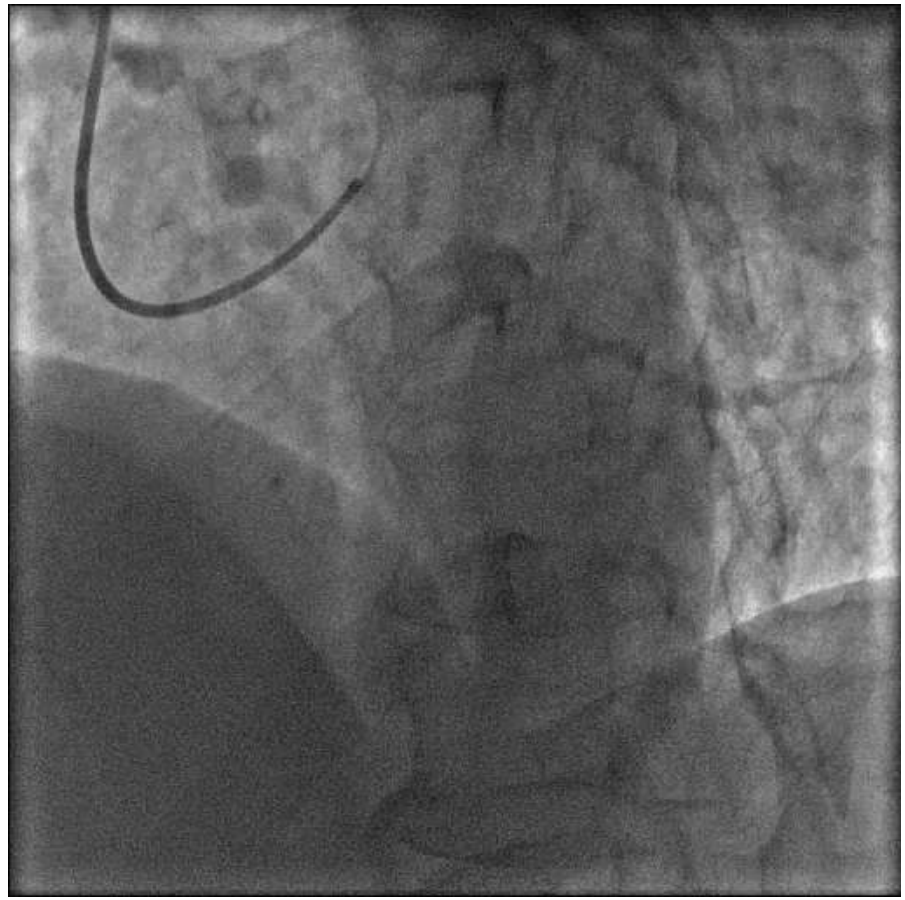
Distal Marker

- The Tableside Controller may be used to position the mouse cursor by tilting the Navigation Controller to the left, right, up, down or variations thereof.

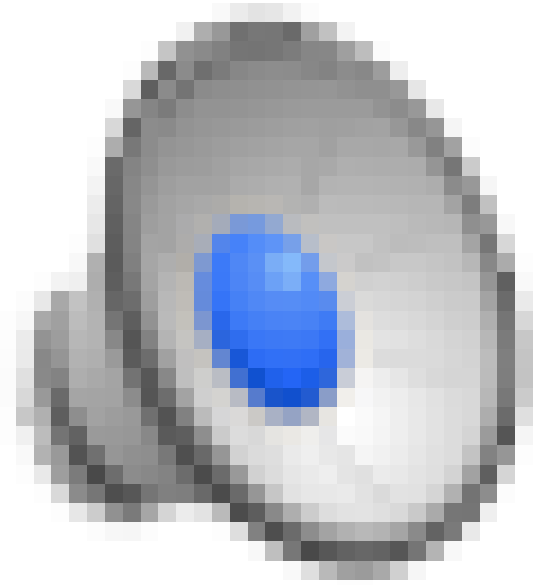
Mapping Coronary Intervention with OCT and ACR

Multiple lesions

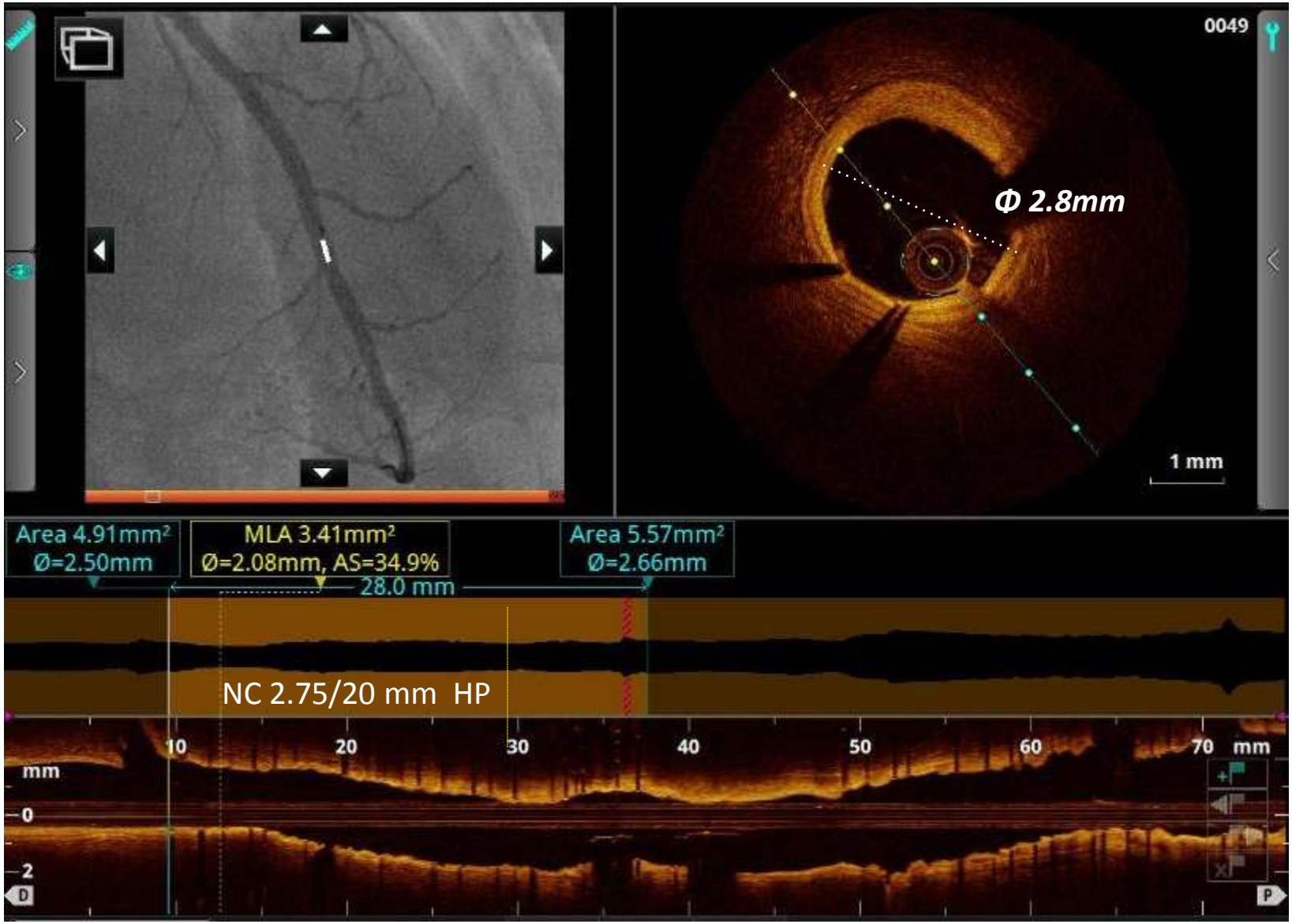




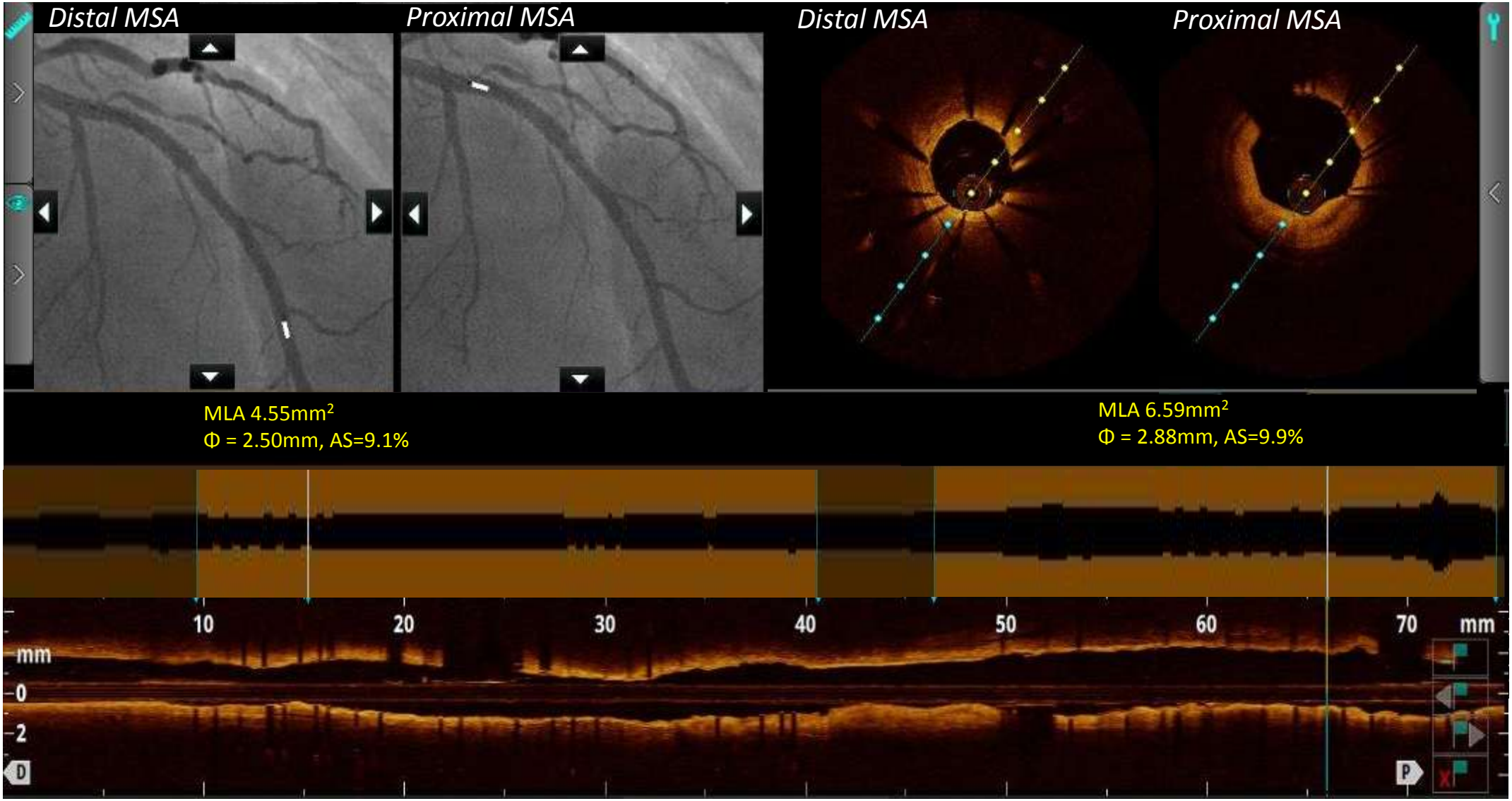
ACR- PCI Procedural Mapping



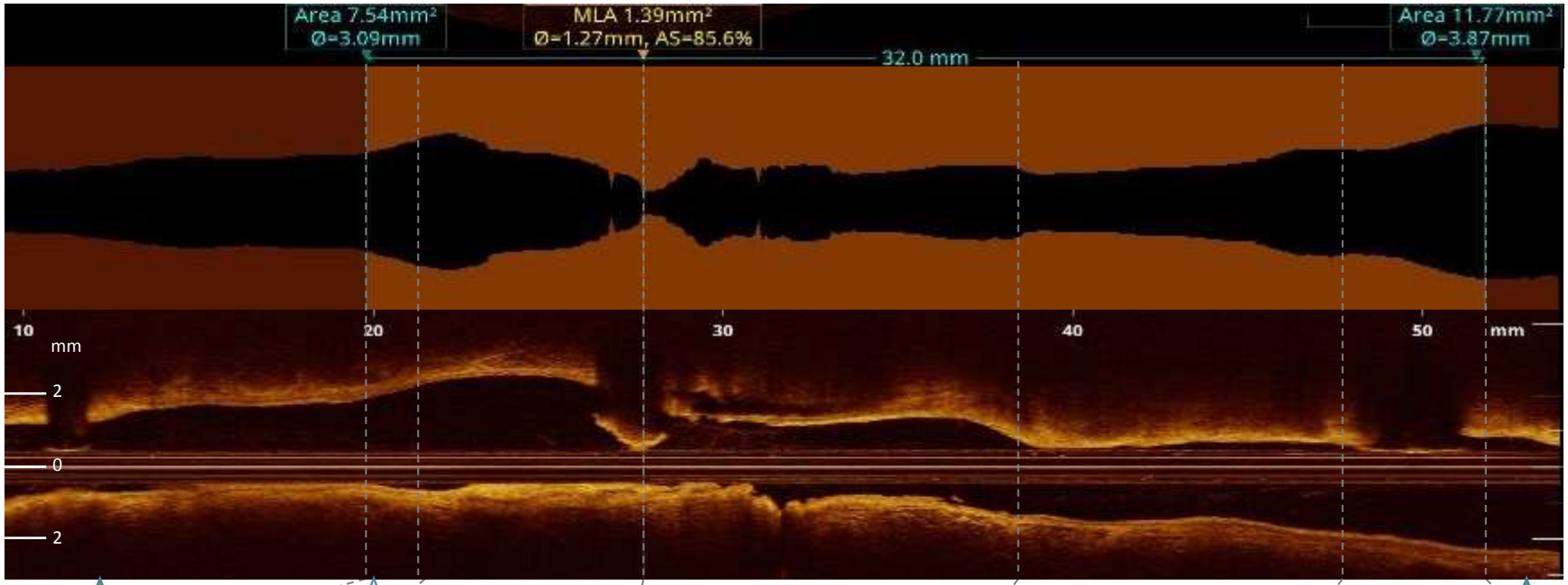
Distal stent: underexpansion

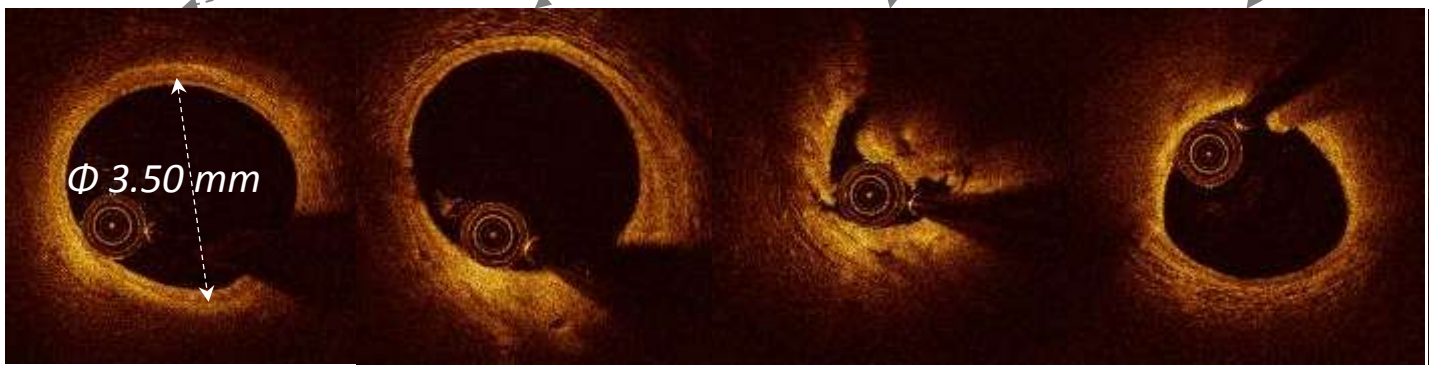


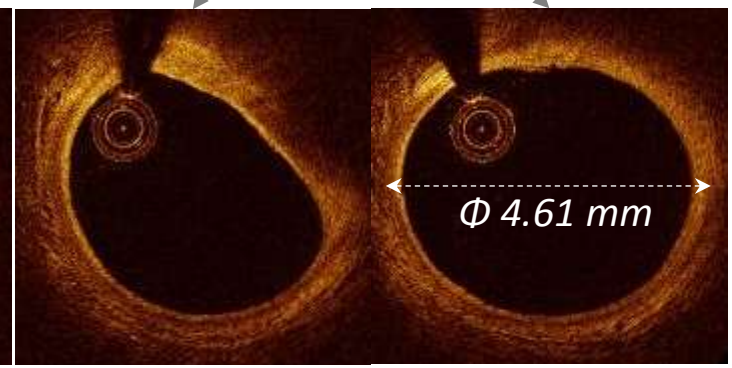
Position at MSA



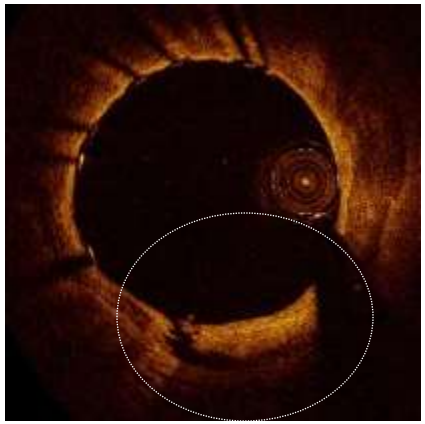
How to select stent size and length?

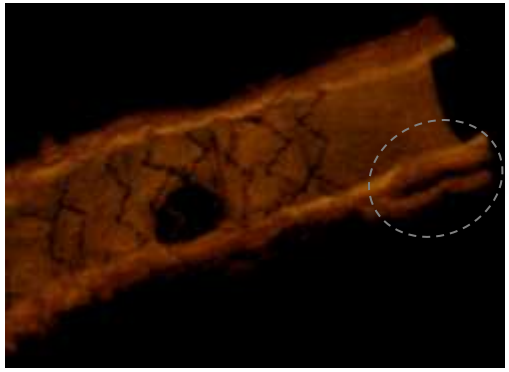


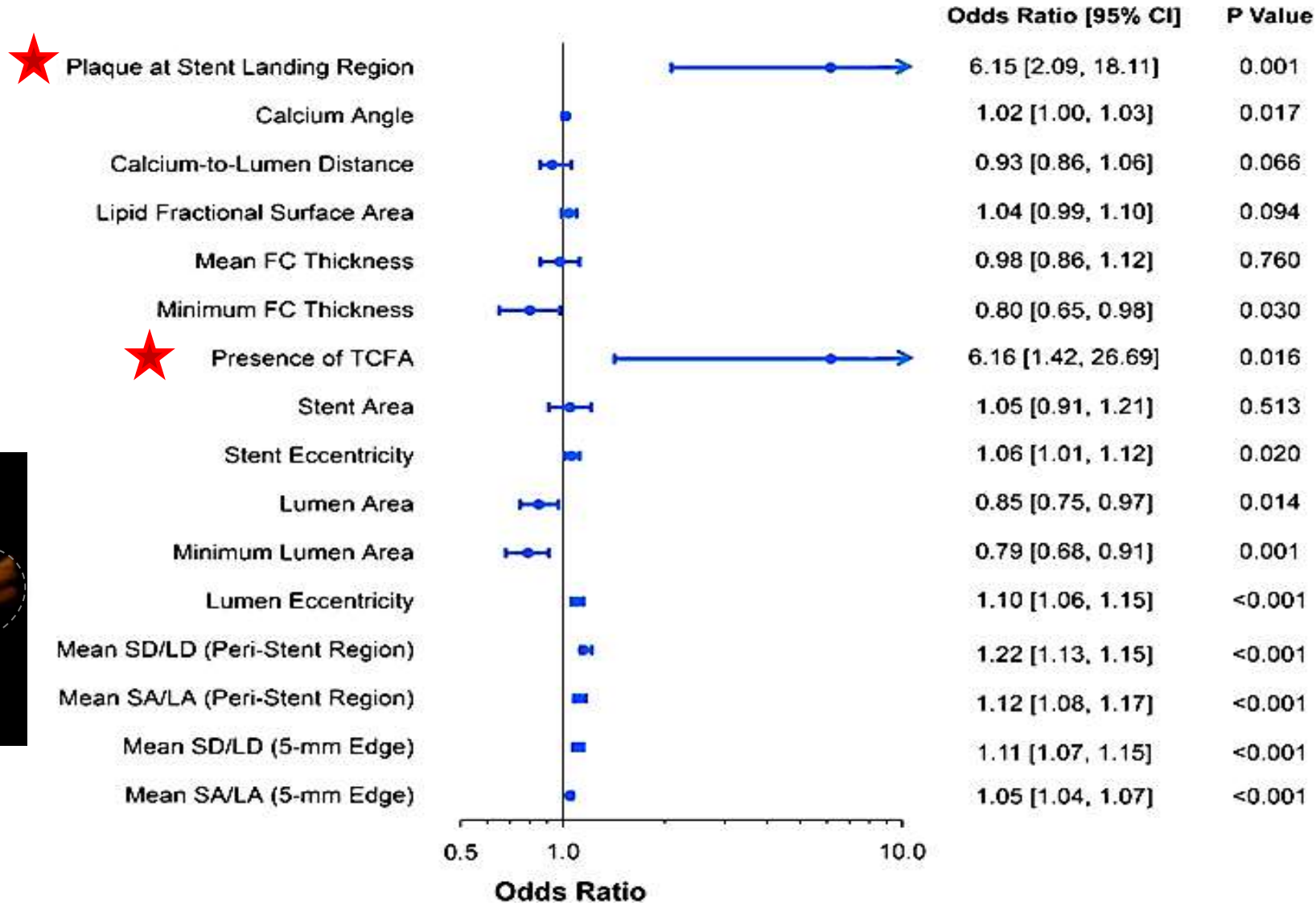




Indipendent Predictors of OCT-Detected Stent Edge Dissections

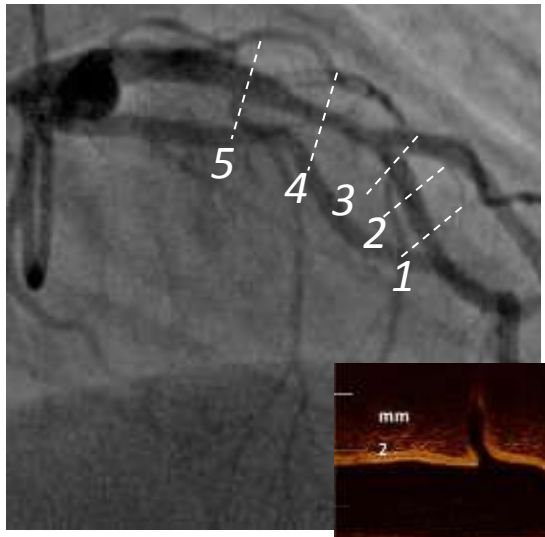


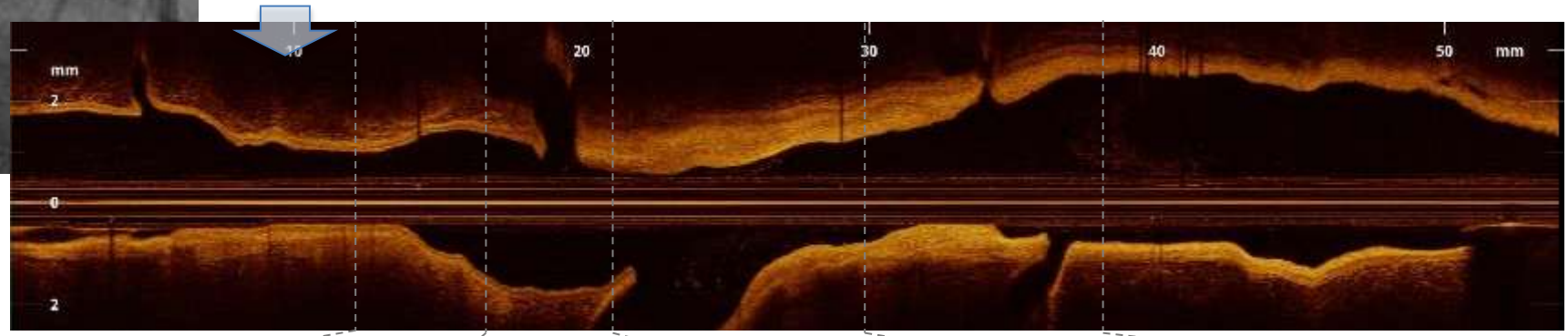


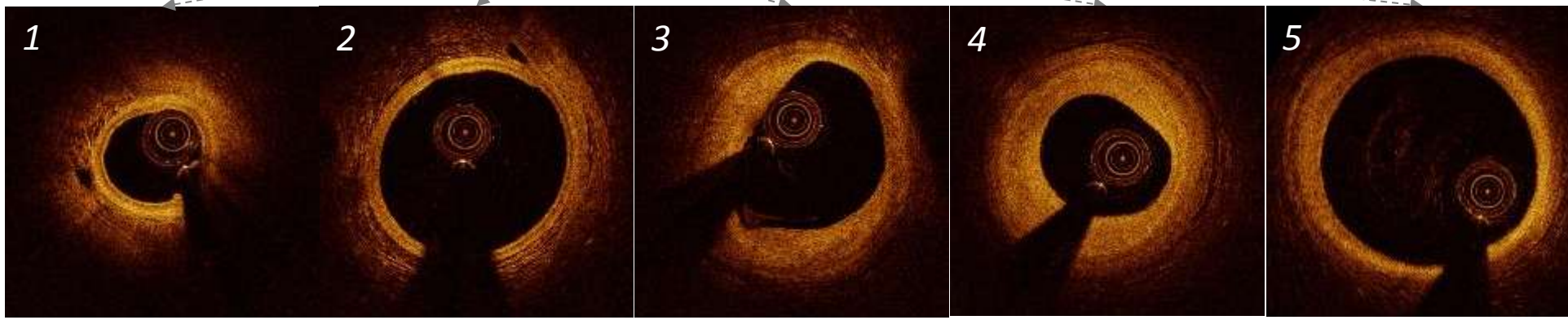


Chaimé D *et al* JACC Aug 2013, vol.6(8): 800-13

Planning the procedure: what to avoid and how to choose







ILUMIEN III: OPTIMIZE PCI*

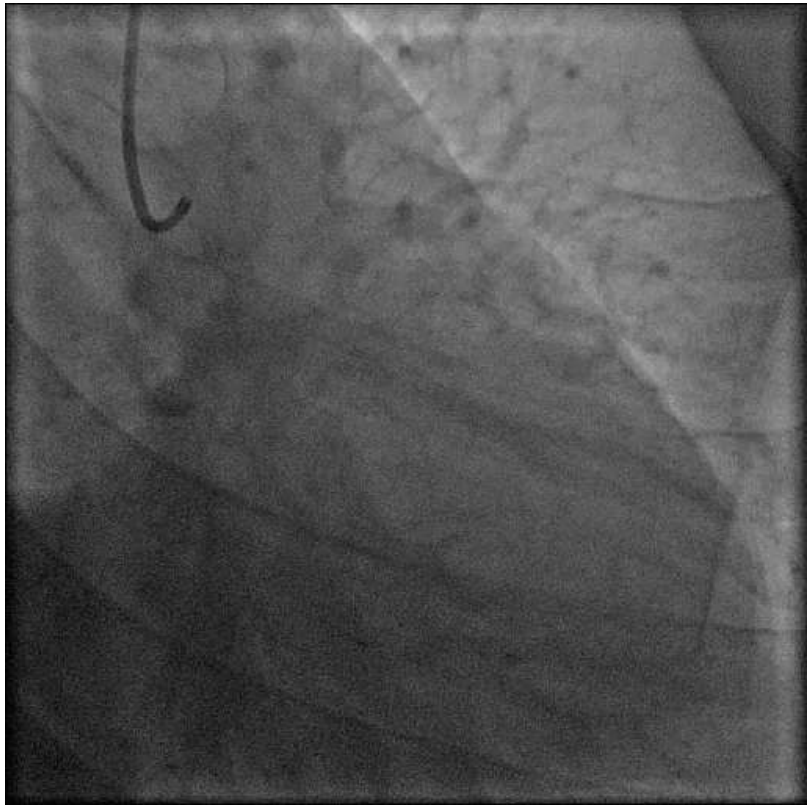
Principal Investigator: Ziad Ali', Columbia University.

Title	ILUMIEN III: OPTIMIZE PCI: Optical Coherence Tomography (OCT) Compared to Intravascular Ultrasound (IVUS) and Angiography to Guide Coronary Stent Implantation: a Multicenter Randomized Trial in PCI.
Primary Objective	To demonstrate the safety and efficacy of an OCT guided strategy for stent implantation.
Trial Hypothesis	OCT-guided stent placement with application of a novel algorithm is non-inferior to IVUS-guided stent placement and superior to Angiography, all as measured by post-PCI minimum stent area (MSA)

** Protocol Approved at my Hospital Friday April 24 2015*

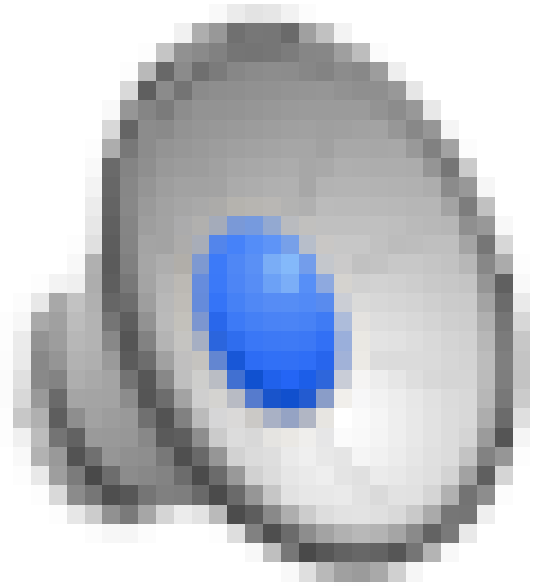
ST. JUDE MEDICAL

39 yrs Crescendo angina:radiotherapy for lymphoma in 2008

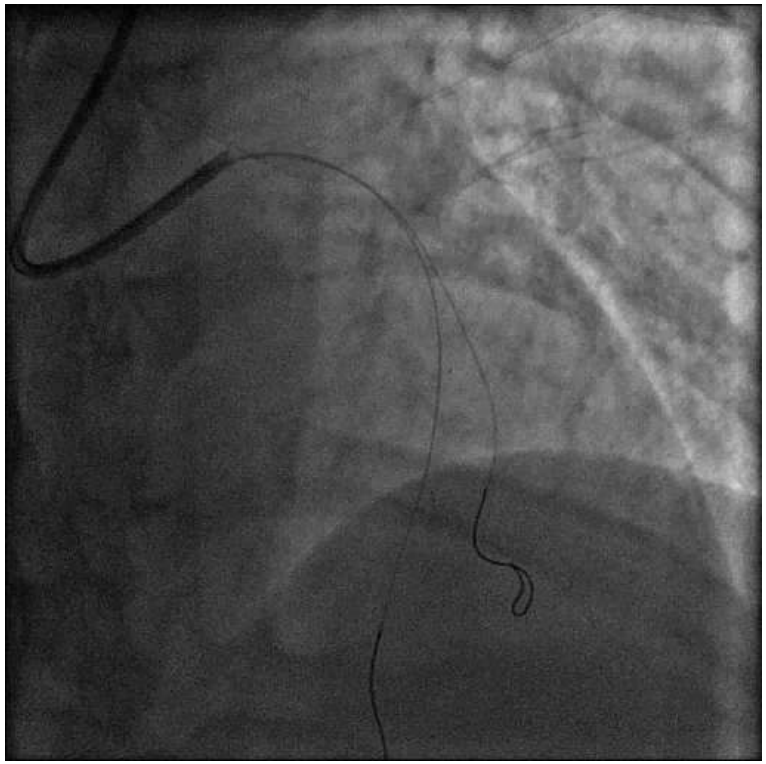


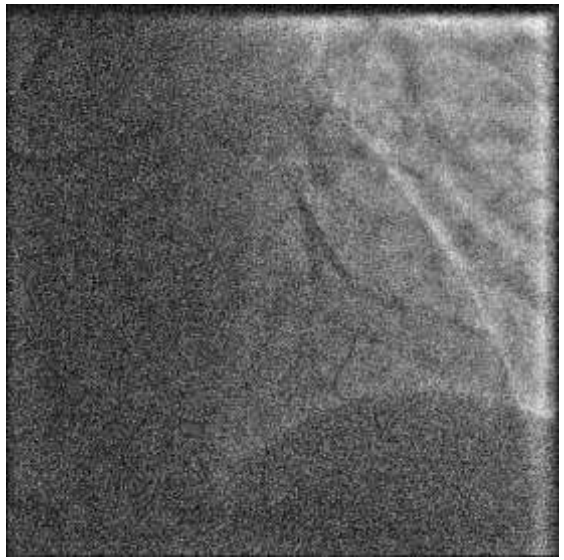
March 5 2015

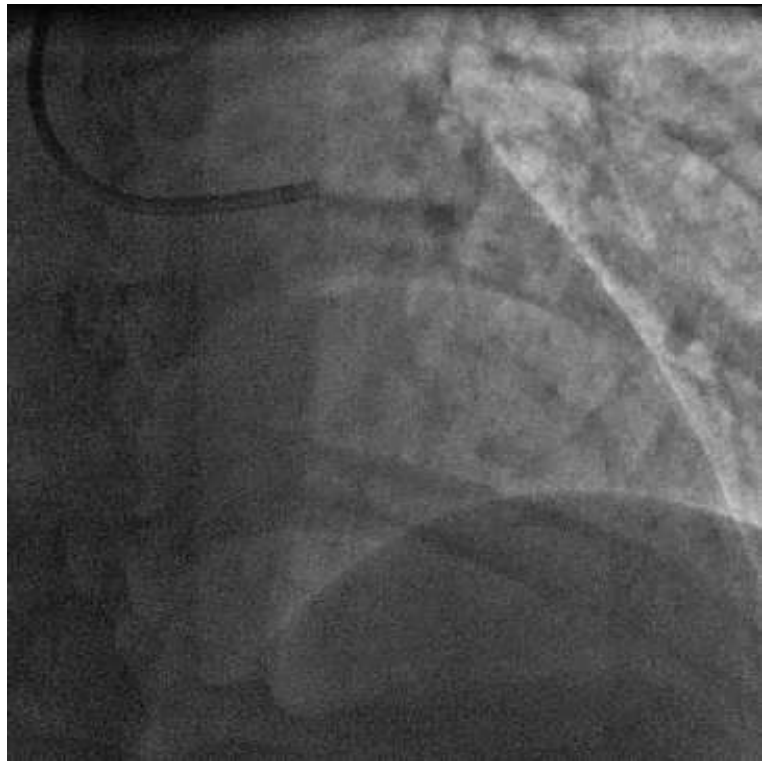
- How to size BVS
- How to deal with major bifurcation



BVS 3.5/23mm in LAD with mini-KBPD (Φ 2.0mm in D1, 5 atm)

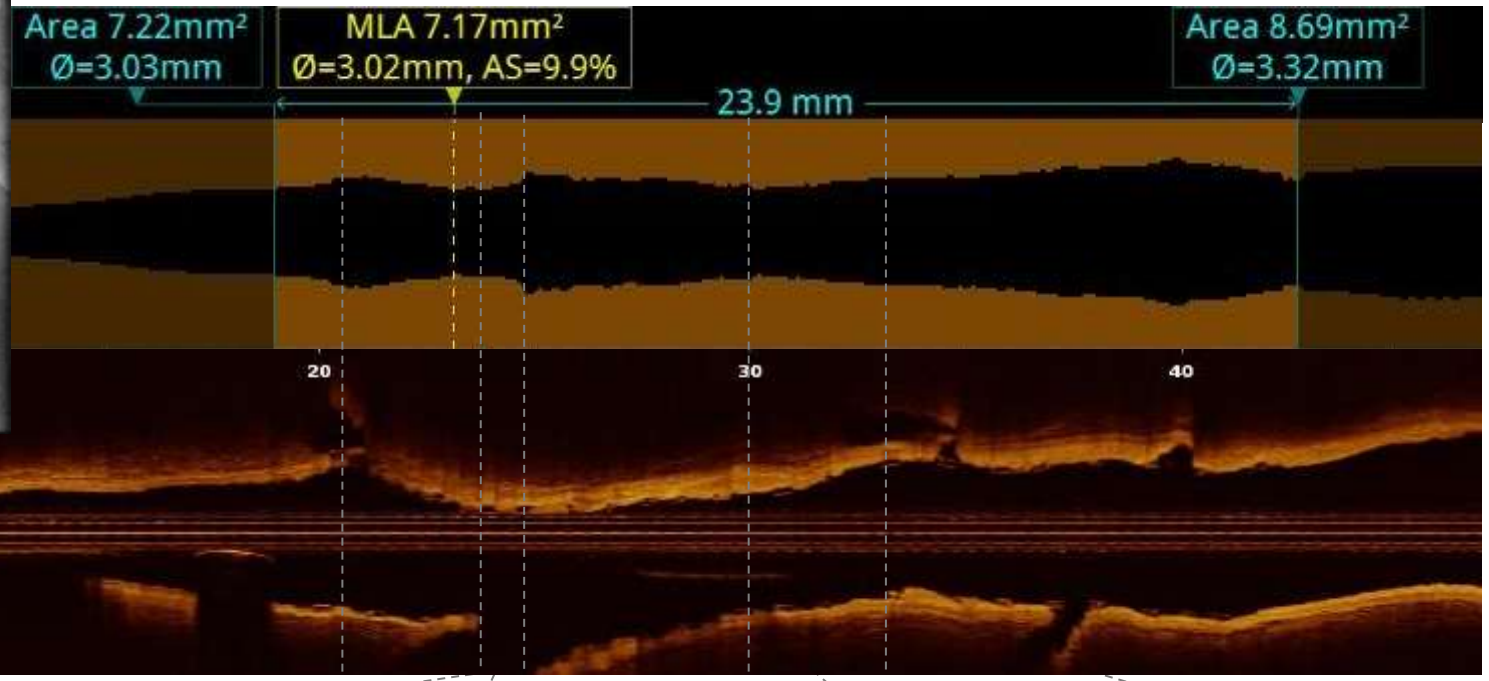


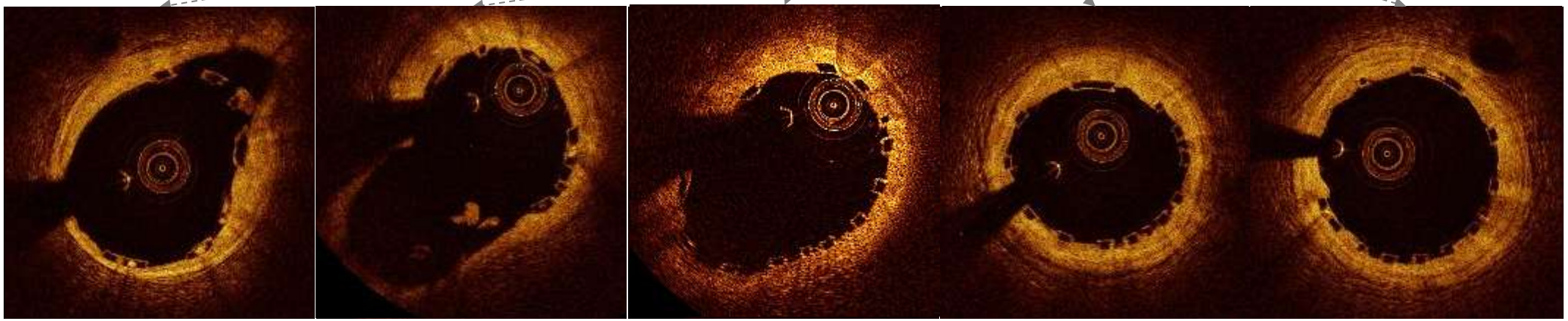




* Not approved for sale in United States, nor recommended as indication for use

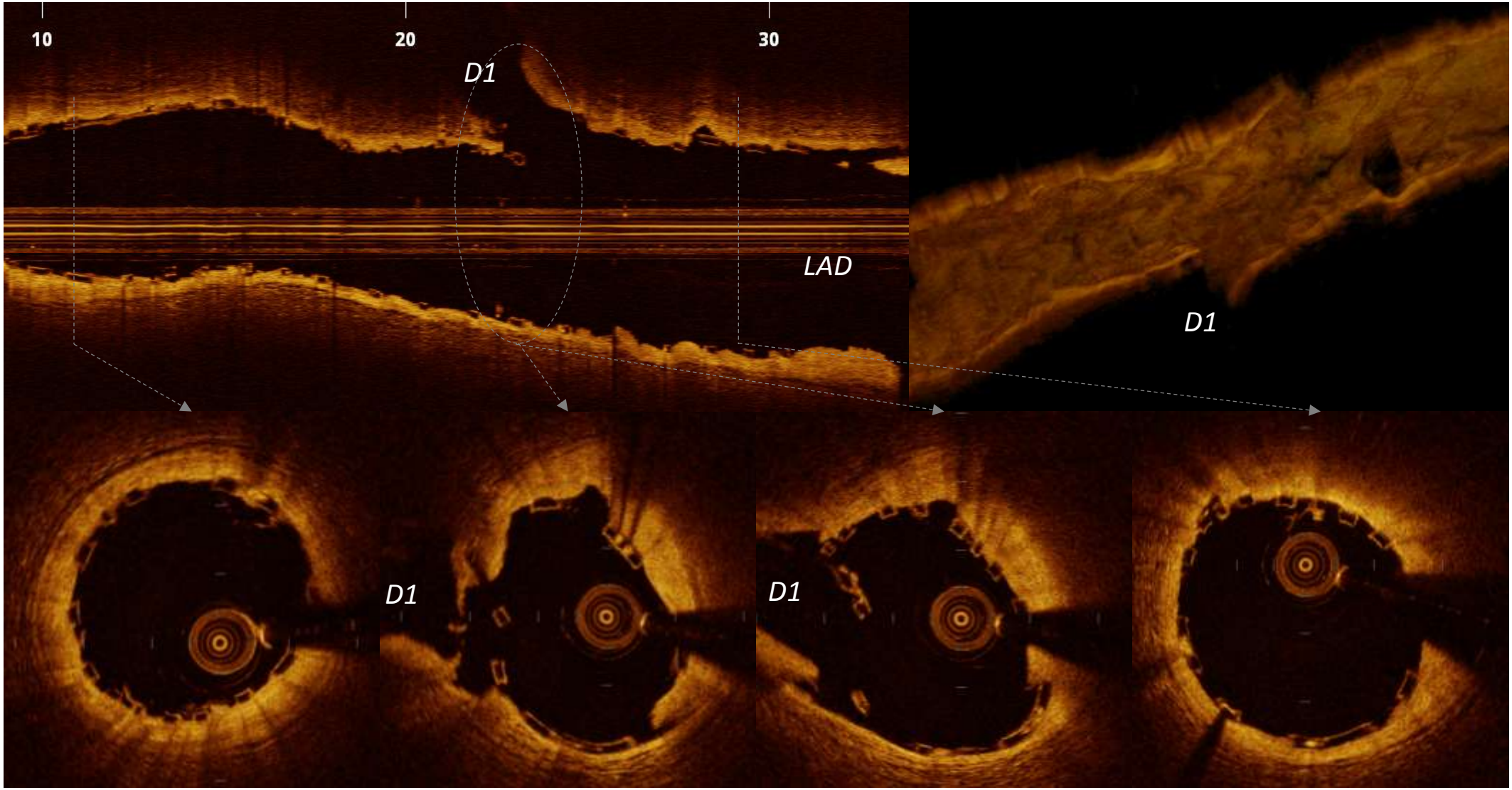
Final BVS result





Complex Lesions

apposition, distortion, fracture, overlap, plaque/thrombus protrusion



*Bioresorbable Vascular Scaffold (BVS Abbott Vascular) are not approved for sale in United States

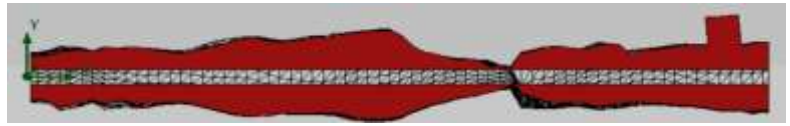
1.7 F = Improved Clearing Distal to Lesions

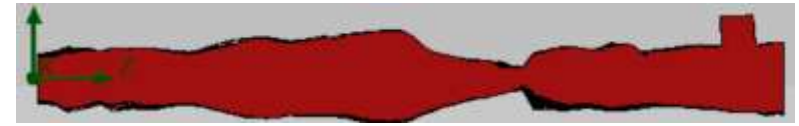
Smaller profile, better crossing, less hemodynamic impact, less contrast

Dragonfly DUO – Clears in 5.0 seconds

Dragonfly NG – Clears in 0.75 seconds

T = 0





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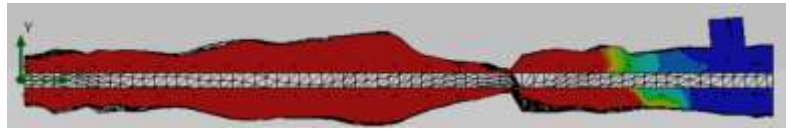

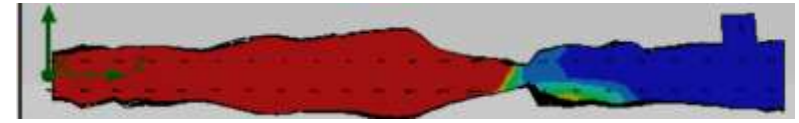

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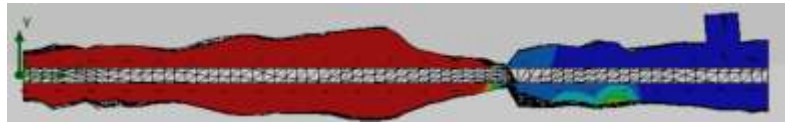

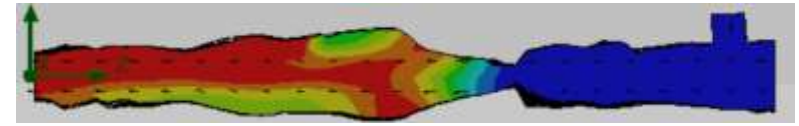

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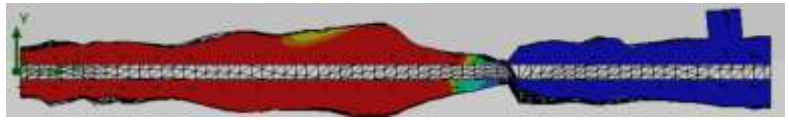

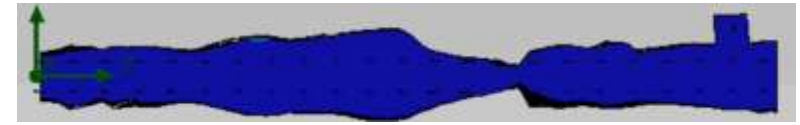

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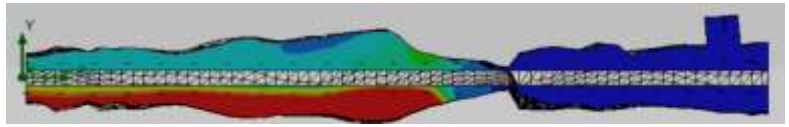
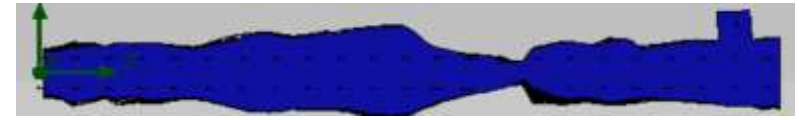
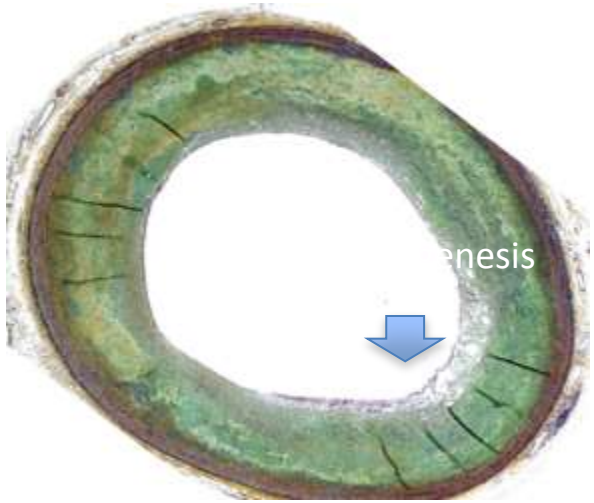


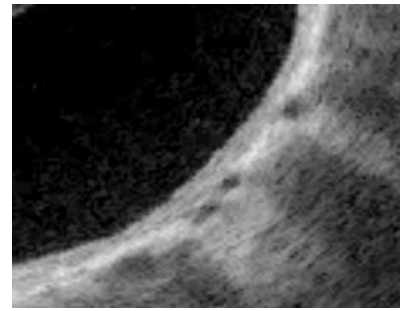


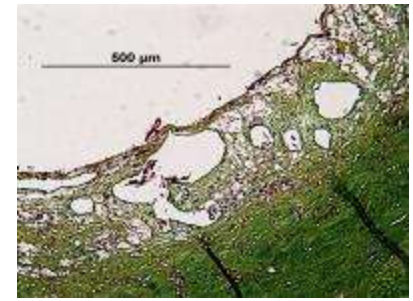
ST. JUDE MEDICAL

MORE CONTROL. LESS RISK.

Association of OCT-based Plaque Characteristics and Subsequent Progression







	Univariate Analysis	
	OR (95% CI)	P
Eccentric	3.3 (0.7-14.4)	0.230
◆ Microchannel	20 (4.8-83.0)	<0.001
◆ TCFA	20 (4.8-83.0)	<0.001
◆ Macrophage	9.6 (2.6-35.6)	0.001
Calcium	1.3 (0.4-4.3)	0.890
◆ Thrombus	12 (2.2-64.3)	0.002

Uemura S. Eur. Heart J 2012, 33: 78-85

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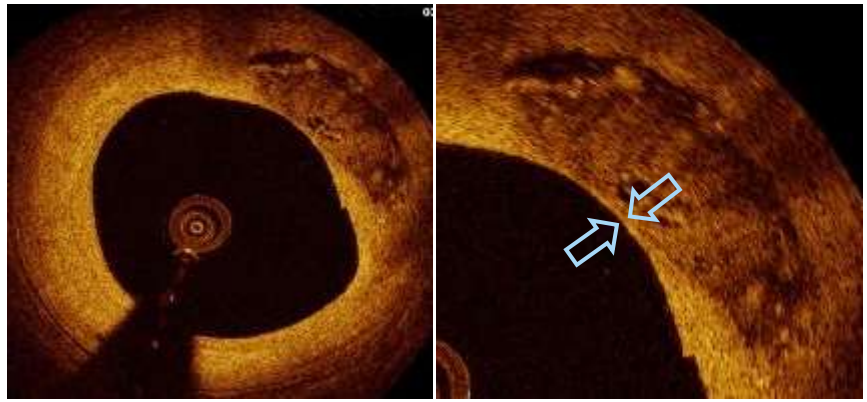
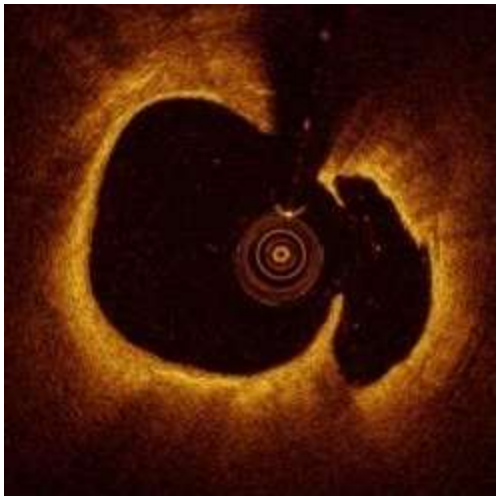
CLINICAL RESEARCH — Coronary Artery Disease

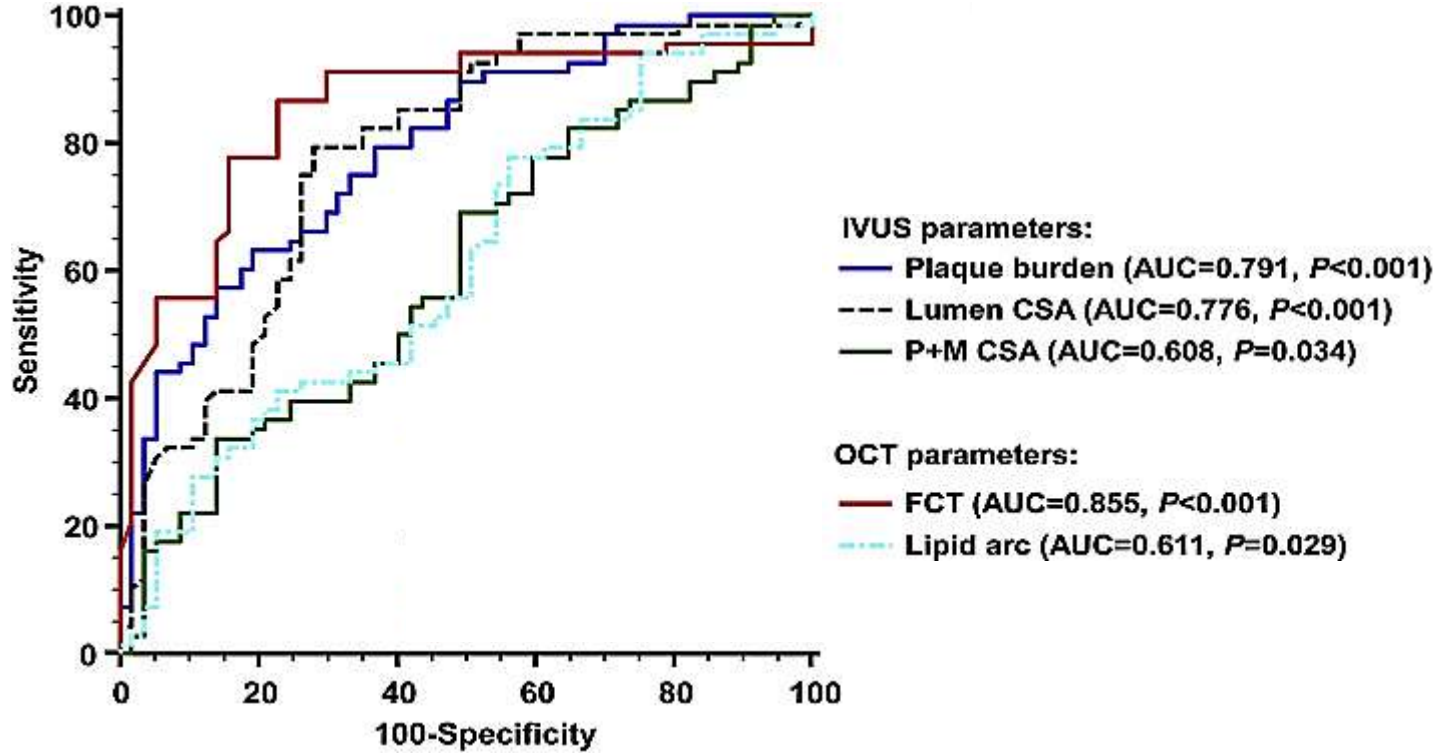
Distinct Morphological Features of Ruptured Culprit Plaque for Acute Coronary Events Compared to Those With Silent Rupture and Thin-Cap Fibroatheroma

A Combined Optical Coherence Tomography and Intravascular Ultrasound Study

Jinwei Tian, MD, PhD,*† Xuefeng Ren, MD,* Rocco Vergallo, MD,† Lei Xing, MD,* Huai Yu, MD,*

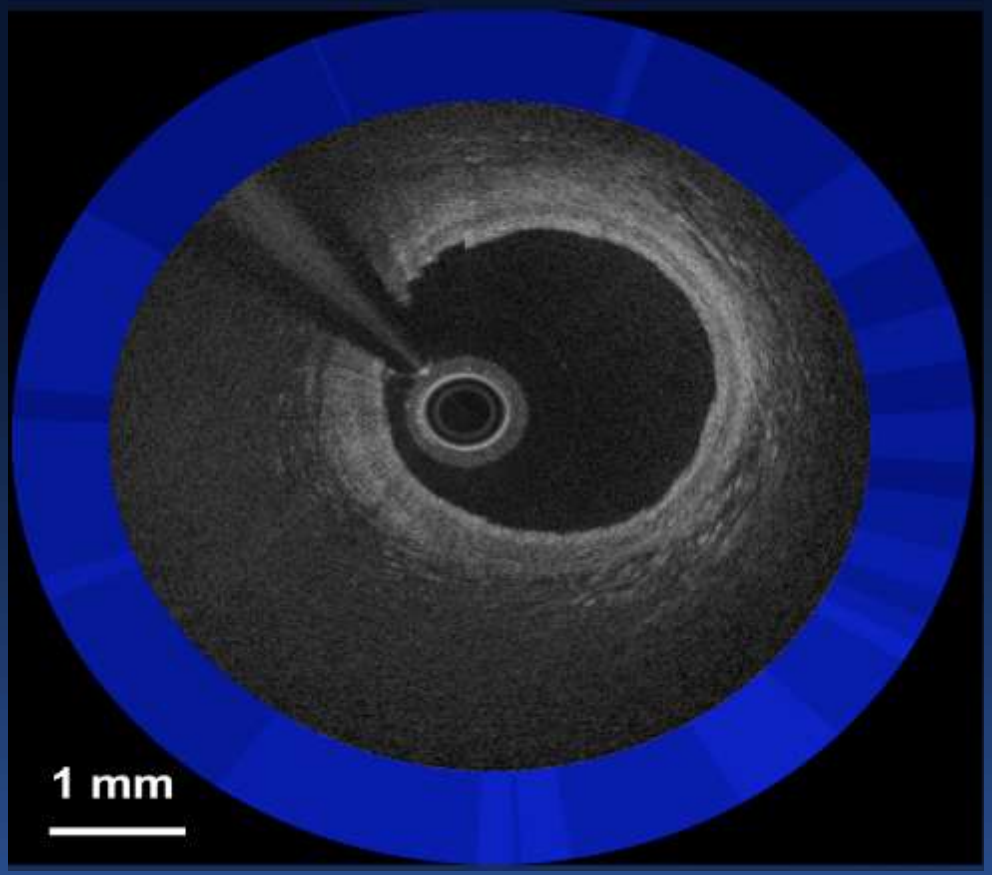


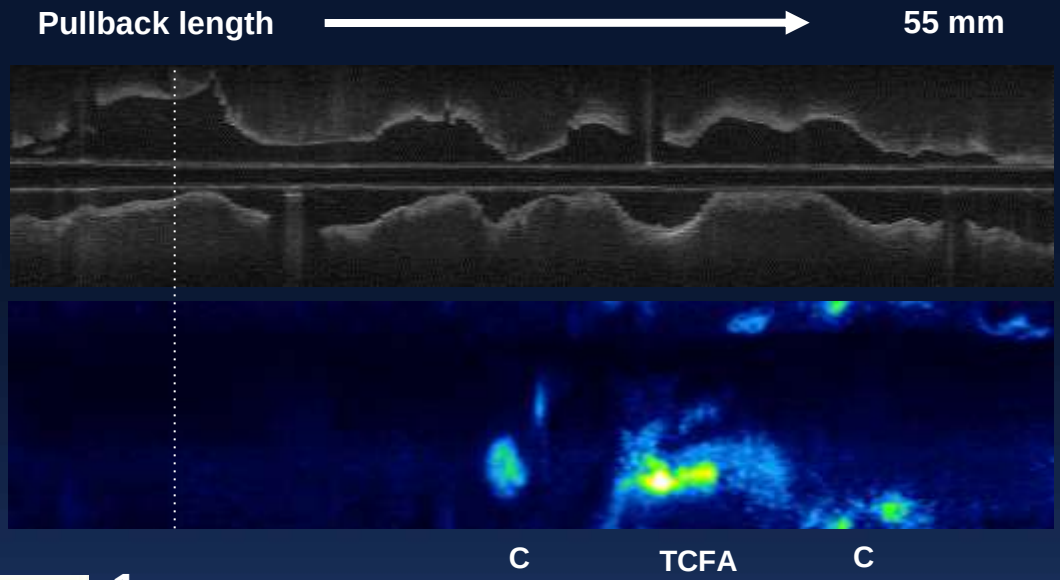




IVOCT-NIRAF pullback

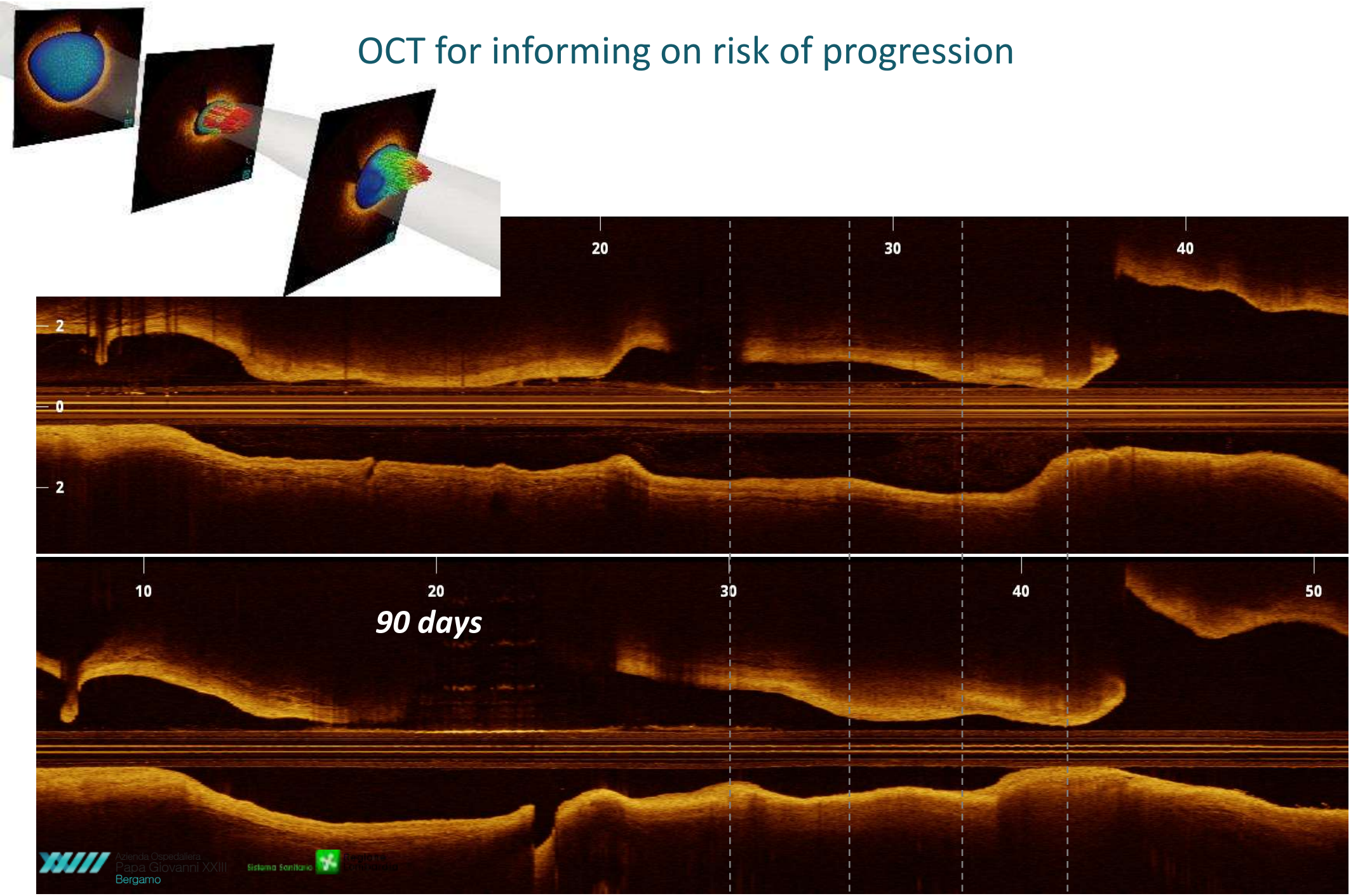
LAD





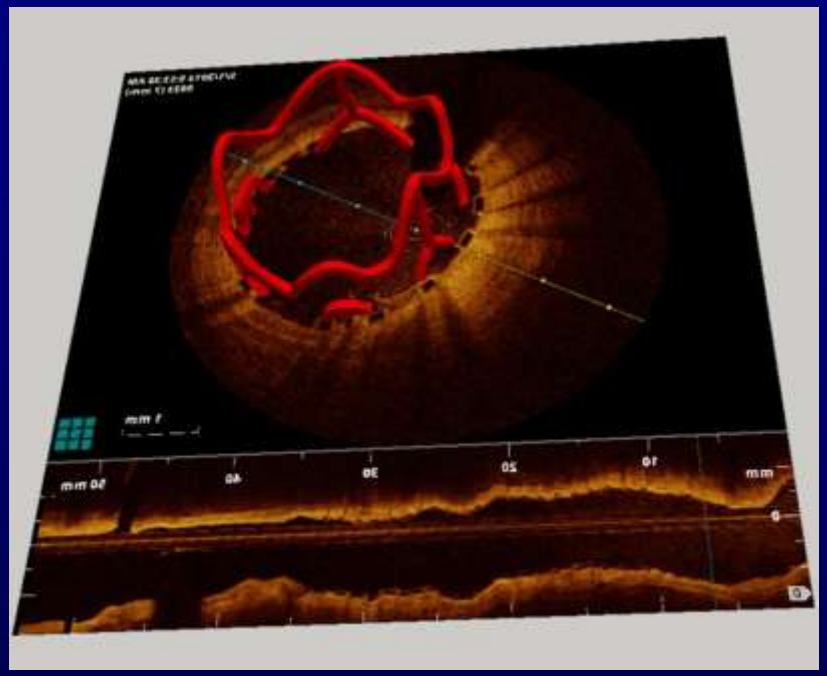
Courtesy Giovanni J. Ughi PhD

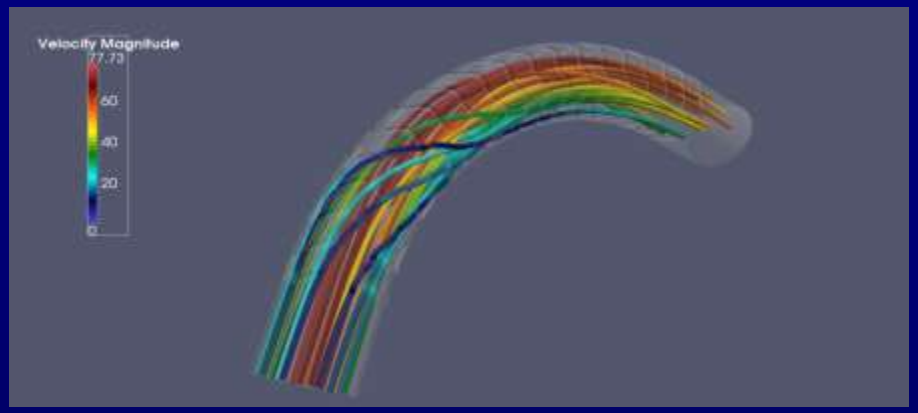
OCT for informing on risk of progression



Azienda Ospedaliera
Papa Giovanni XXIII
Bergamo

Reconstructed stent from OCT , velocity Streamlines, shear stress





Courtesy B. Yang, B. Gogas MD, A. Veneziani Phd, H. Samady MD March 2015

EMORY

OCT PROCEDURE GUIDANCE IN THE CATHLAB….

- **Quick overview of the pullback: full vessel assessment of coronary plaques phenotypes with accurate lumen measures, in only couple of seconds (plus in unstable patients)**
- **Highly sensitive for thrombus (detection and removal) and high-risk plaques (ACS, LST)**
- **Display of key stent planning metrics with full tableside control**
- **Best for mapping, positioning and controlling the planned stent with high quality point-to point longitudinal view (automatic lumen profile) and software capability for daily use (angio co-registration).**

The impact of this innovative technology on day-to day treatment strategies and outcome remains to be proved by prospective, RCTs.