

Role of OCT for Optimal Stenting

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Yonsei University College of Medicine**



Joint meeting of Coronary Revascularization

2014 심혈관중재시술 국제학술회의 | December 12-13, 2014 | Busan, Korea

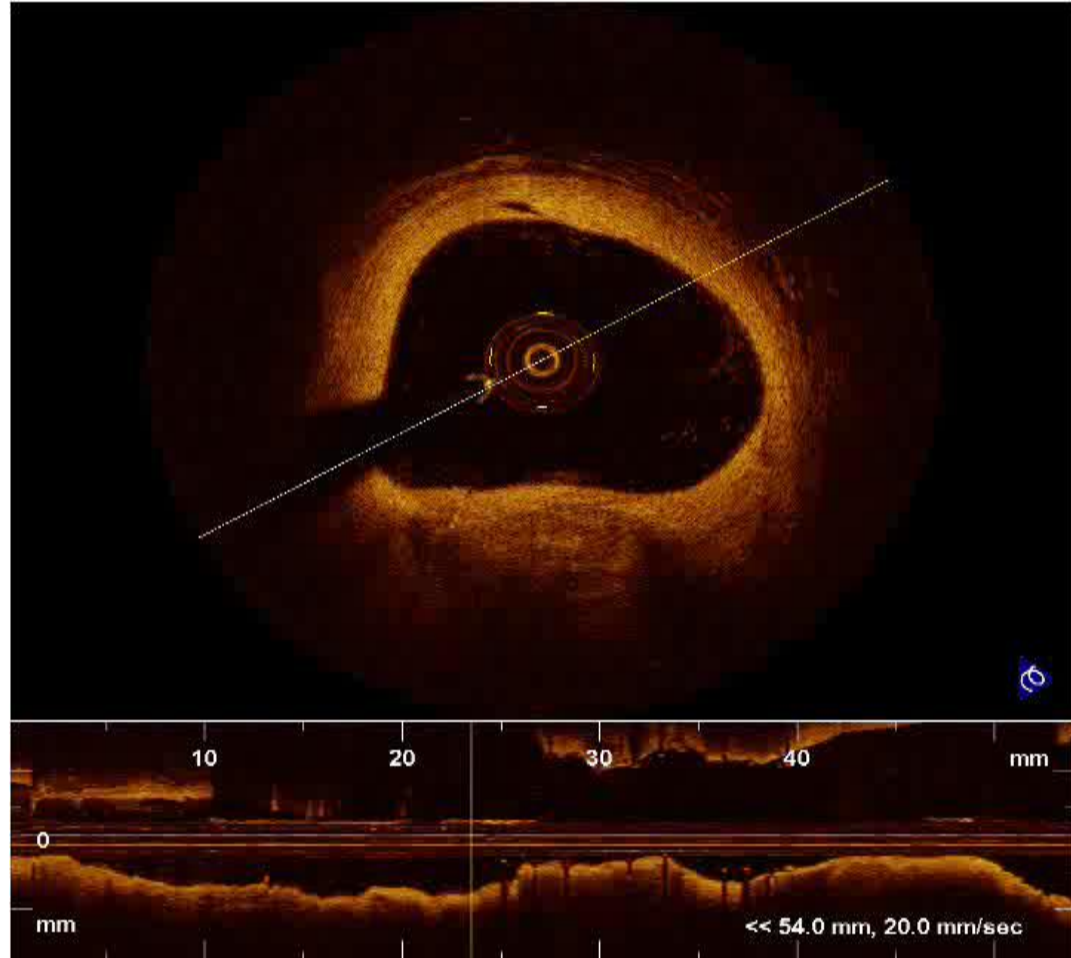
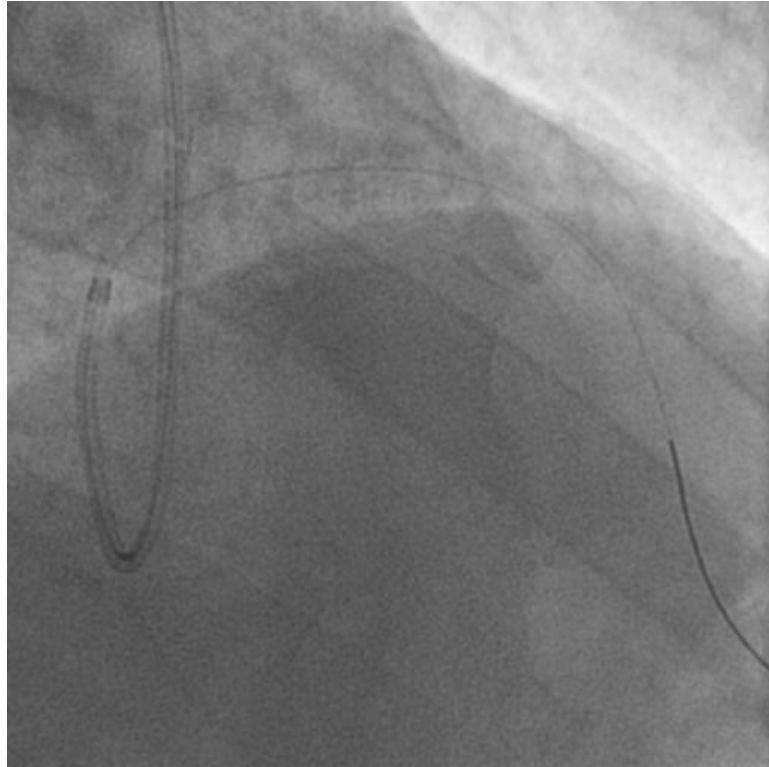
I have no financial conflicts of interest to disclose concerning the presentation.

Agenda

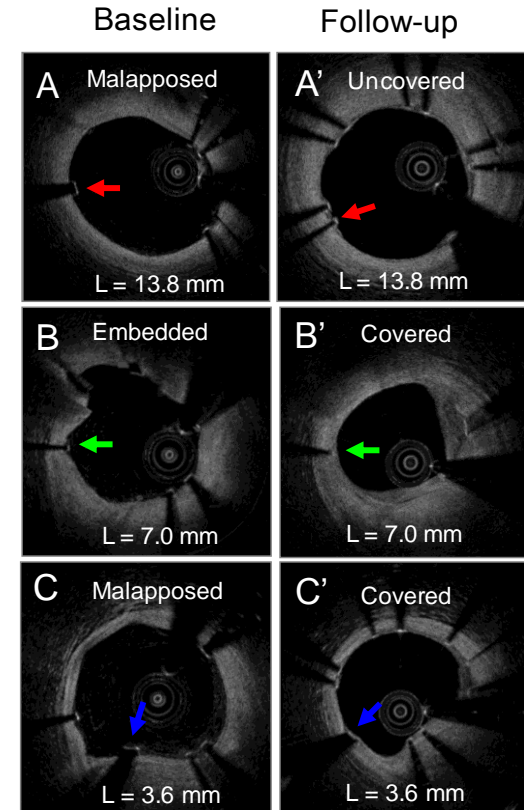
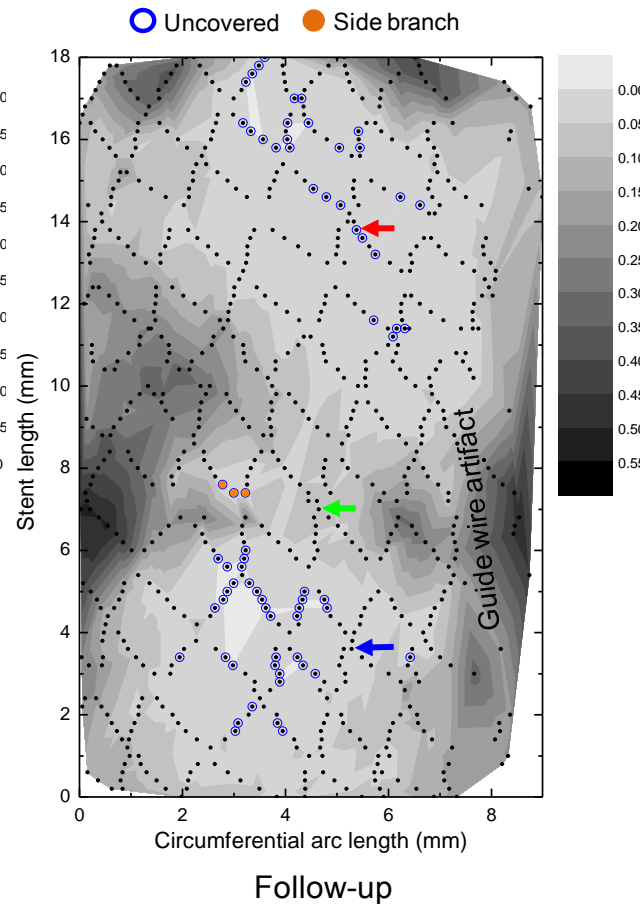
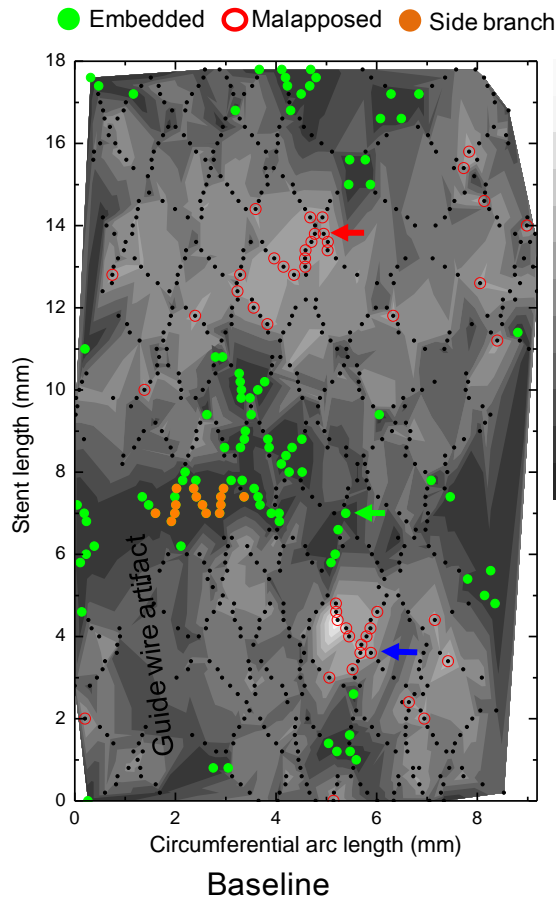
- 1. Malapposition**
- 2. Peri-procedural findings**
- 3. Bifurcation Lesion**
- 4. Calcified Lesion**

Malapposition

Acute Malaposition

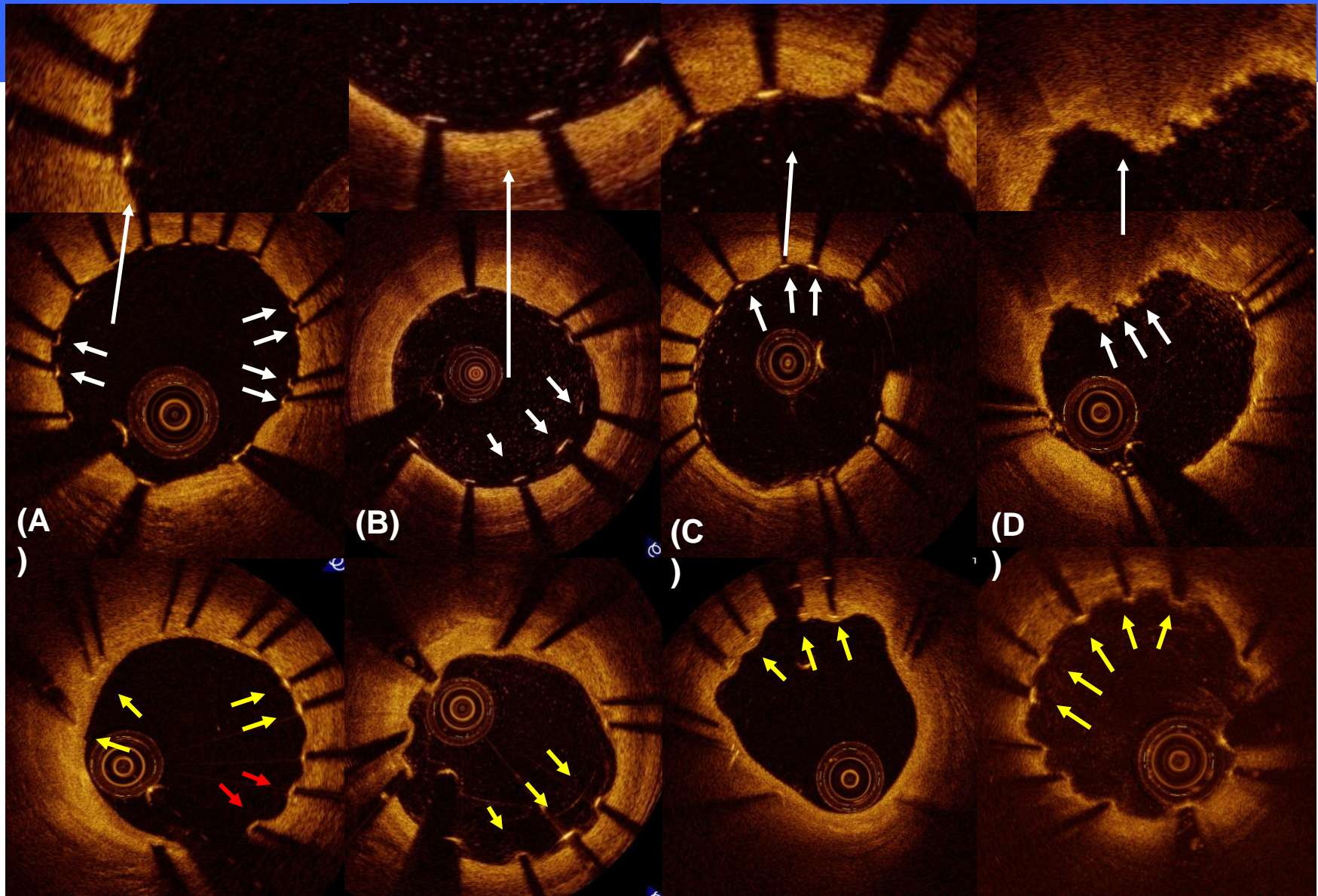


Strut Level Analysis



Kim JS, Ha J, Hong MK, et al. J Am Coll Cardiol Interv 2014

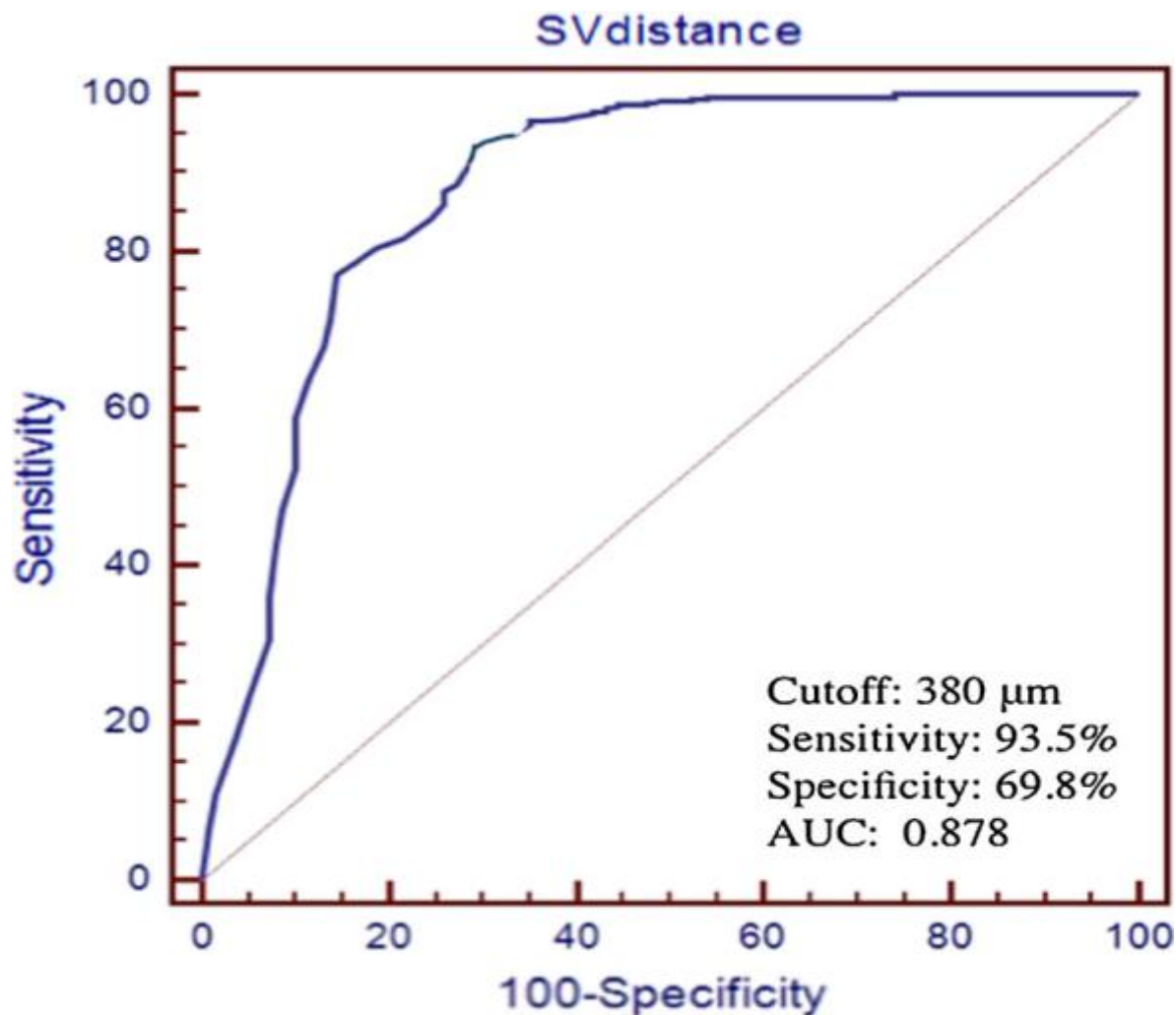
Post-
intervention



Follow-up

Kim JS, Ha J, Hong MK, et al. J Am Coll Cardiol Interv 2014

ROC analysis of strut–vessel (S–V) distance.

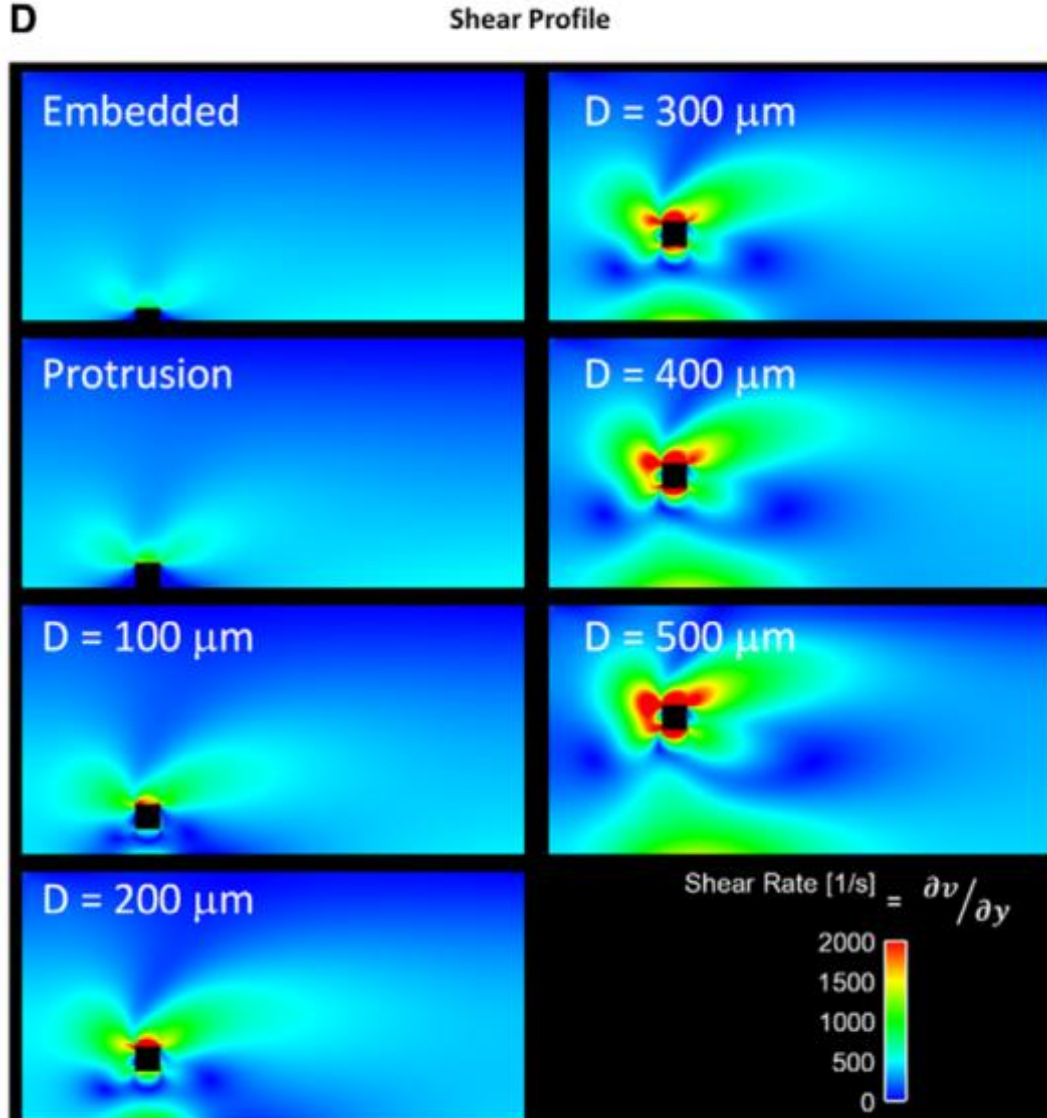


35 EES
8 month follow-up

The best cutoff value of S–V distance for predicting resolved strut malapposition was 380 μm [sensitivity: 93.5 %, specificity: 69.8 %, AUC: 0.878, 95 % CI 0.848–0.904]

Inoue T, et al. Int J Cardiovasc Imaging 2014;30:857-65

Incomplete Stent Apposition Causes High Shear Flow Disturbances and Delay in Neointimal Coverage



Malapposed segments with an ISA detachment <100 μm at baseline showed complete strut coverage at follow-up.

Segments with a maximal ISA detachment distance of 100 to 300 μm and >300 μm had 6.1% and 15.7% of their struts still uncovered at follow-up, respectively ($P < 0.001$)

Foin N, et al. *Cir Cardiovasc Interv* 2014;7:180-9

CONSTANT trial

124 stented lesions in 117 patients with Resolute zotarolimus eluting stent In Yonsei OCT Registry

13 patients refused follow up coronary angiography

2 patients was not passed OCT catheter

1 patient had in-stent restenosis

104 stented lesions in 101 patients

OCT guided PCI

51 lesions (50 patients)

8 patients was not performed OCT follow-up

Angiography guided PCI

54 lesions (51 patients)

8 patients was not performed OCT follow-up

Primary Outcome: % of uncovered struts on 6-month OCT

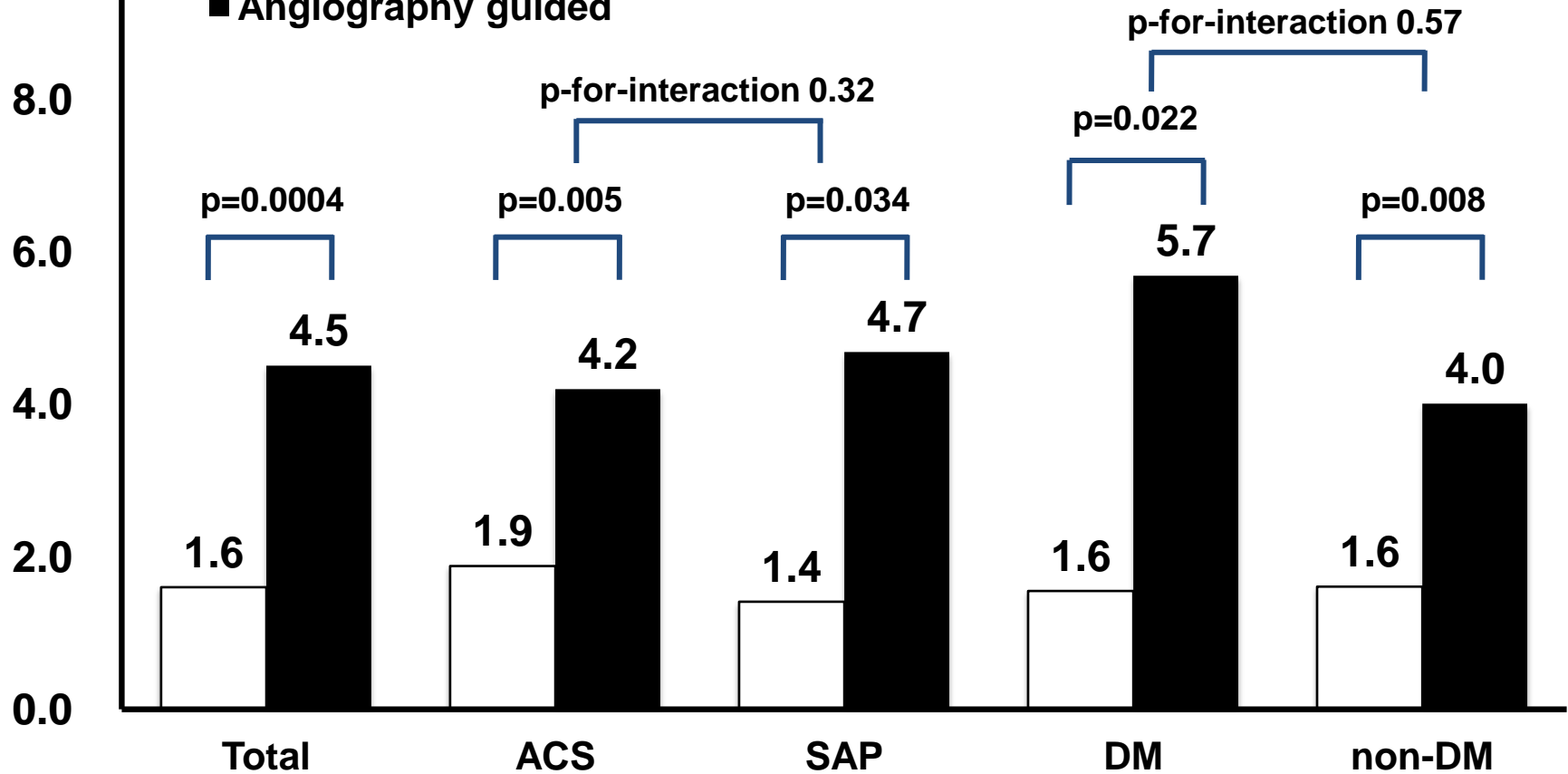
Secondary outcome : % of malapposition & mean NIH of 6-month OCT and MACEs (Cardiac death, non-fatal MI, TVR or stent thrombosis) at 12-months

Rate of uncovered struts

(%)
10.0

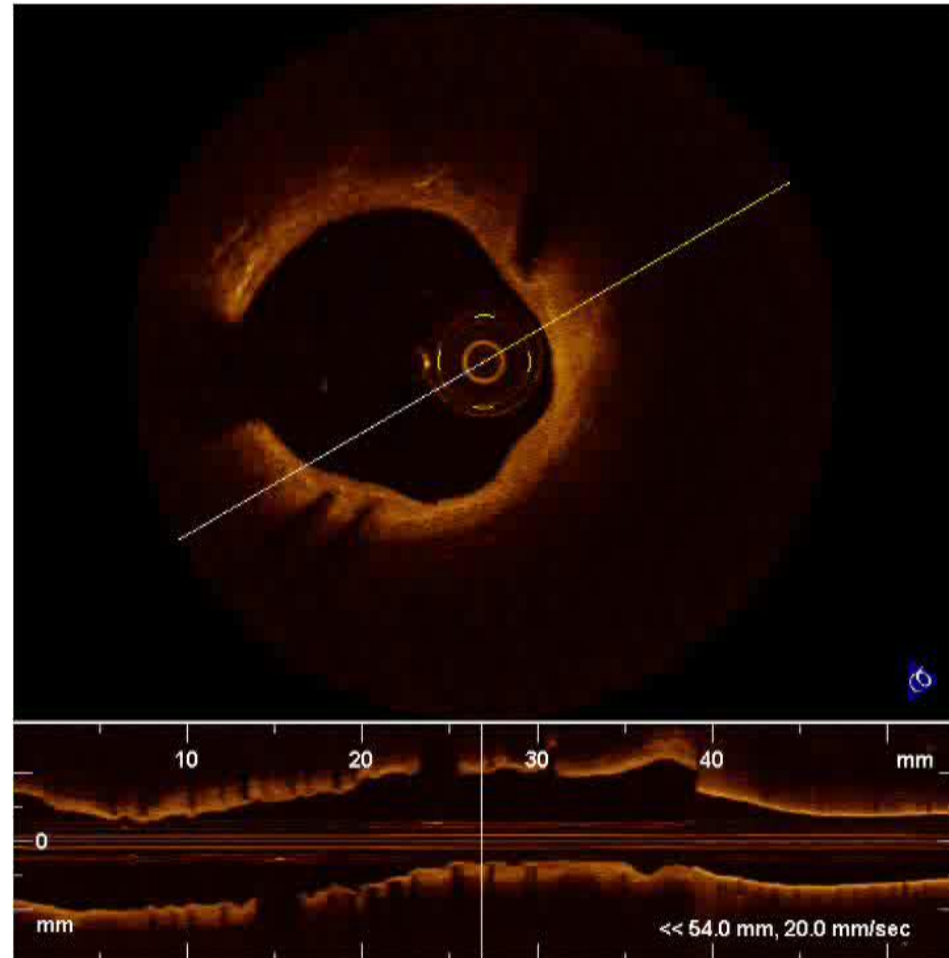
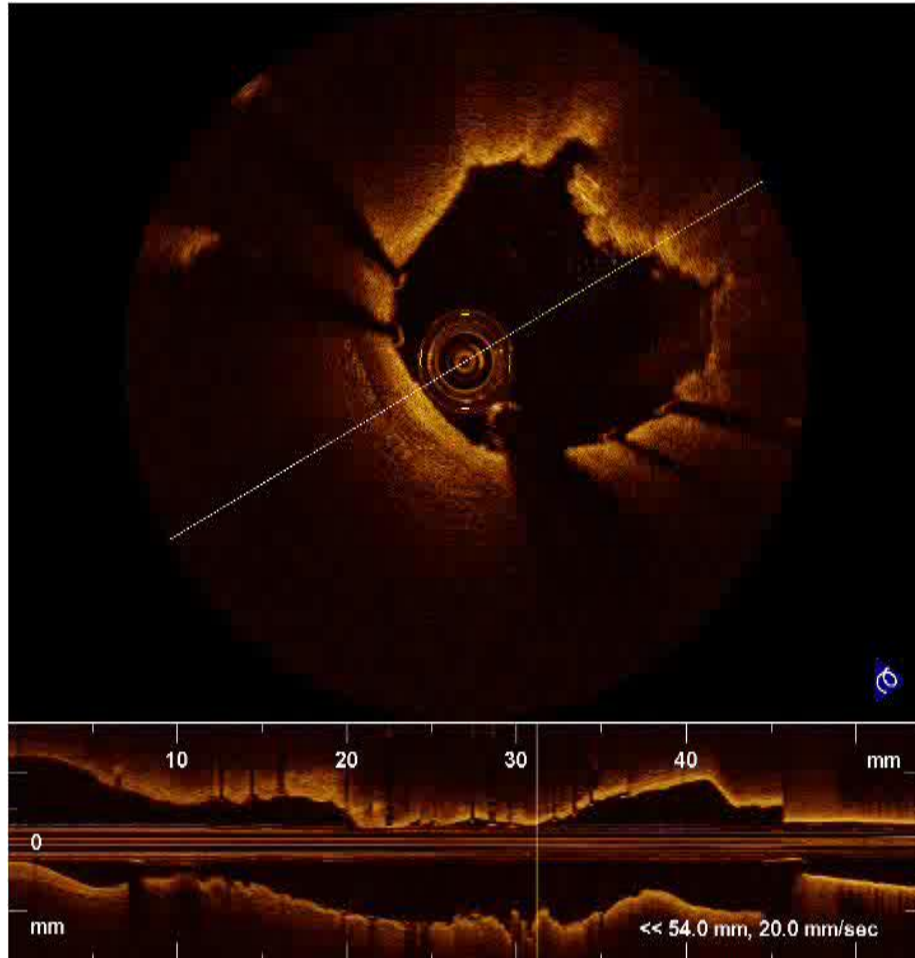
□ OCT guided

■ Angiography guided

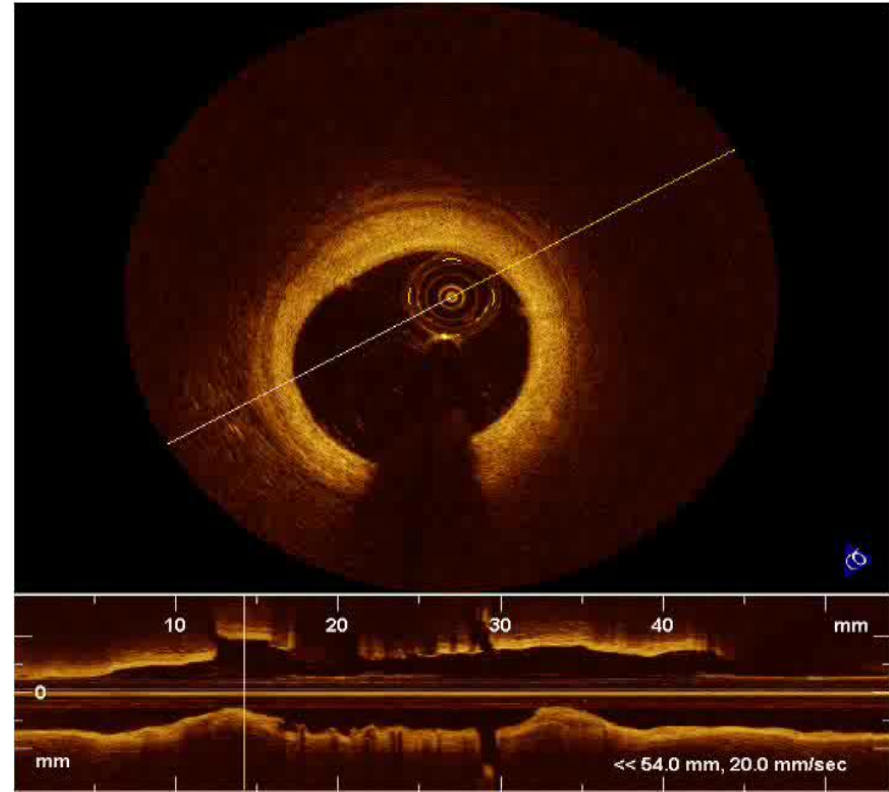
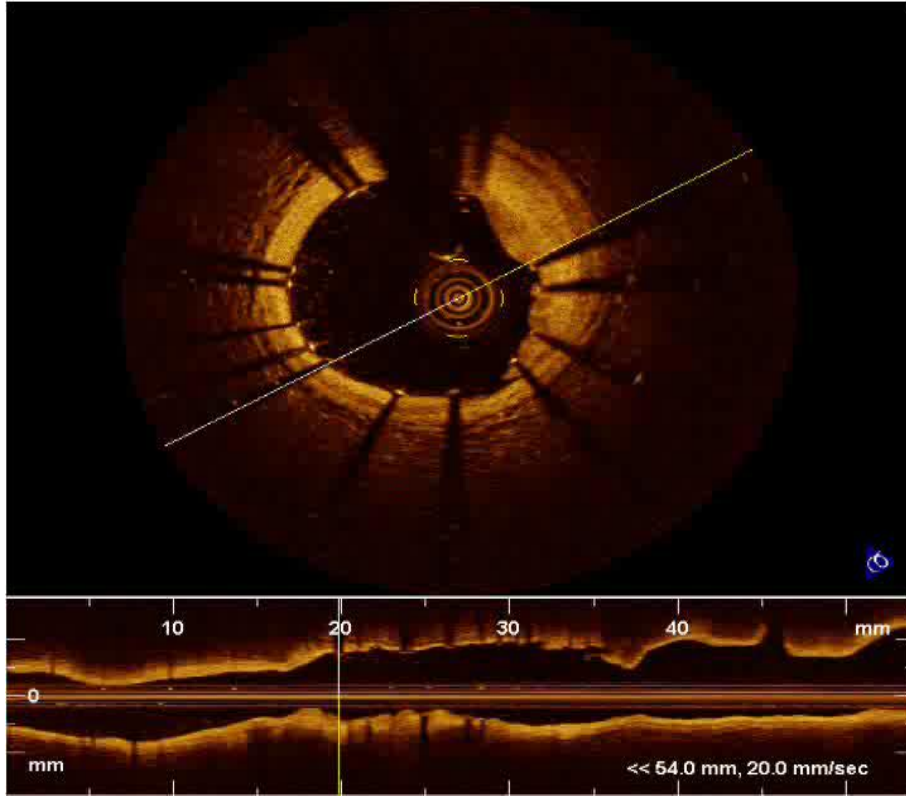


Periprocedural Findings

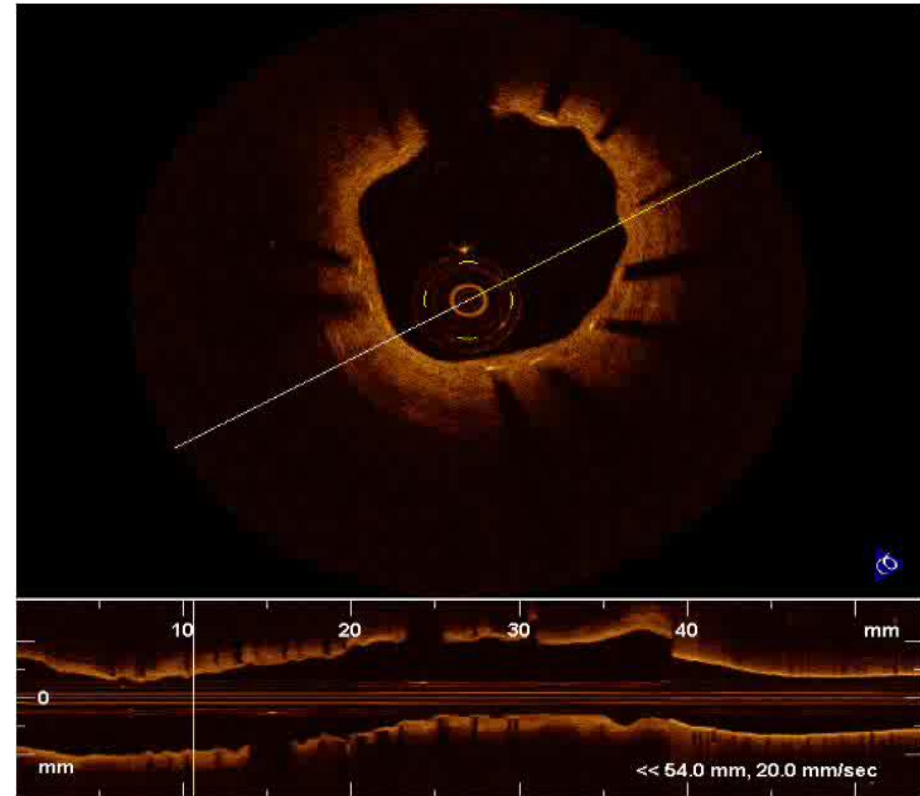
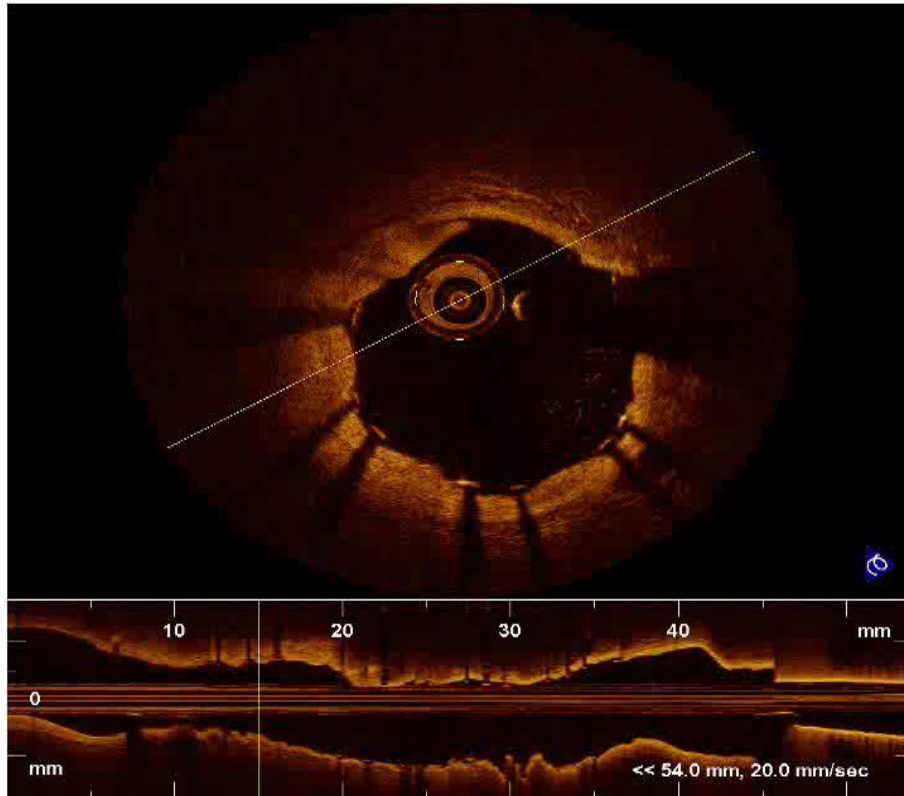
Edge dissection I



Prolapse

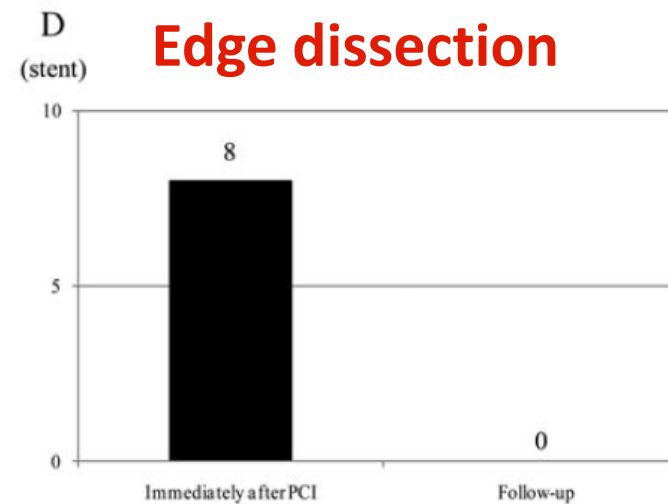
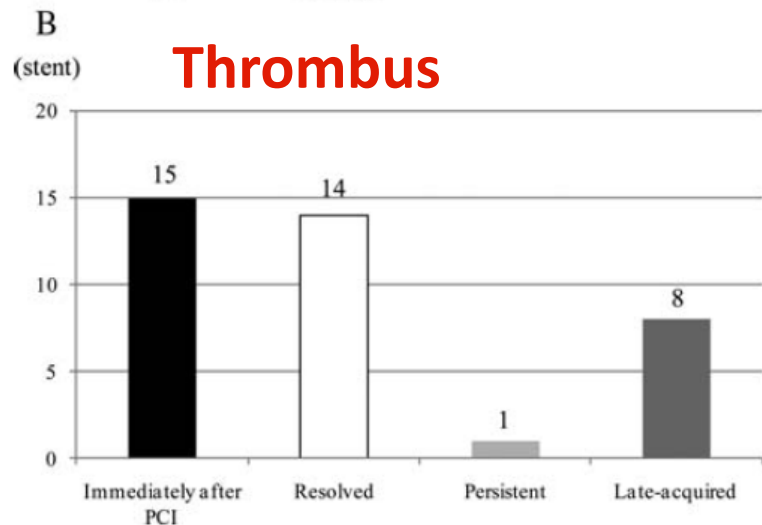
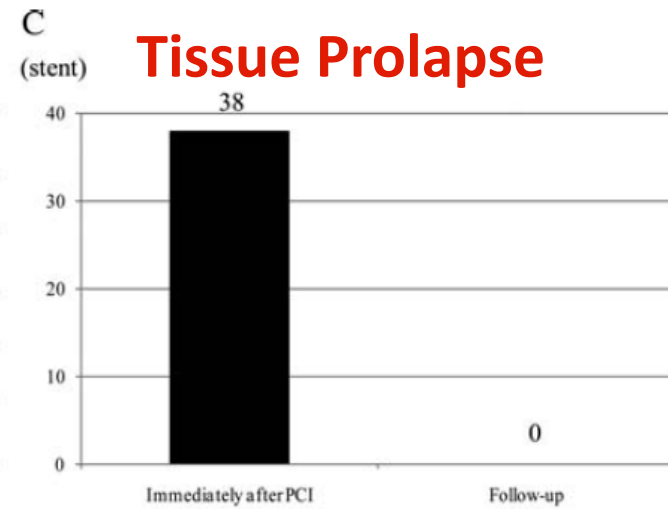
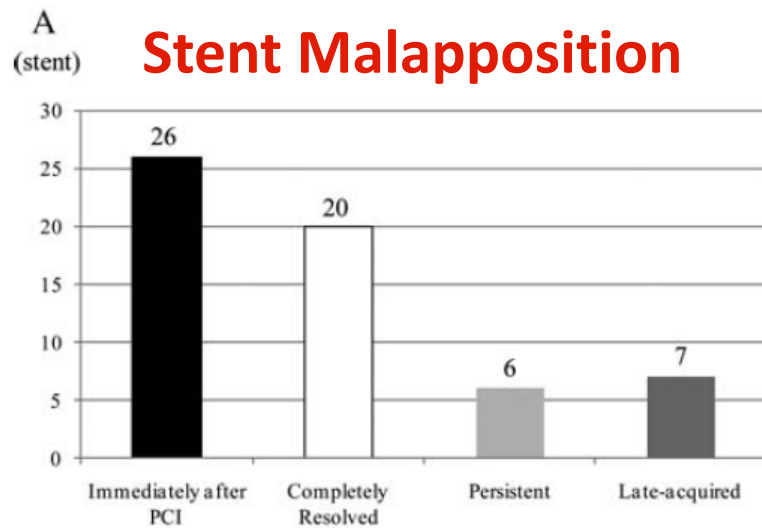


Thrombus Prolapse



Natural consequence of post-intervention stent malapposition, thrombus, tissue prolapse, and dissection assessed by OCT at mid-term follow-up

40 DESs (SEs and PESs) in 35 Pts

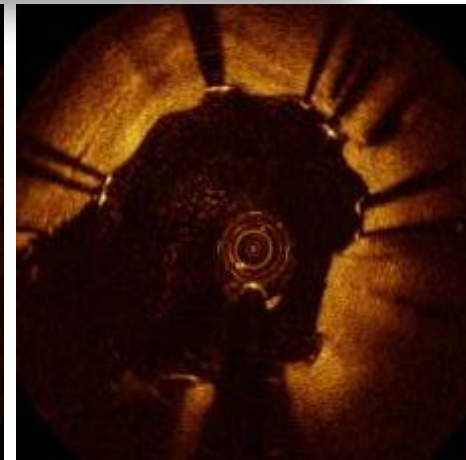
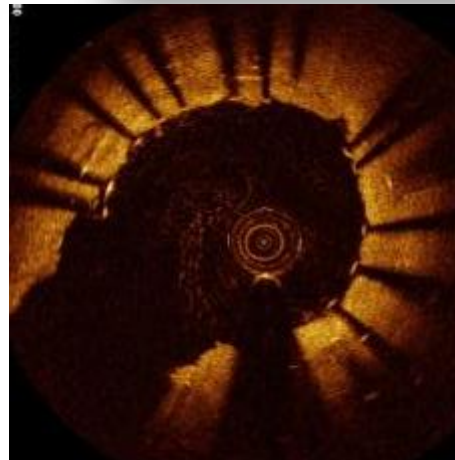
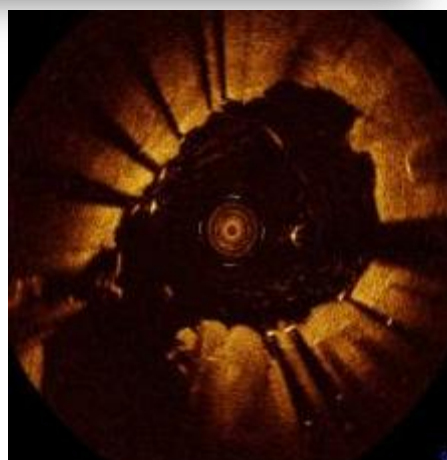
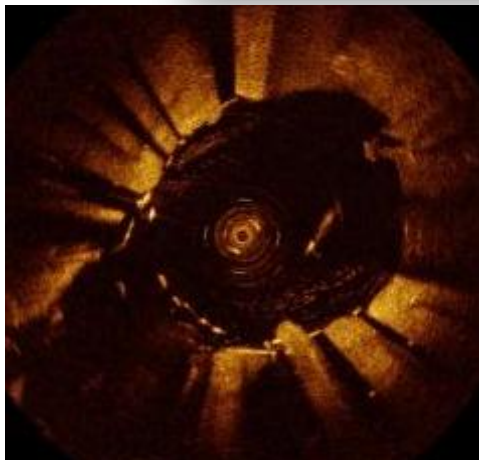


Kawamori H, et al. Eur Heart J – Cardiovascular Imaging 2013

Bifurcation

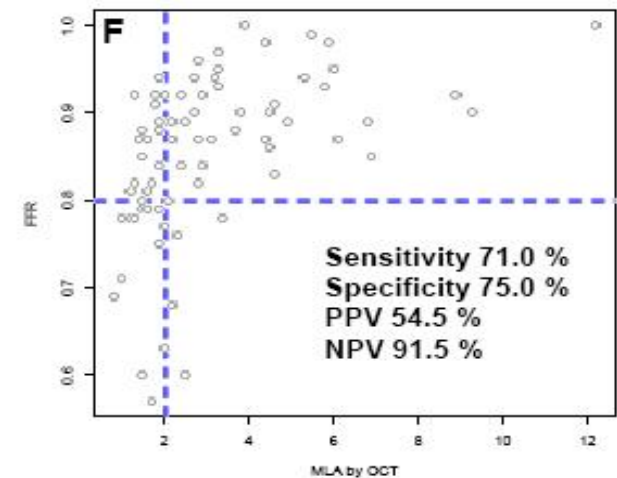
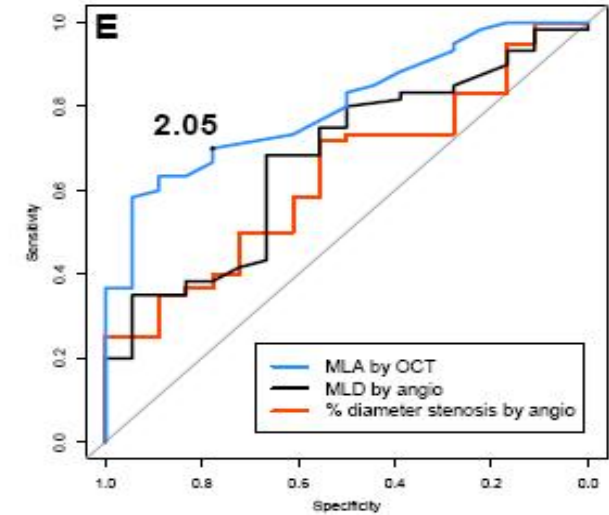
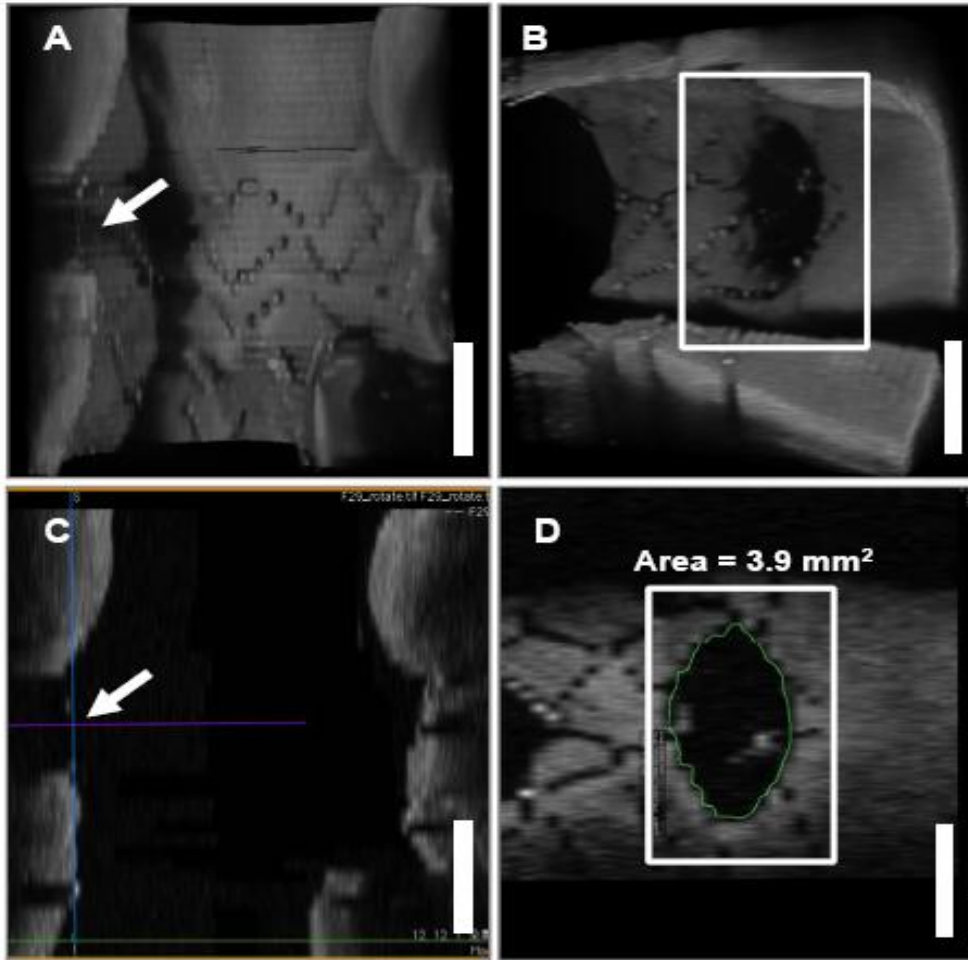
Pre Kissing ballooning

Post Kissing ballooning

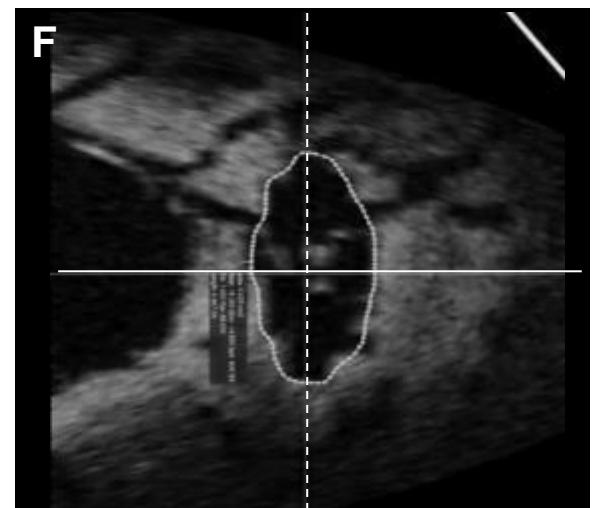
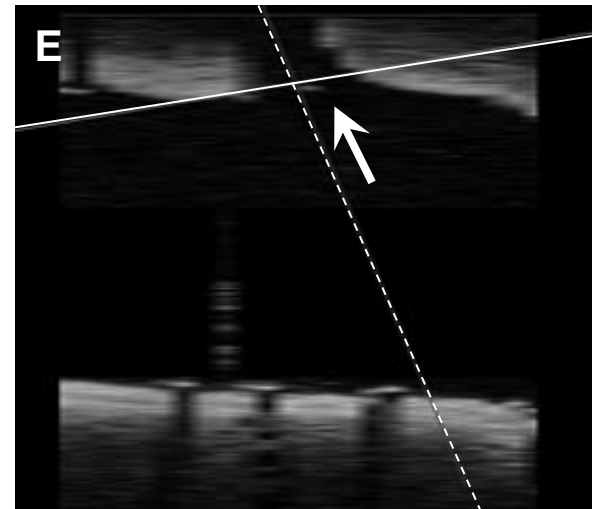
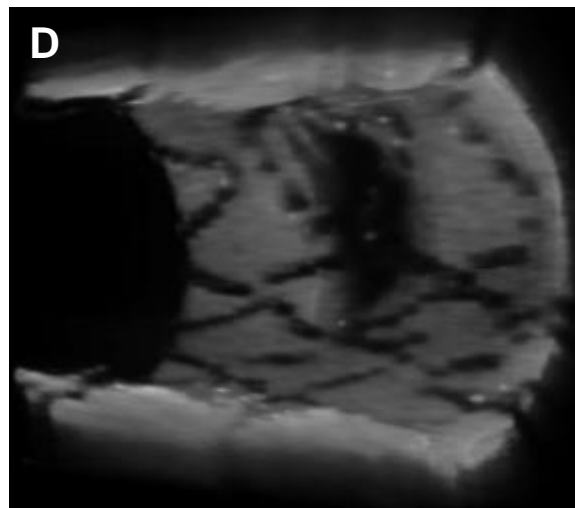
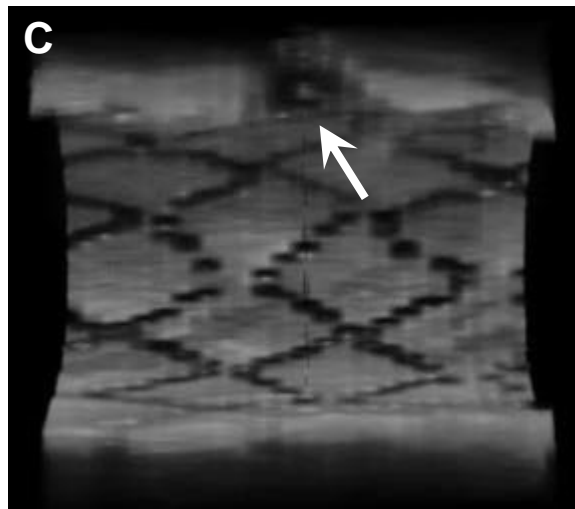
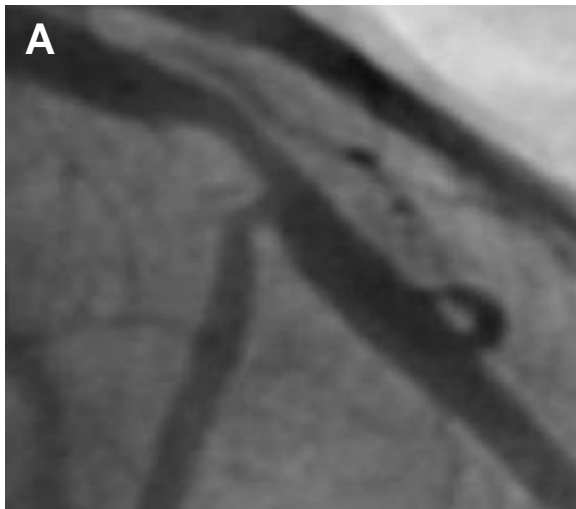


OCT with FFR for Assessment of Jailed SB

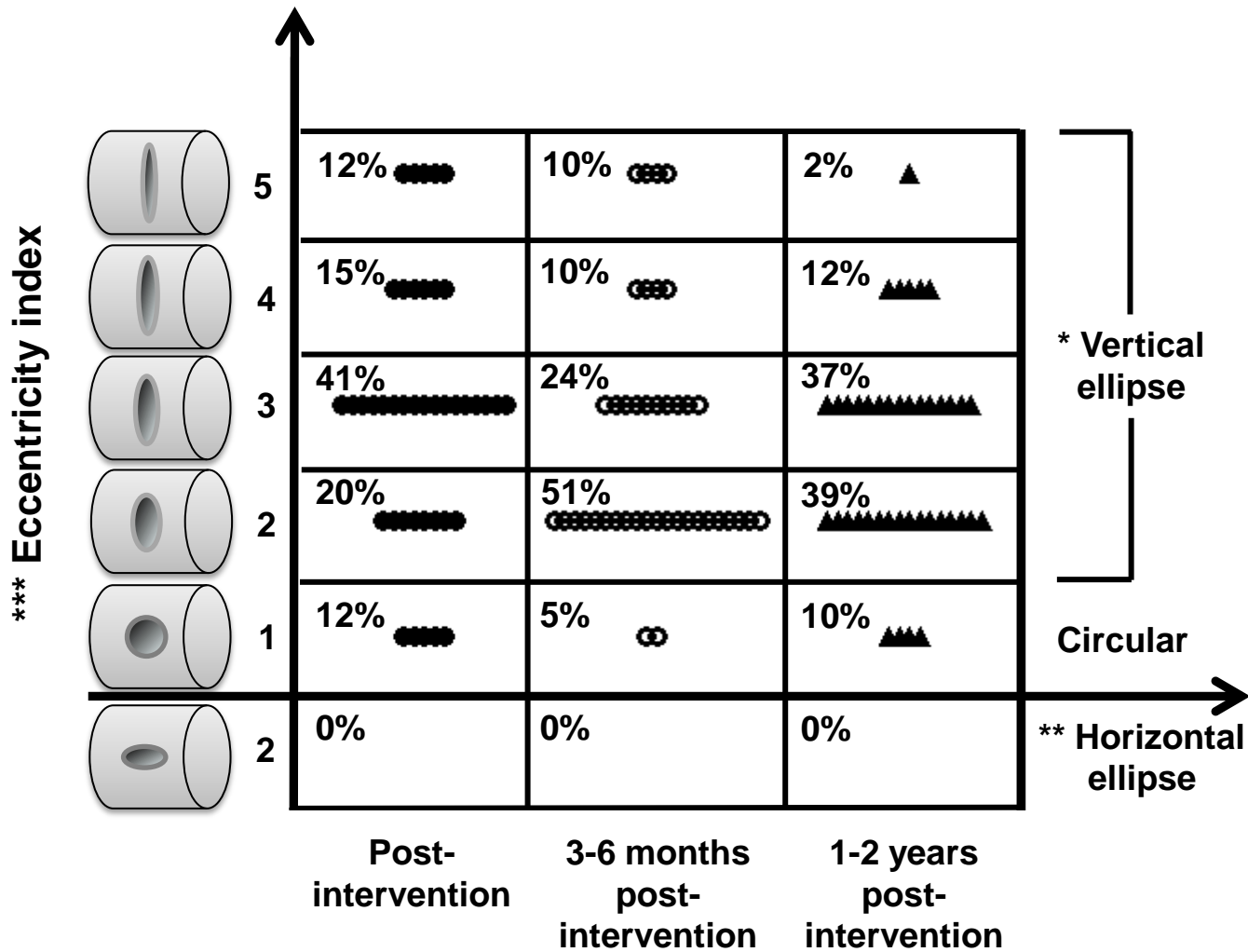
Cutoff values and diagnostic accuracy of OCT for FFR 0.80



Ha J, Kim JS, et al. J Am Coll Cardiol Img 2014



Yang PS, et al. J of Cardiol 2014 In Press



Yang PS, et al. J of Cardiol 2014 In Press

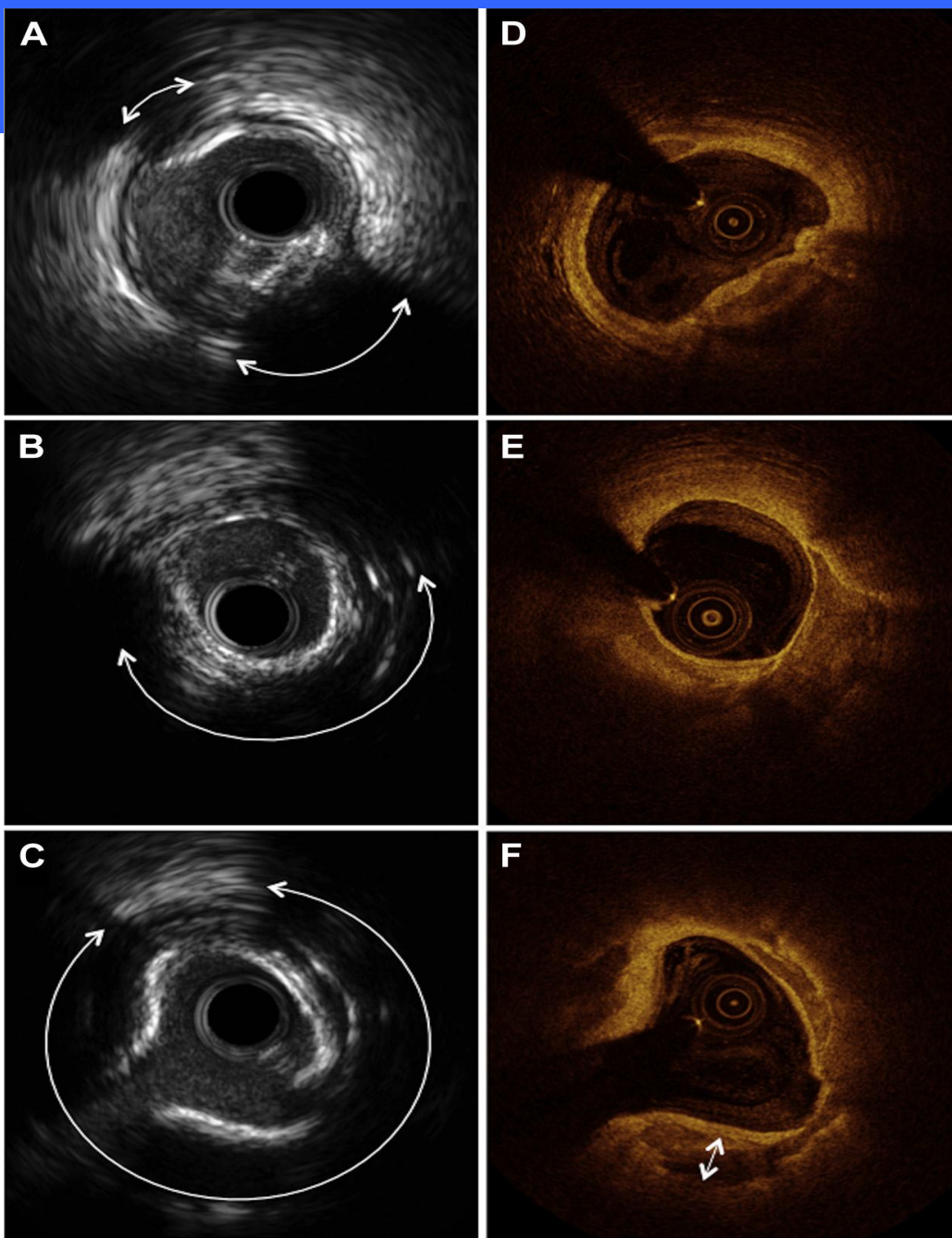
Calcification

IVUS vs. OCT

- Approximately 25% of severely calcified lesions are completely missed by angiography.
- IVUS is more accurate than angiography for CAC detection, with sensitivity of 90% to 100% and specificity of 99% to 100%.
- The sensitivity (95% to 100%) and specificity (97% to 100%) of OCT for CAC rival that of IVUS.

Madhavan MV, et al. J Am Coll Cardiol 2014;63:1703–14

IVUS vs. OCT

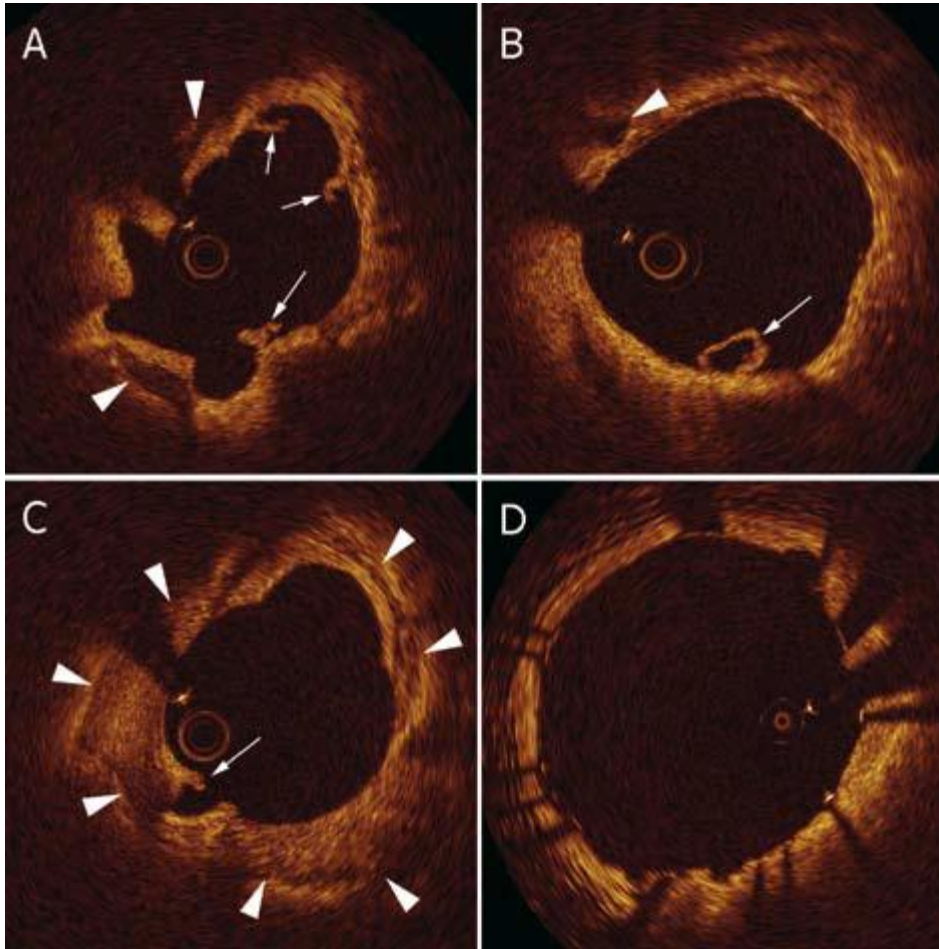


IVUS does not penetrate calcium, calcium thickness cannot be determined, and volume cannot be calculated.

Because light can penetrate calcium, **OCT** can in many cases assess calcium thickness and measure calcium volume

Madhavan MV, et al. J Am Coll Cardiol
2014;63:1703-14

What is the Optimal Result after RA in OCT ?



The OCT can assess the effect of the rotational atherectomy in the calcified plaque:

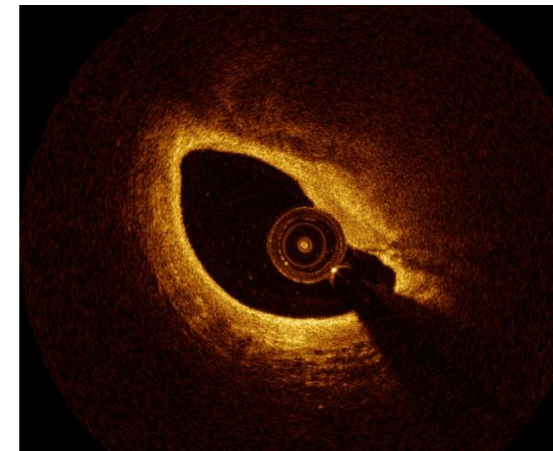
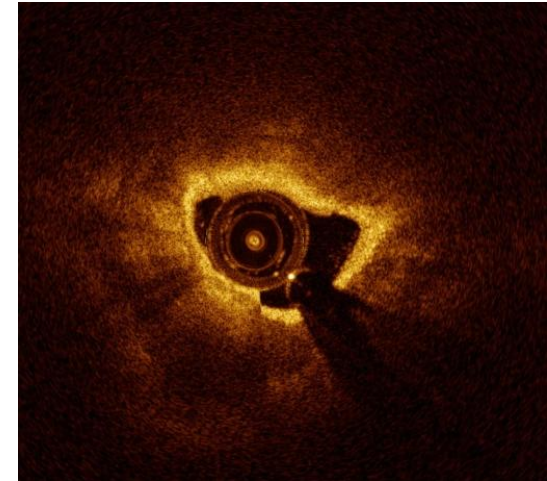
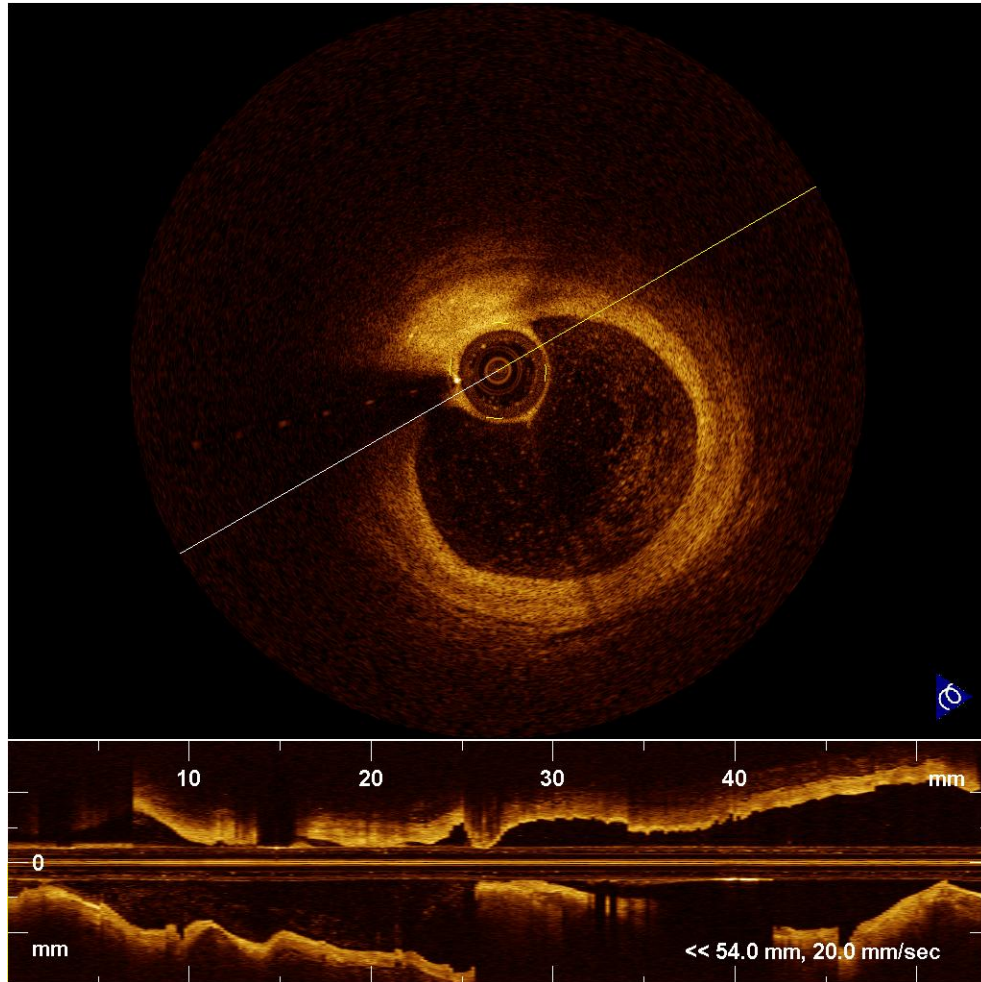
a uniform arterial lumen
multiple microdissections
on the arterial wall.

Coronary Angiography



OCT catheter passed the lesion

OCT finding Pre-Intervention



Balloon Angioplasty with NC balloon



2.5*15 NC Balloon



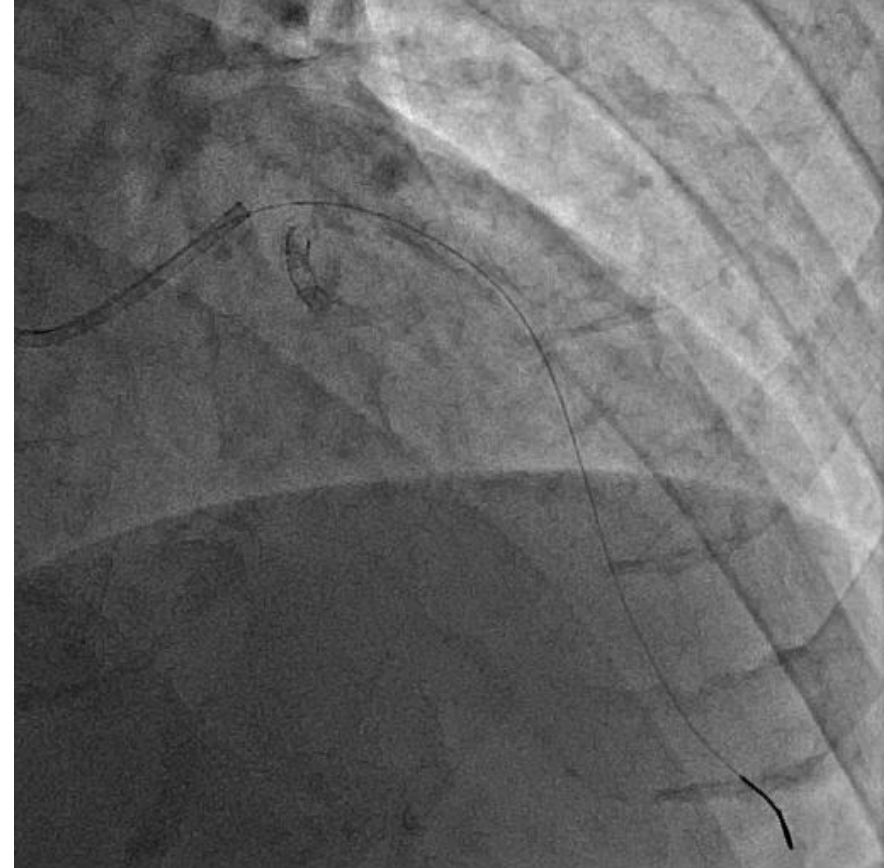
R/S > 70% !!!

Increase balloon size (NC 3.0 x 15 mm and Cutting Balloon)

Around 20 times

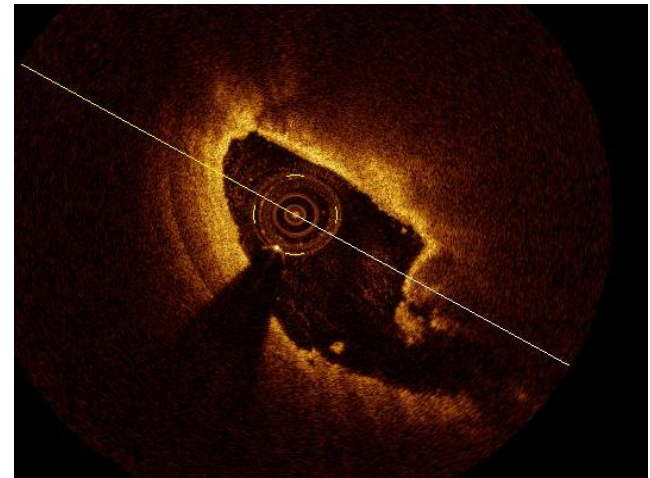
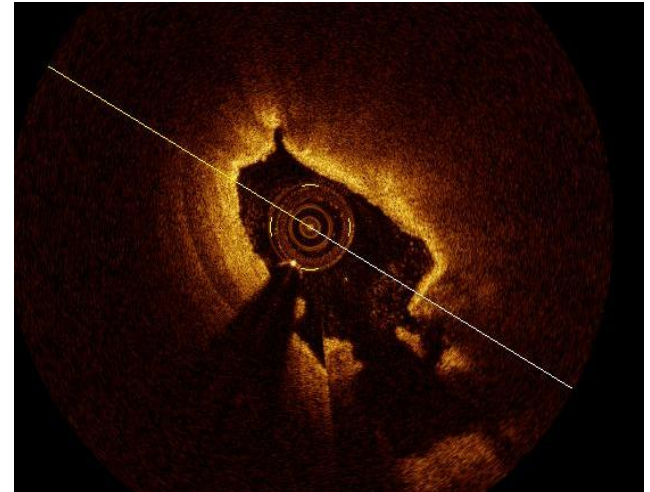
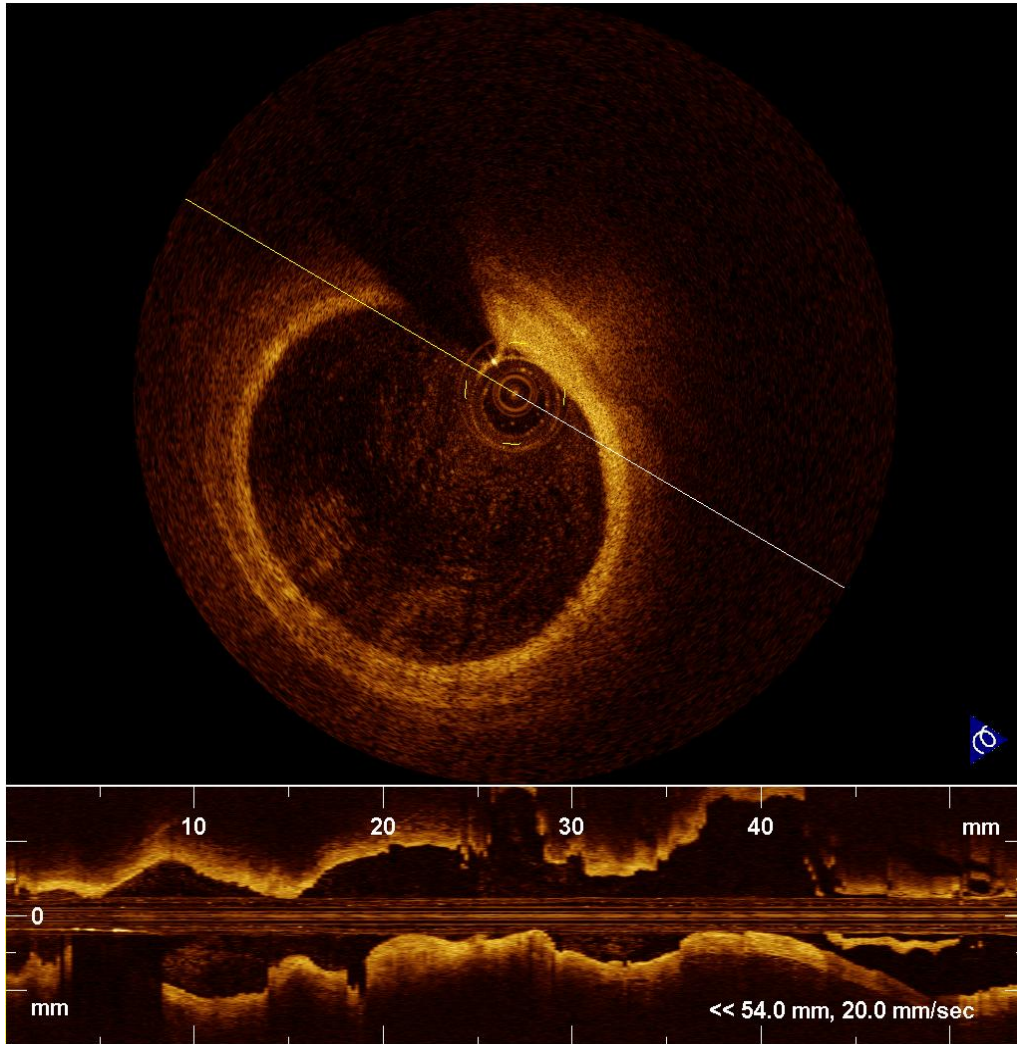


3.0*15 NC Balloon



But, R/S > 60% !!!

Case- OCT - Post balloon

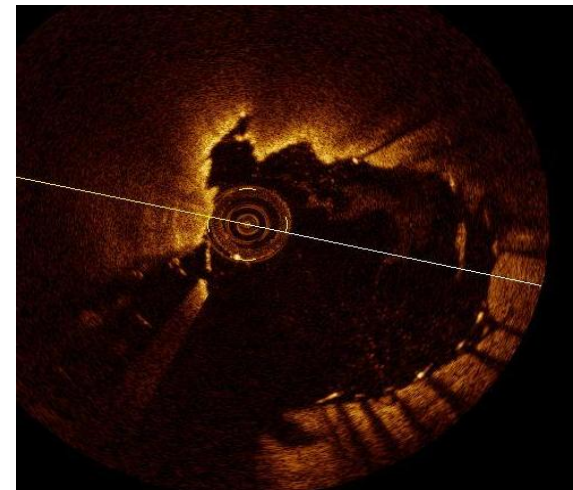
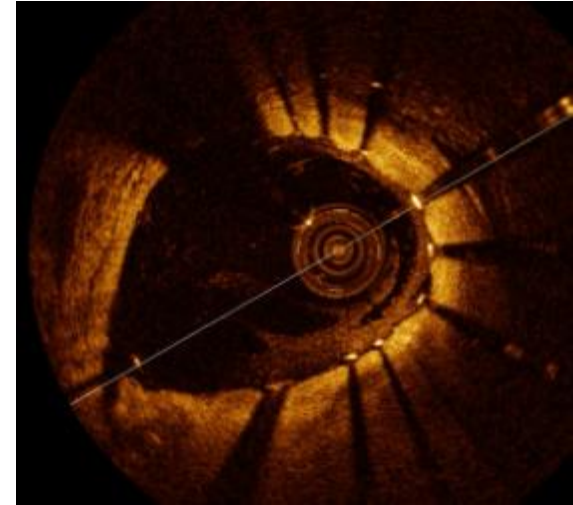
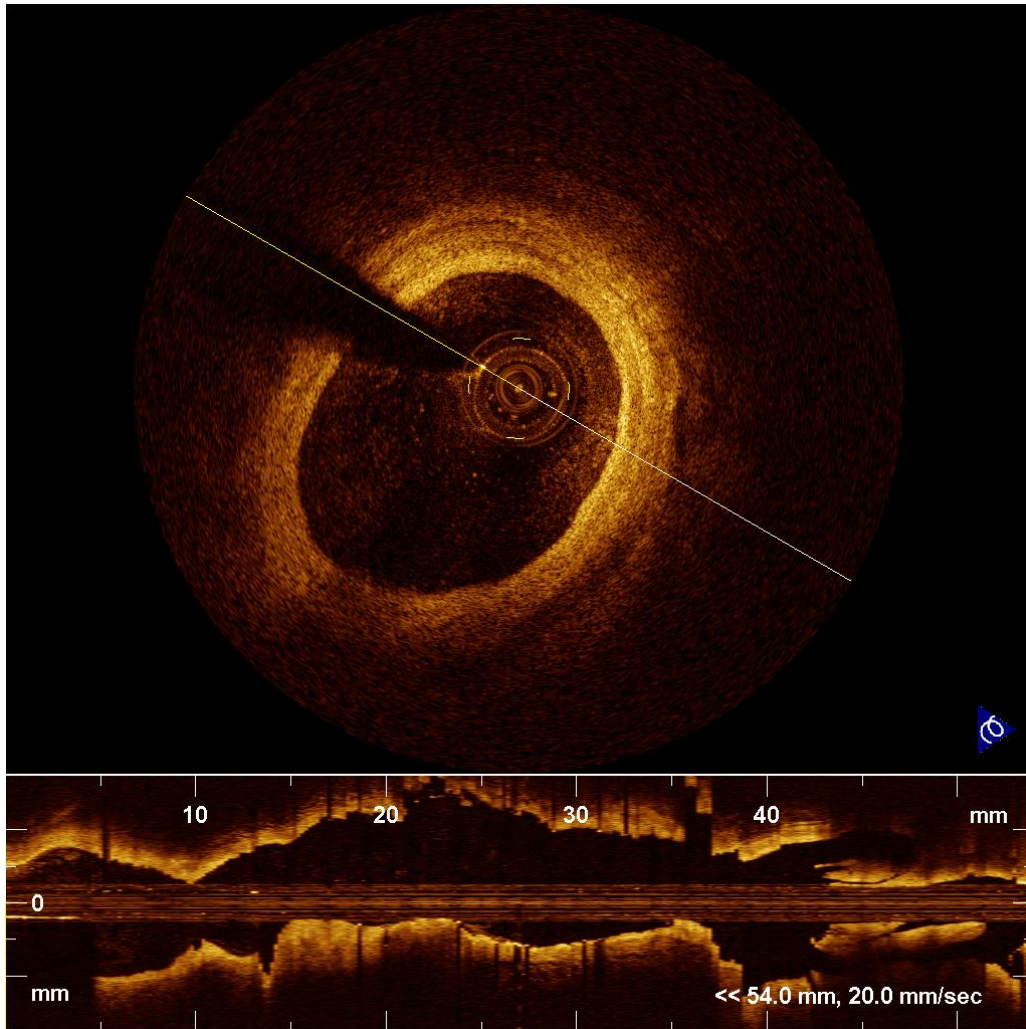


Case - Stent Implantation



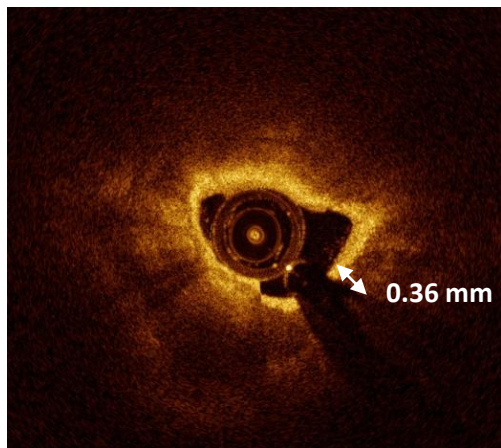
Xience Xpedition 3.5*15

Case- OCT – post stenting



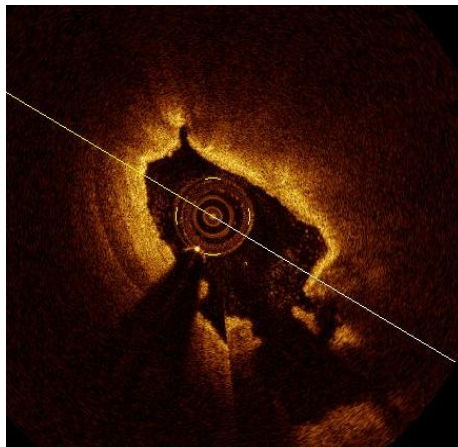
Case Review

Pre



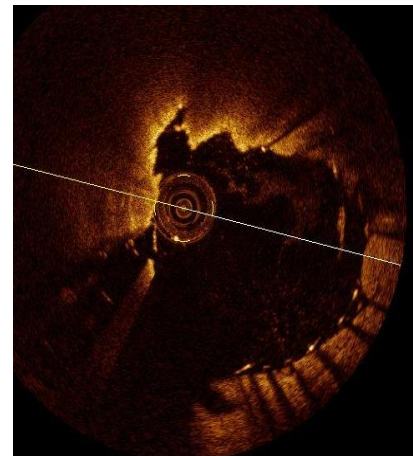
Lumen Area 1.18

Ballooning

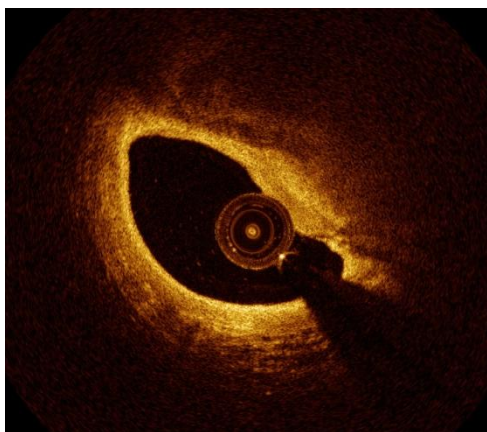


Lumen Area 4.36

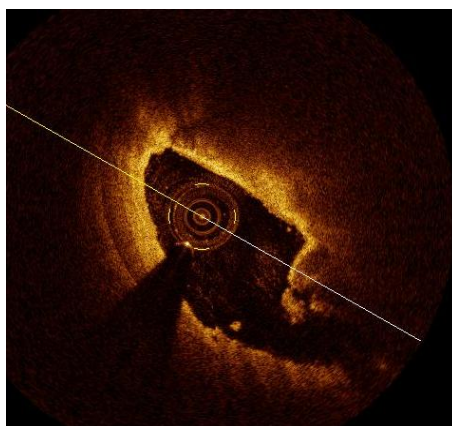
Stenting



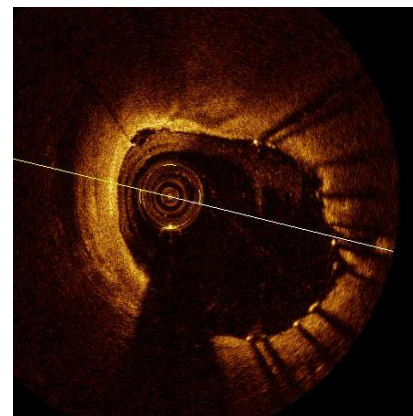
Stent Area 8.32



Lumen Area 3.53



Lumen Area 4.3



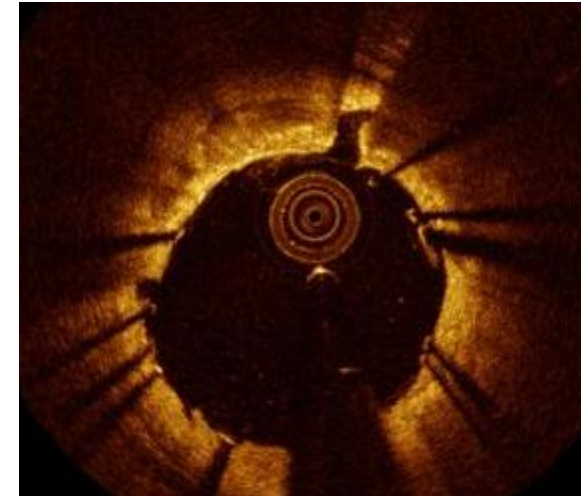
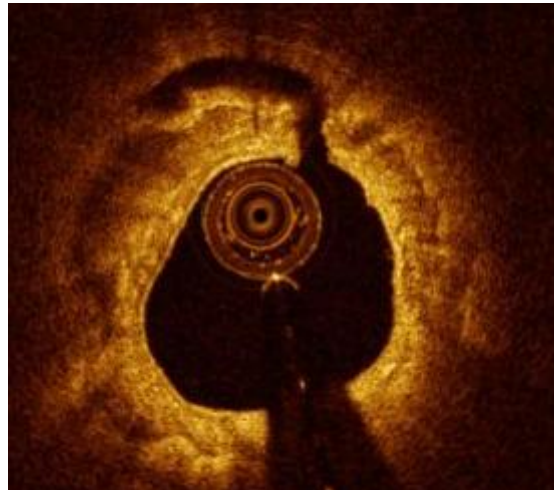
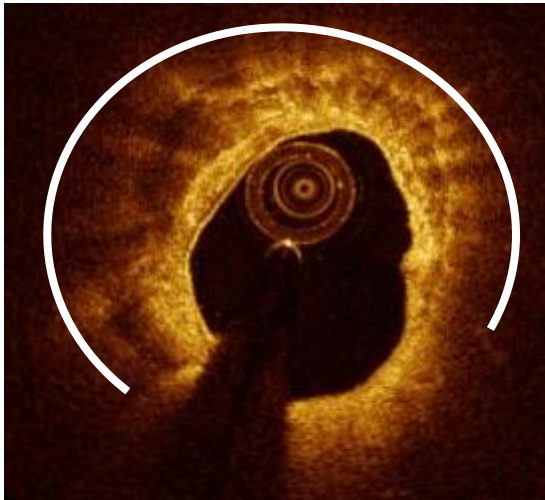
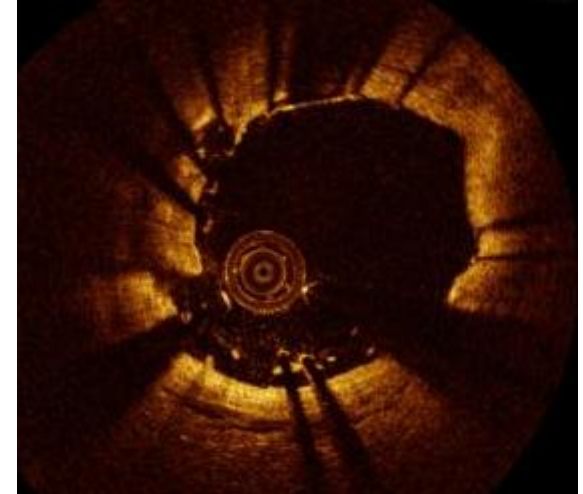
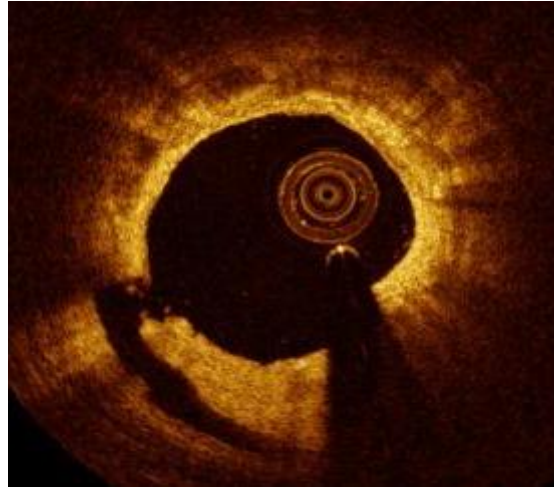
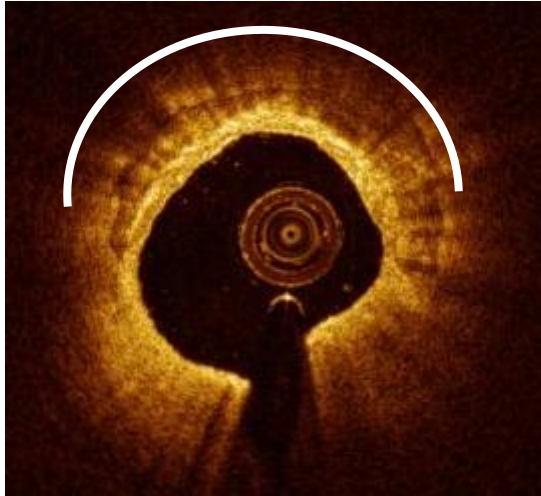
Stent Area 8.04

Possible Dissection Point

Pre

After Ballooning

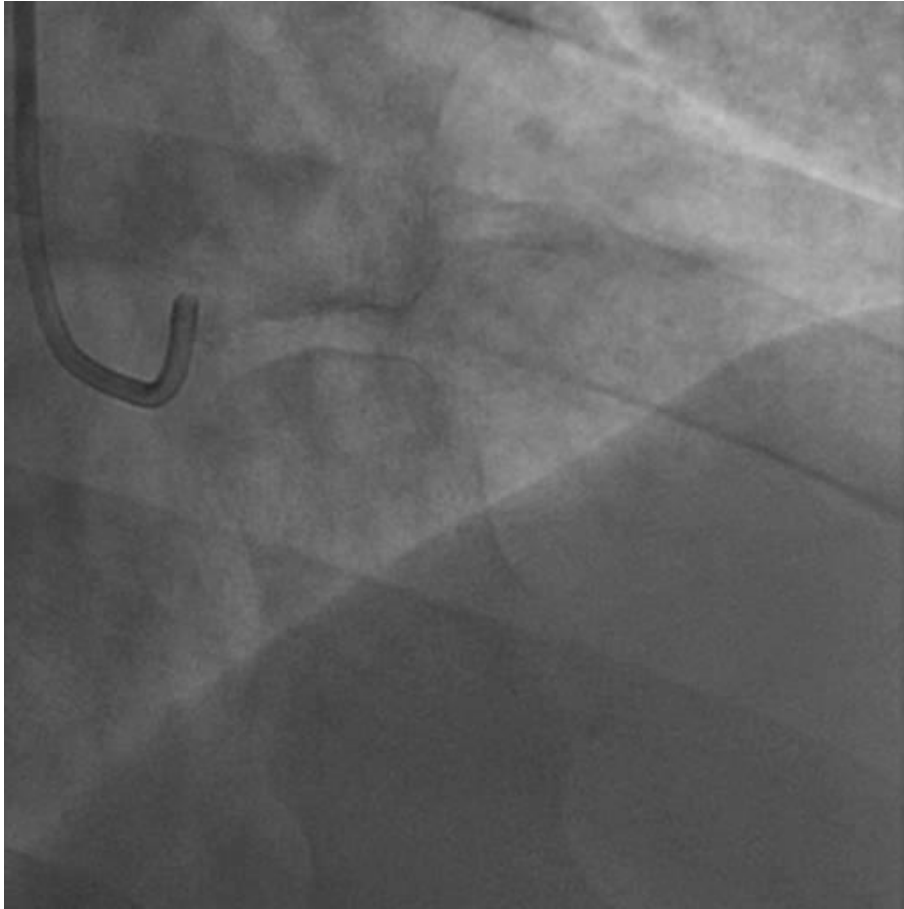
Stent



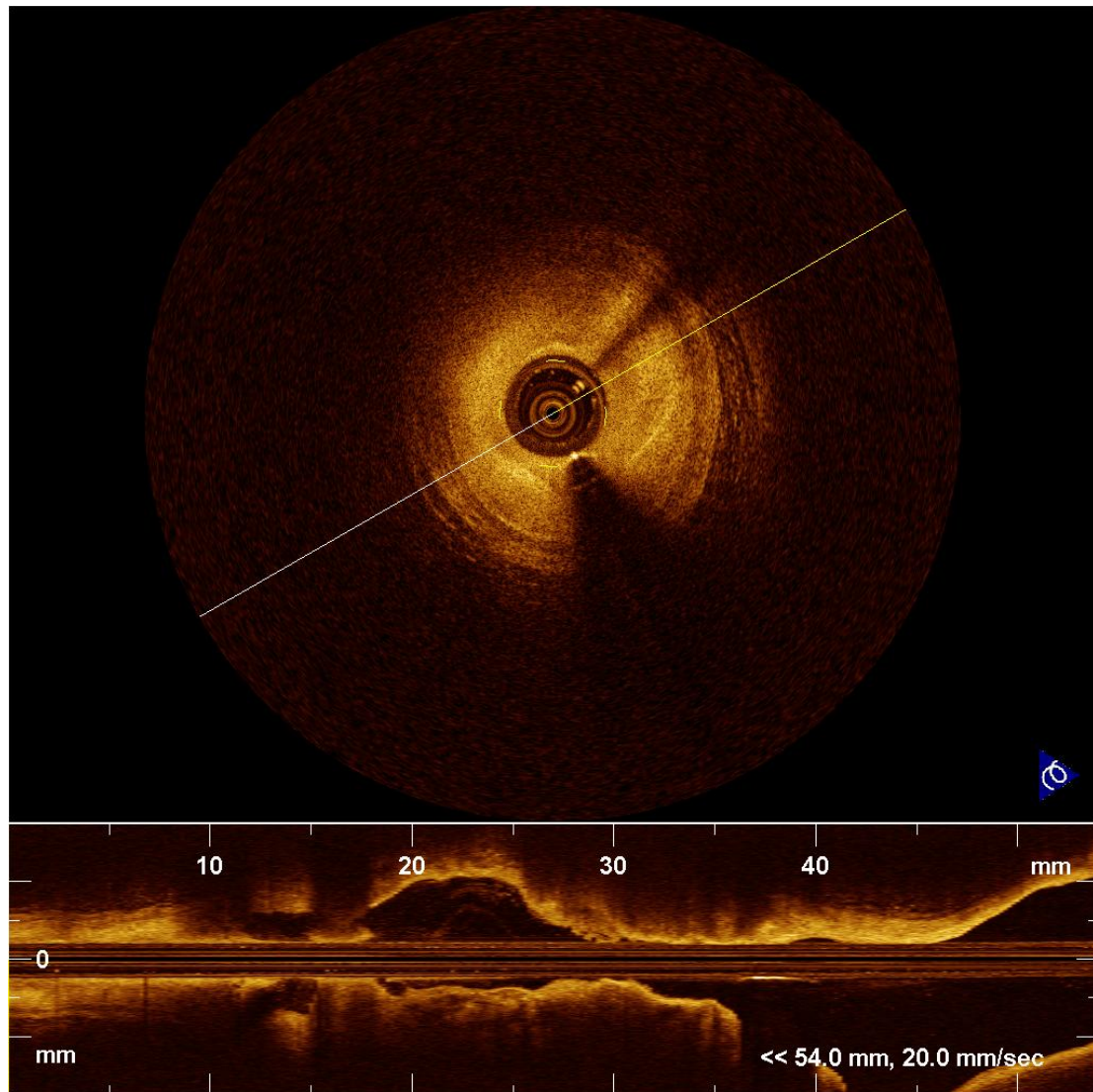
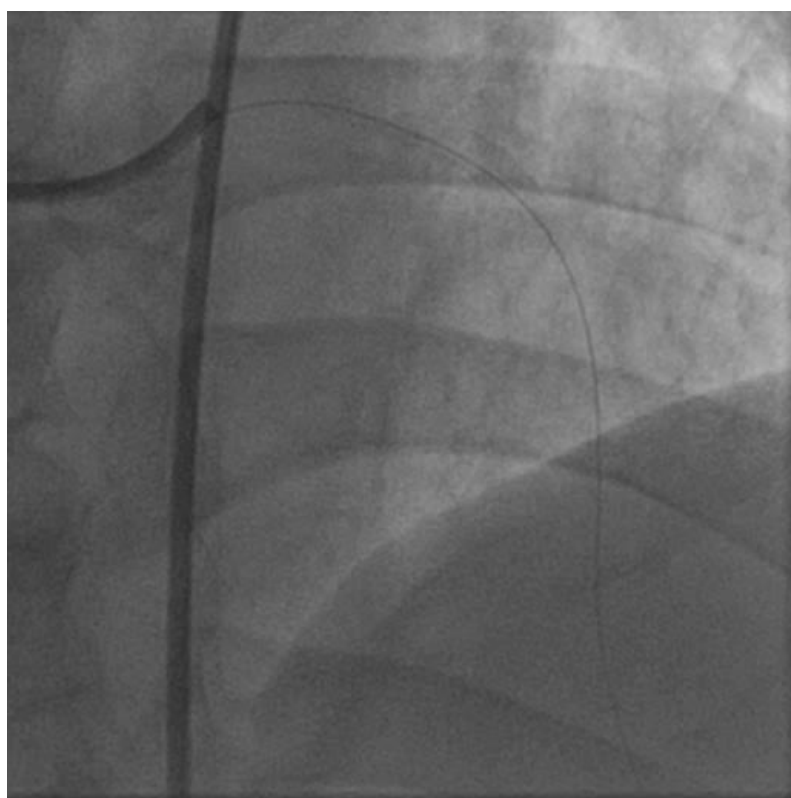
Calcium is the Possible Cause of Haziness

- **The presence and extent of calcium in coronary lesions is directly related to the appearance of questionable (“hazy”) images on conventional angiography, especially in eccentric lesions.**

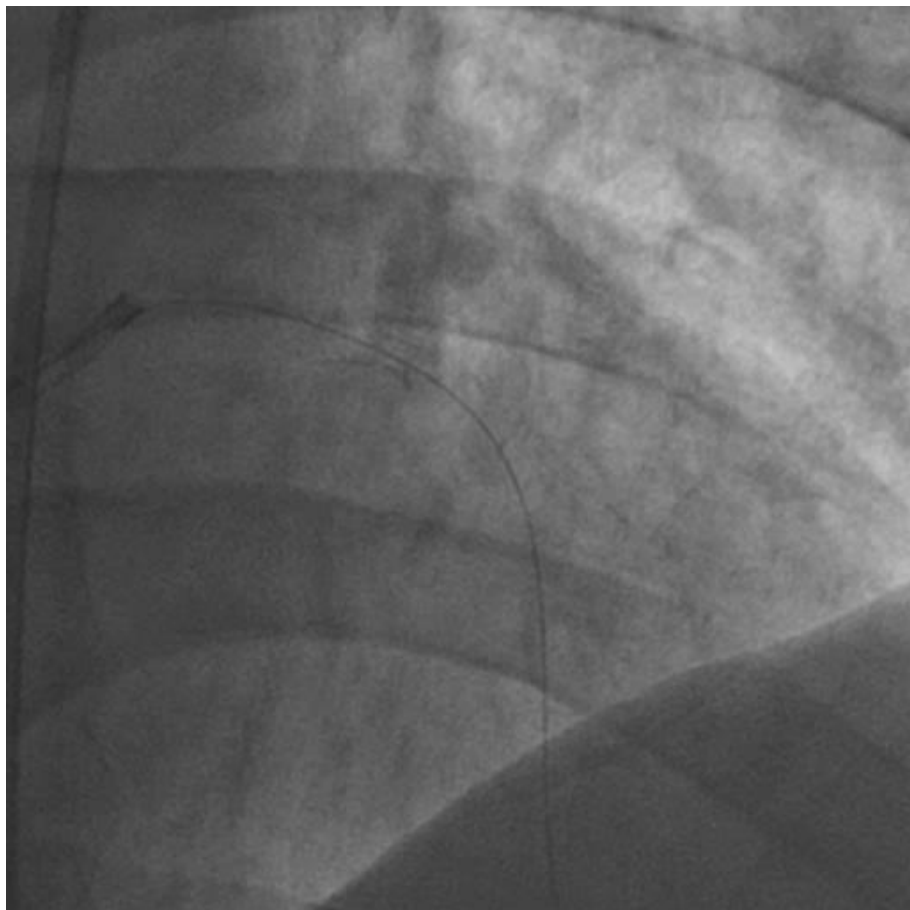
Initial Angiography



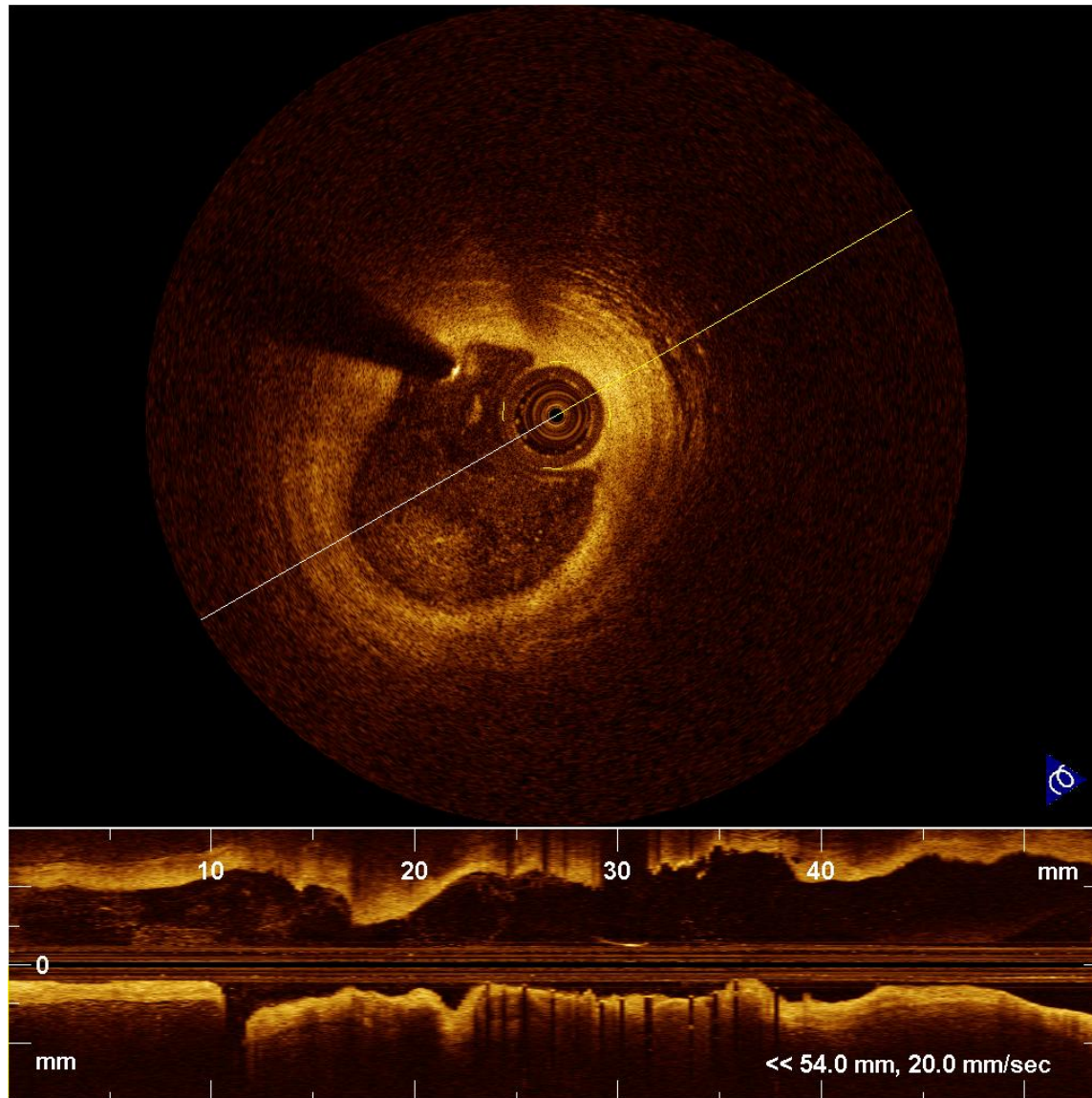
After Thrombosuction



Osorio 2.75x15



OCT Evaluation



SUMMARY

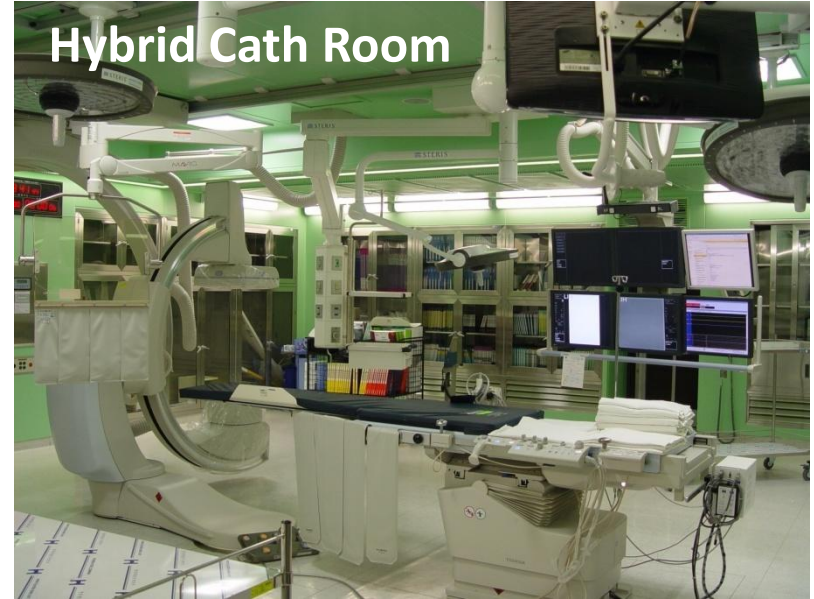
- *Intravascular OCT is a high-resolution intravascular imaging modality that can be used to optimize the stent and assess the peri-procedural complications.*
- *It is also useful to assess the complex lesion such as bifurcation, calcified and thrombotic lesions.*
- *OCT guided PCI may have a beneficial role of stent strut coverage and improve clinical outcomes.*

Thanks for your Attention

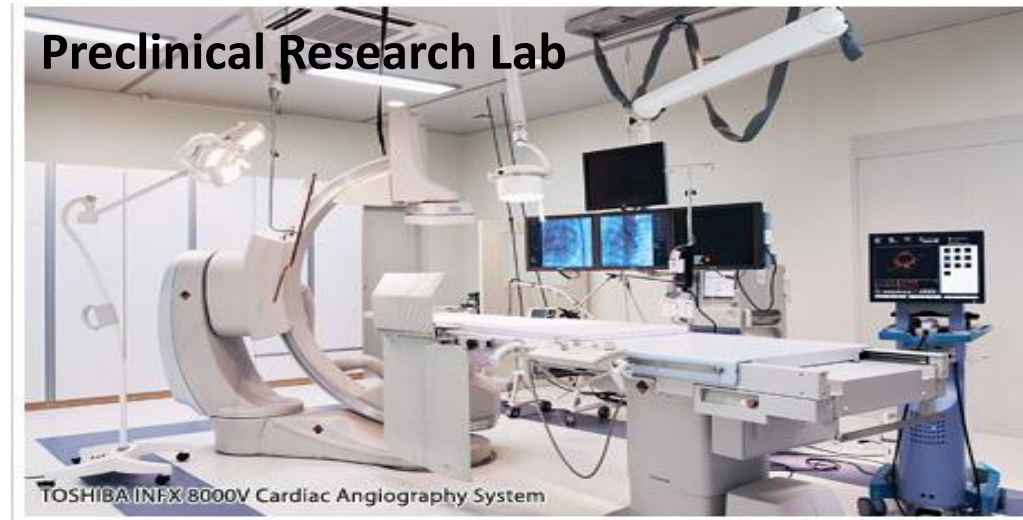
Cardiovascular Hospital



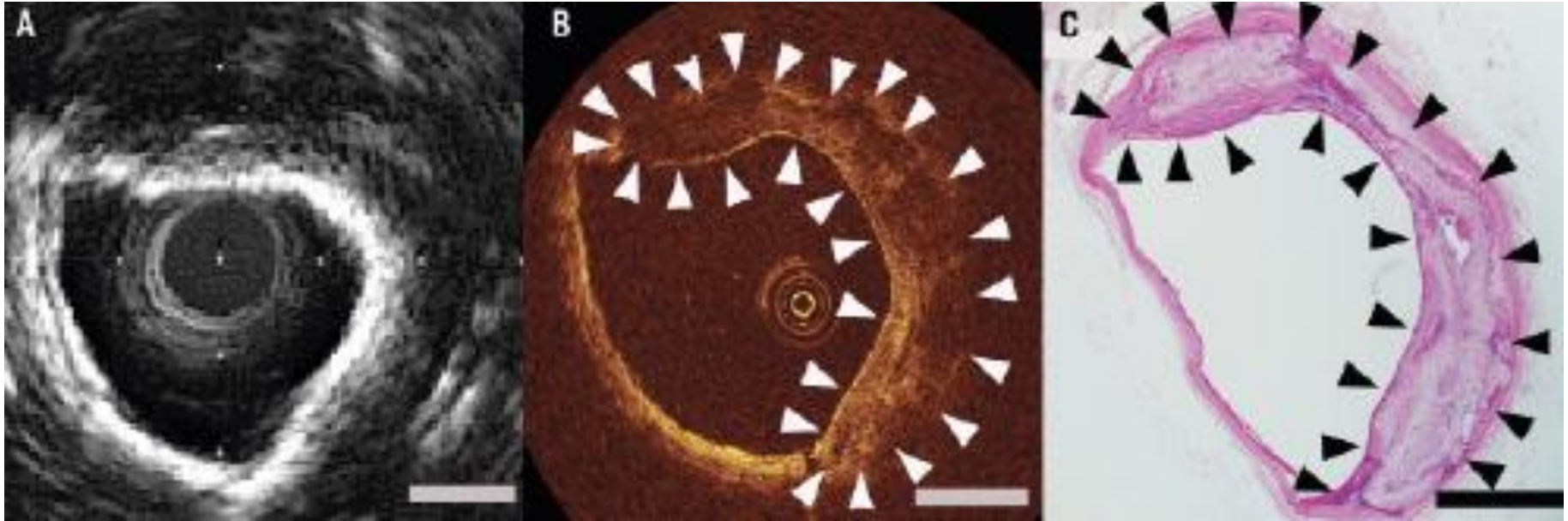
Hybrid Cath Room



Preclinical Research Lab



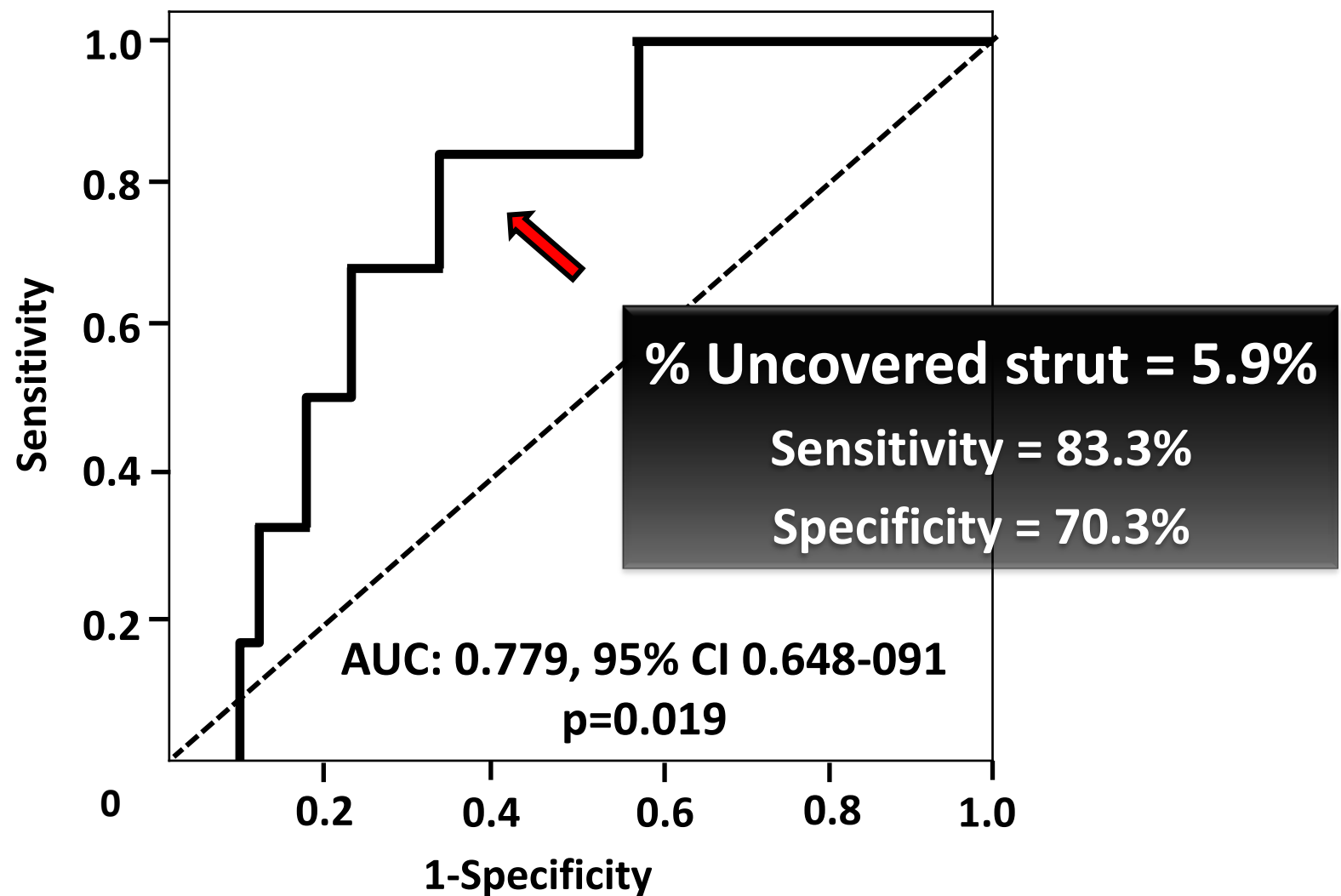
OCT is better tool to evaluate calcium than IVUS



Superficial calcification could be quantified more accurately by using OCT rather than IVUS.

-> The area of calcification assessed by OCT might be related to stent expansion.

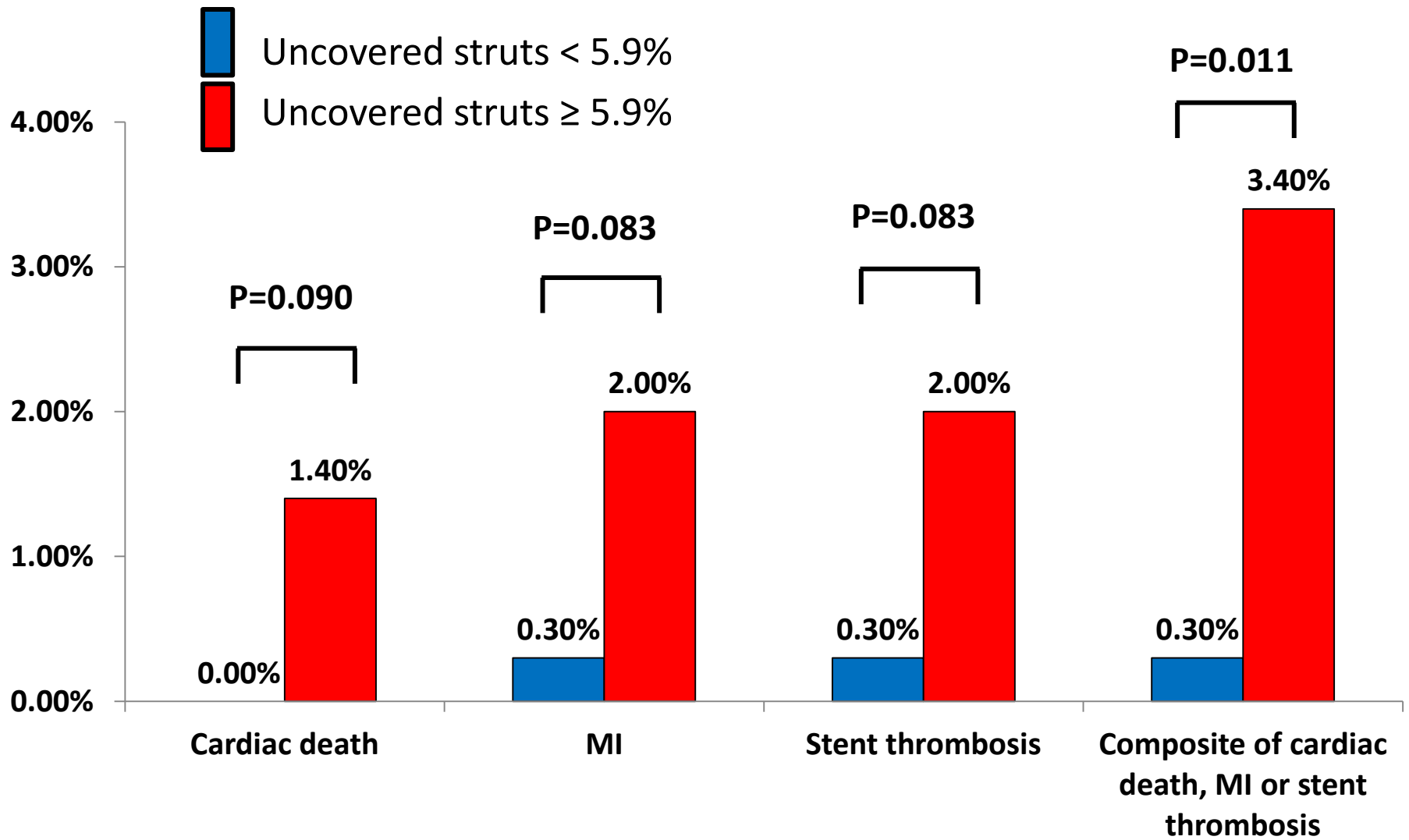
ROC Curve of Uncovered struts for Prediction of MACE



Won H, et al. Int J Cardiovasc Imaging. 2013;29(6):1255-63



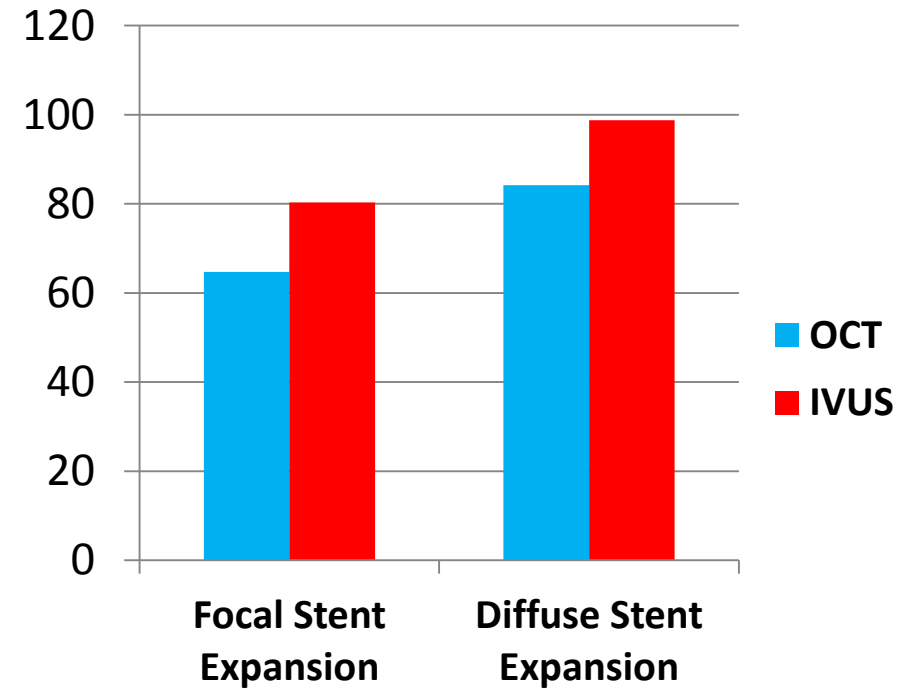
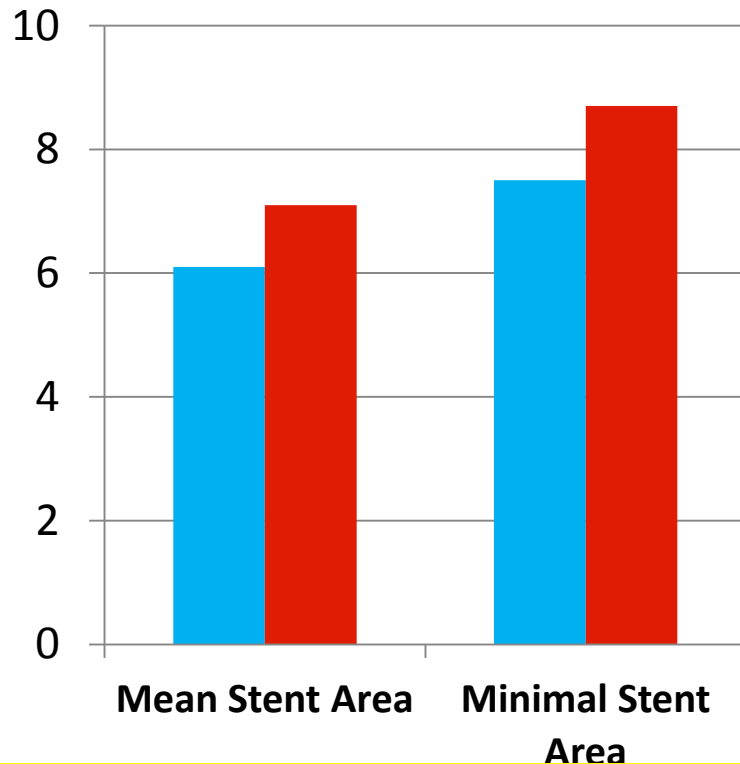
Clinical Outcomes



Won H, et al. Int J Cardiovasc Imaging. 2013;29(6):1255-63

Impact of FD OCT Guidance for Optimal Coronary Stent Implantation in Comparison With IVUS Guidance

Total 70 Pts: 35 OCT Guidance vs. 35 IVUS Guidance



FD-OCT guidance for stent implantation was associated with smaller stent expansion and more frequent significant residual reference segment stenosis compared with conventional IVUS guidance.

Habara M, et al. *Circ Cardiovasc Interv.* 2012;5:193-201

Stent Coverage

CLINICAL RESEARCH

Examination of the In Vivo Mechanisms of Late Drug-Eluting Stent Thrombosis

CME

Findings From Optical Coherence Tomography and Intravascular Ultrasound Imaging

Giulio Guagliumi, MD,* Vasile Sirbu, MD,* Giuseppe Musumeci, MD,* Robert Gerber, MD,† Giuseppe Biondi-Zoccai, MD,* Hideyuki Ikejima, MD,* Elena Ladich, MD,‡ Nikoloz Lortkipanidze, MD,* Aleksandre Matiashvili, MD,* Orazio Valsecchi, MD,* Renu Virmani, MD,‡ Gregg W. Stone, MD§

Bergamo, Italy; London, United Kingdom; Gaithersburg, Maryland; and New York, New York

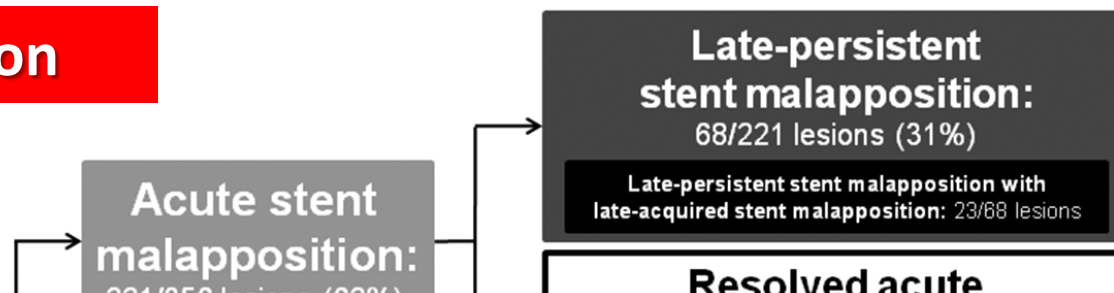
Variable	OR (95% CI)	p Value
Maximum length of segments with uncovered struts at OCT, mm	2.45 (1.27–4.73)	0.007
Remodeling index at IVUS*	1.05 (1.01–1.11)	0.019

Only the 2 covariates with strongest association at univariate analysis were included in the model, given the limited number of cases. *Per 0.01-increase.

CI = confidence interval; IVUS = intravascular ultrasound; OCT = optimal coherence tomography; OR = odds ratio.

Incidences, Predictors, and Clinical Outcomes of Acute and Late Stent Malapposition Detected by OCT After DES Implantation

Malapposition



Acute, late-persistent, and late-acquired stent malapposition had relatively high incidences but different predictors.

Acute: calcified lesion, > 70 % stenosis and longer stent (>25 mm)

Late persistent: acute malapposition vol (>2.56 mm²), stent edge malapposition

Late acquired: Thrombus or plaque protrusion

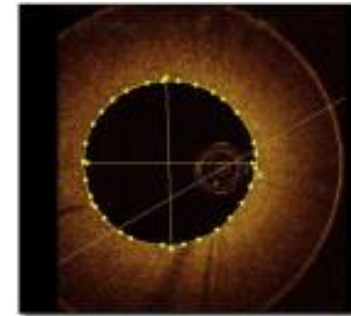
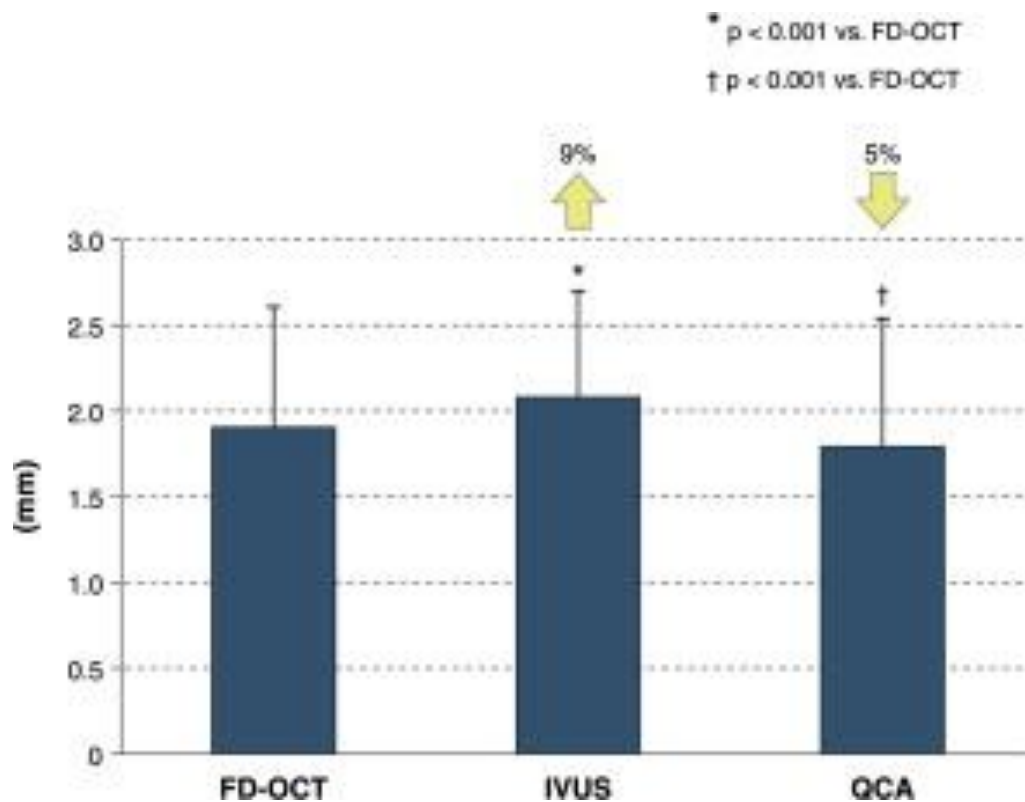
However, the clinical outcome of stent malapposition was

favorable.

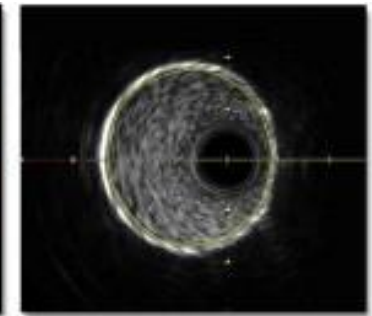


Im E, Hong MK, et al *Circ Cardiovasc Interv.* 2014;7:88-96

OCT compared with IVUS in a Coronary Lesion



Area (mm²) = 7.37
Diameter (mm): Min = 2.99; Max = 3.14; Mean = 3.06



Area (mm²) = 8.35
Diameter (mm): Min = 3.13; Max = 3.43; Mean = 3.27

MLD by IVUS was greater than that by FD-OCT (relative reference 9%).
MLD by QCA was smaller than that by FD-OCT (relative reference -5%).

Kubo T, et al. J Am Coll Cardiol Img 2013;6;1095-104