

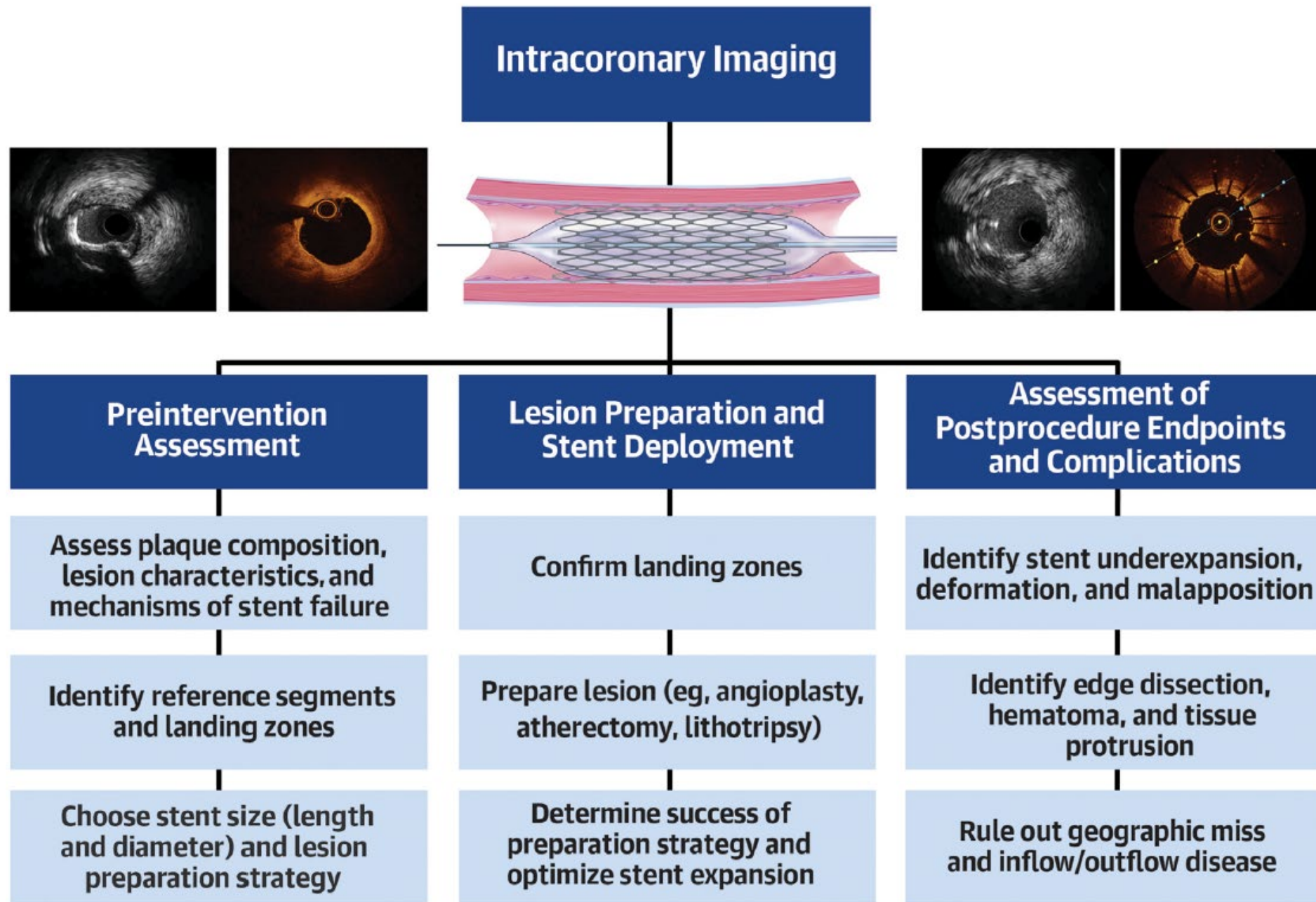
Rol of Intravascular Imaging in Bifurcation Lesions

Mauricio G. Cohen, MD, FACC, FSCAI
Director of Structural Heart Interventions
Cleveland Clinic Florida
X @DrMauricioCohen



Cleveland Clinic
Florida





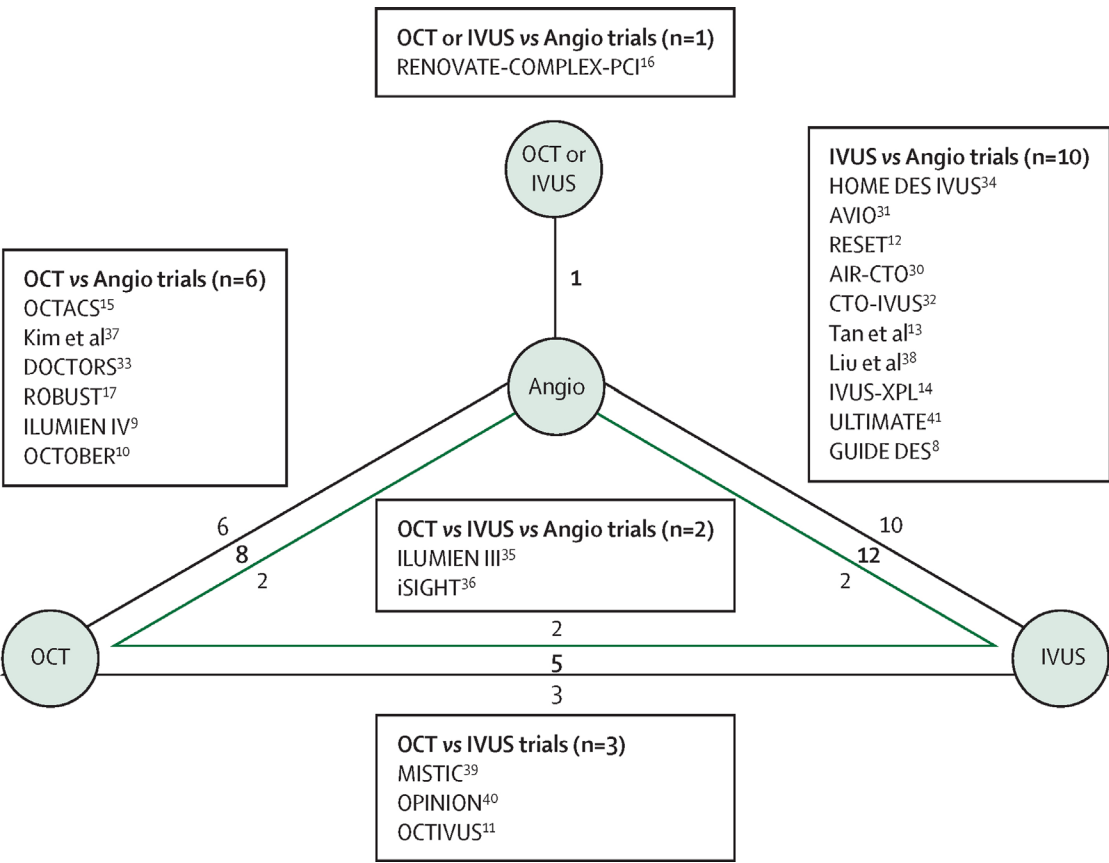
2021 ACC/AHA/SCAI Guideline for Coronary Artery Revascularization

A Report of the American College of Cardiology/American Heart Association
Joint Committee on Clinical Practice Guidelines

COR	LOE	RECOMMENDATIONS
2a	B-R	1. In patients undergoing coronary stent implantation, IVUS can be useful for procedural guidance, particularly in cases of left main or complex coronary artery stenting, to reduce ischemic events (1-10).
2a	B-R	2. In patients undergoing coronary stent implantation, OCT is a reasonable alternative to IVUS for procedural guidance, except in ostial left main disease (11-13).
2a	C-LD	3. In patients with stent failure, IVUS or OCT is reasonable to determine the mechanism of stent failure (14-17).

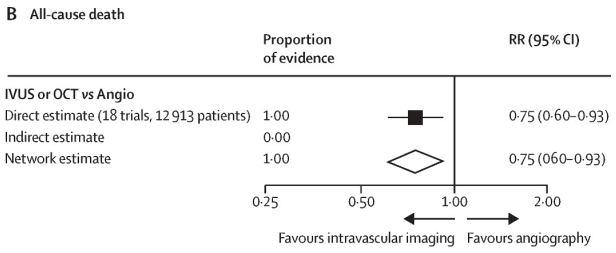
Intravascular imaging-guided coronary drug-eluting stent implantation: an updated network meta-analysis

Gregg W Stone, Evald H Christiansen, Ziad A Ali, Lene N Andreasen, Akiko Maehara, Yousif Ahmad, Ulf Landmesser, Niels R Holm



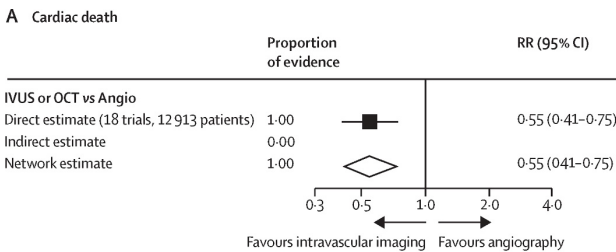
22 randomized trials (publication years 2010 – 2023)
15,964 randomized patients – Avg F/U 24.7 mo

All-cause
Death



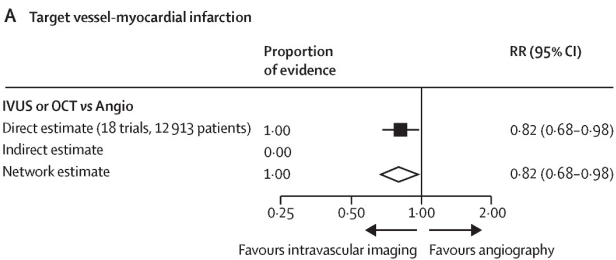
↓ 25%

Cardiac
Death



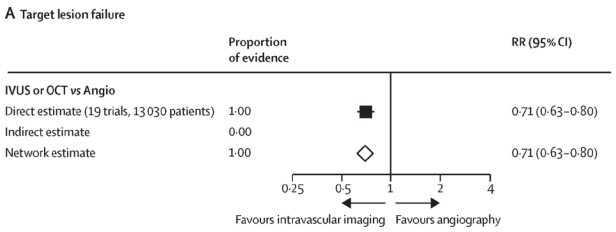
↓ 45%

TV-MI



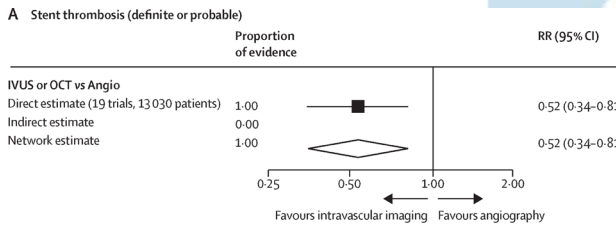
↓ 18%

TVF



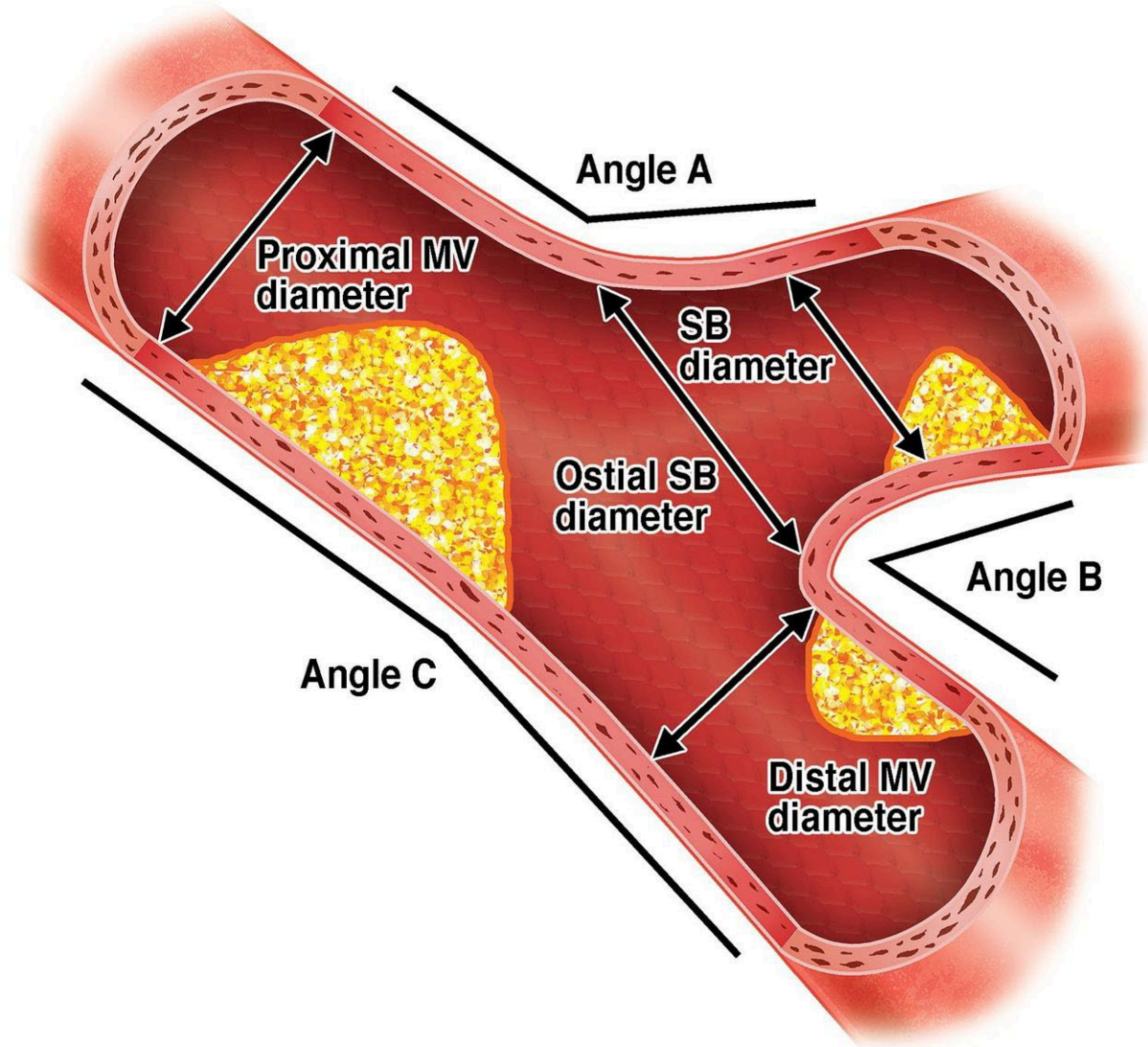
↓ 29%

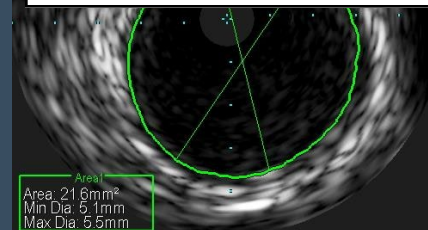
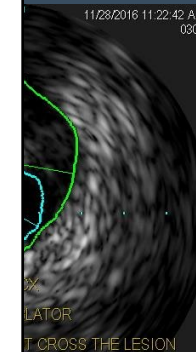
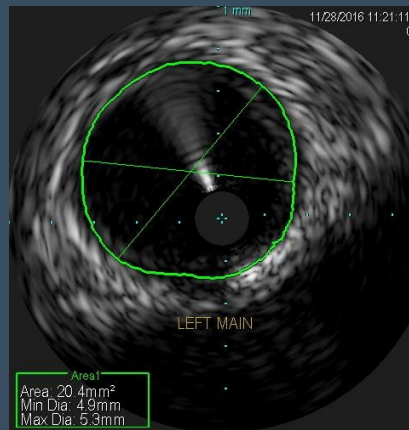
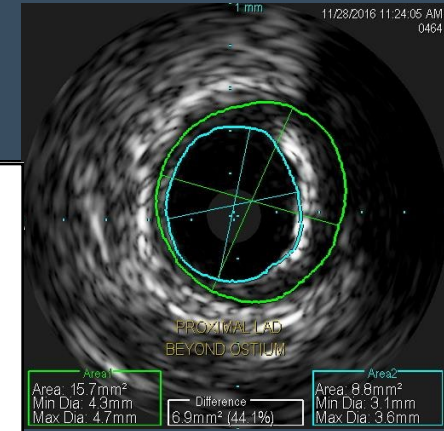
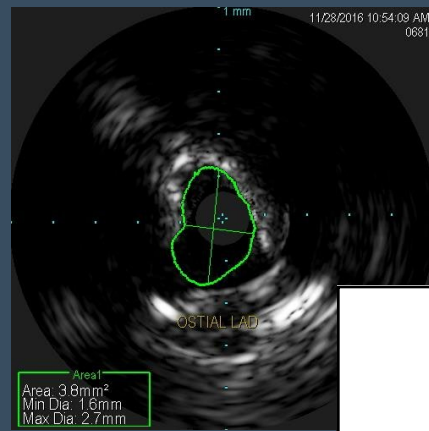
Stent
Thrombosis

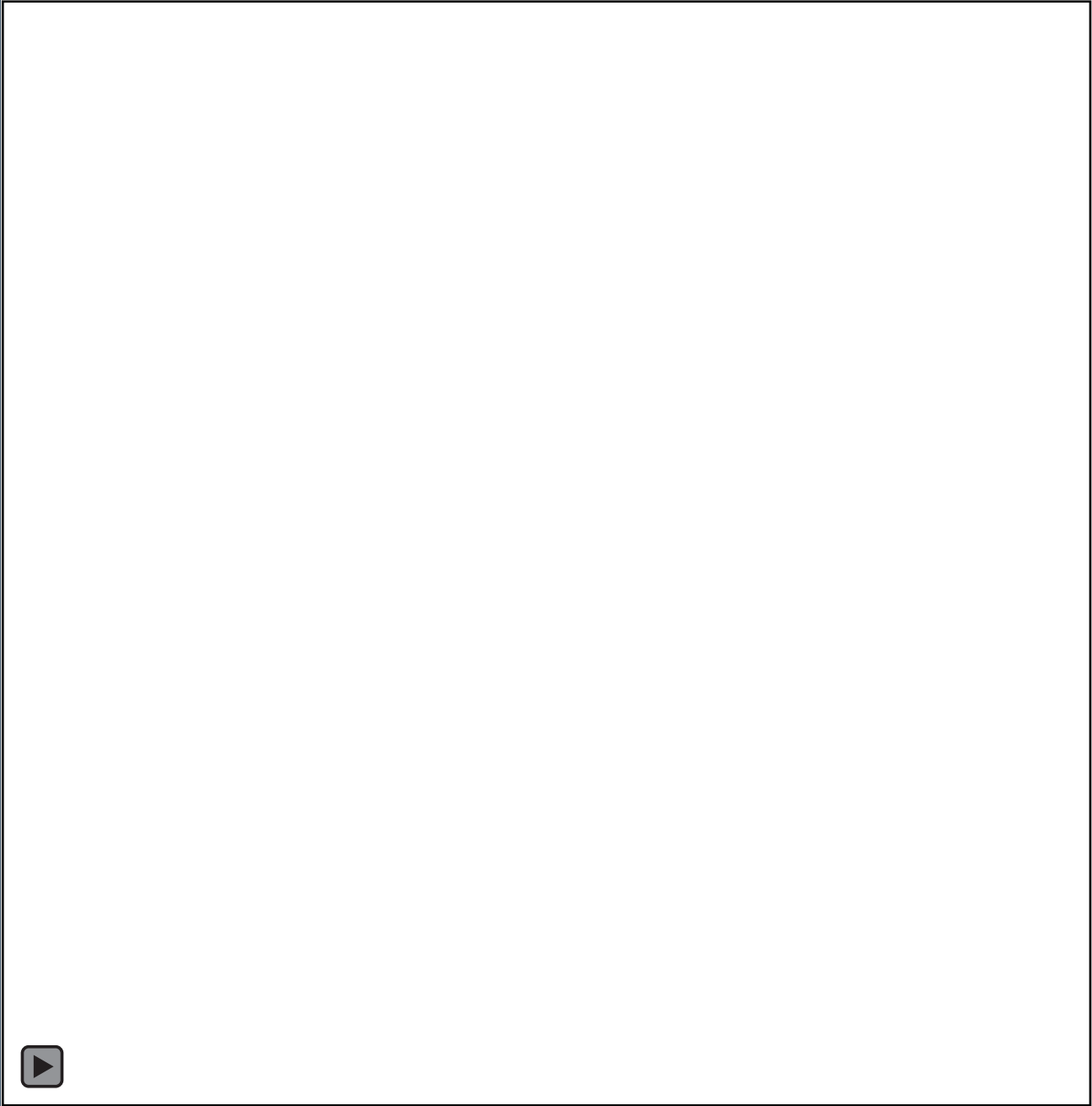


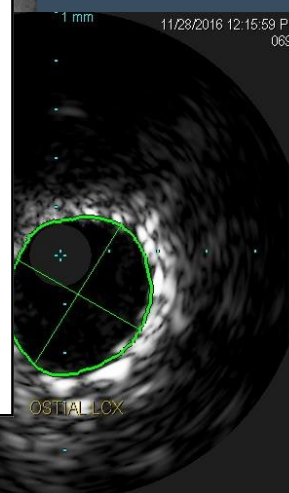
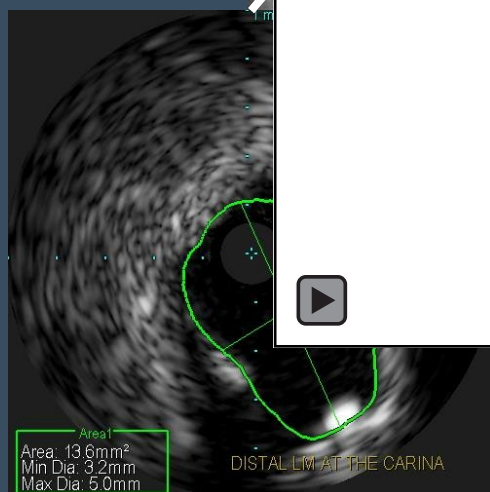
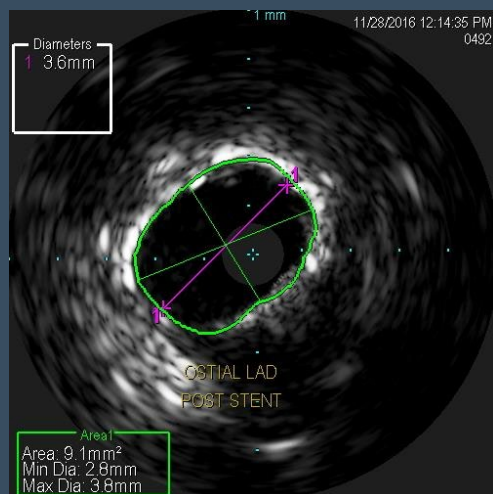
↓ 48%

Anatomy of a Bifurcation Lesion

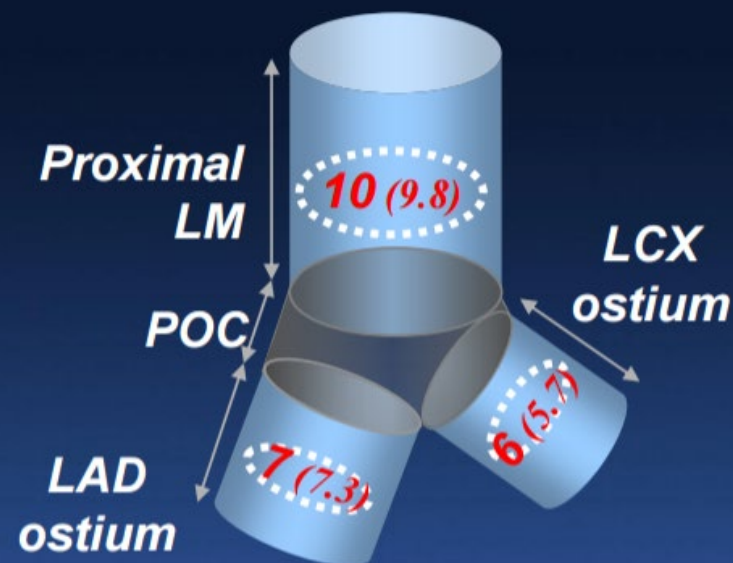








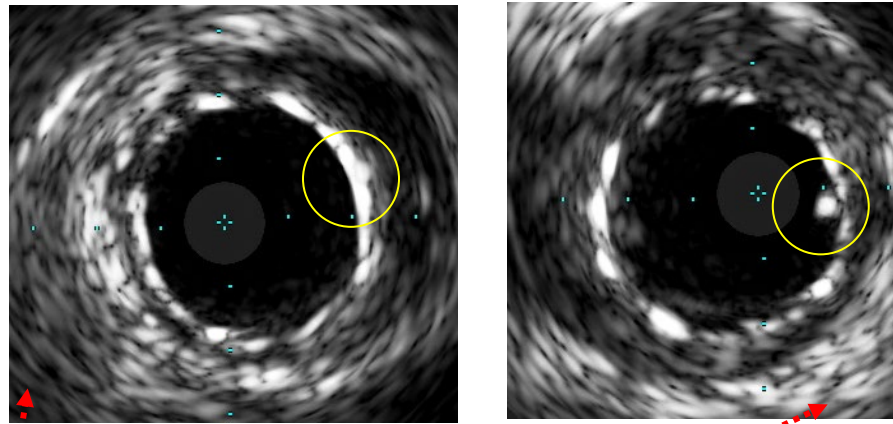
Caucasian (Large person) Criteria



EXCEL trial analysis
A. Maehara TCT 2018

IVUS check

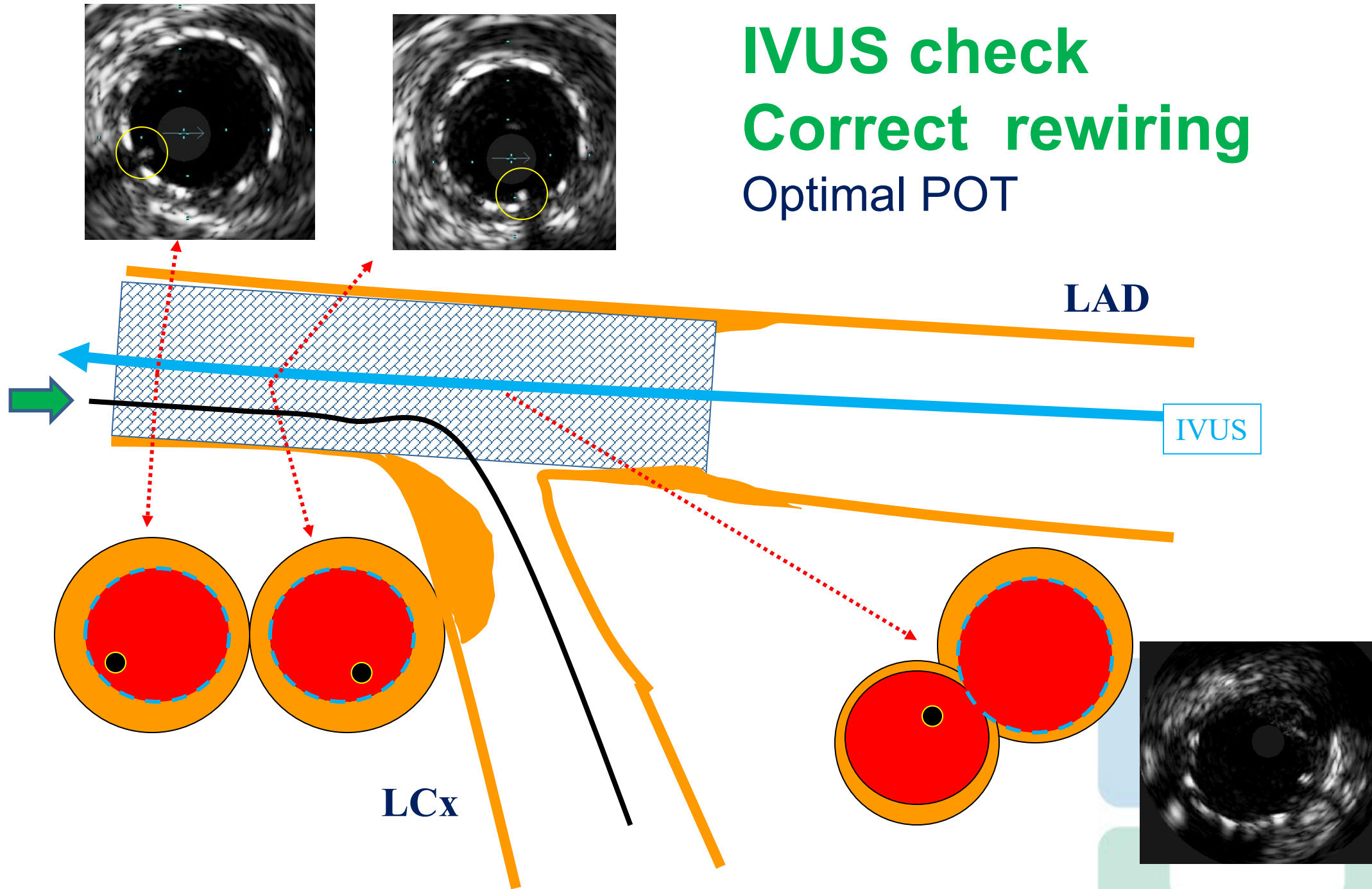
Incorrect rewiring



IVUS check

Correct rewiring

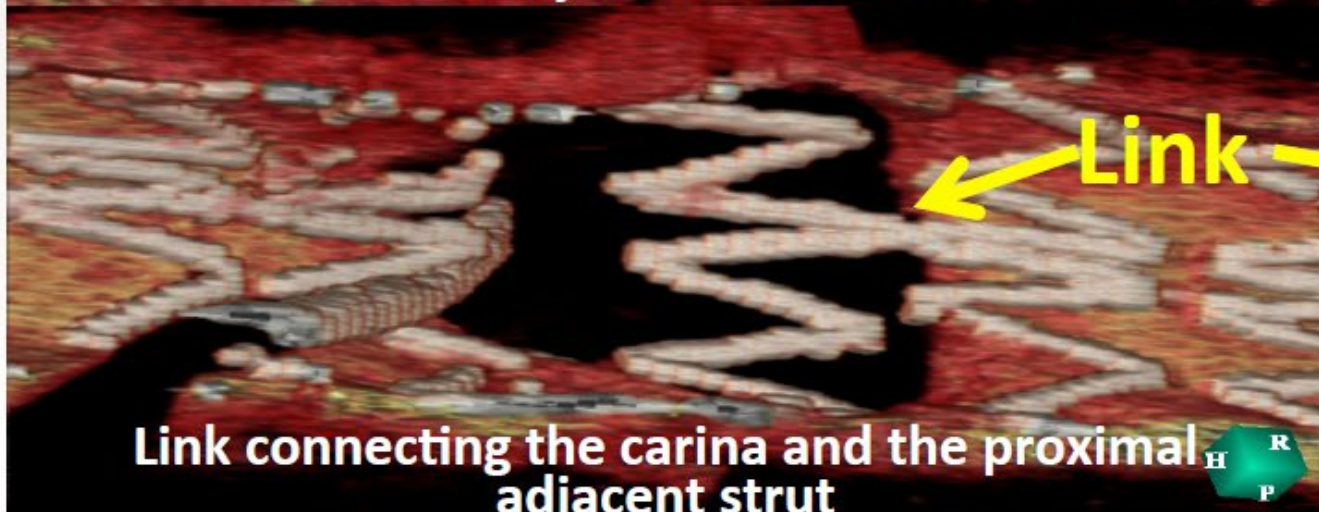
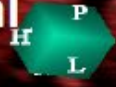
Optimal POT



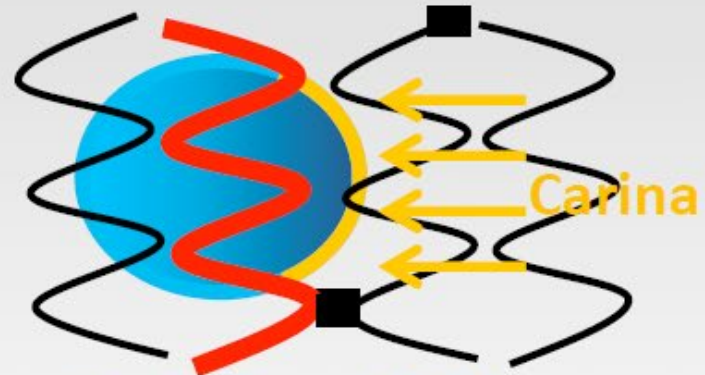
Proximal



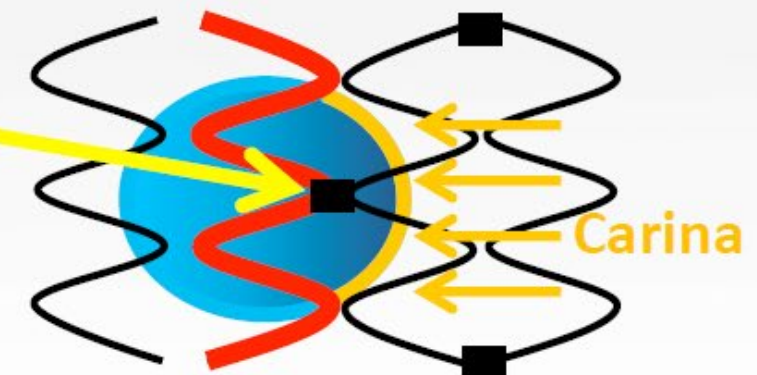
No link between the carina and the proximal adjacent strut



Link connecting the carina and the proximal adjacent strut

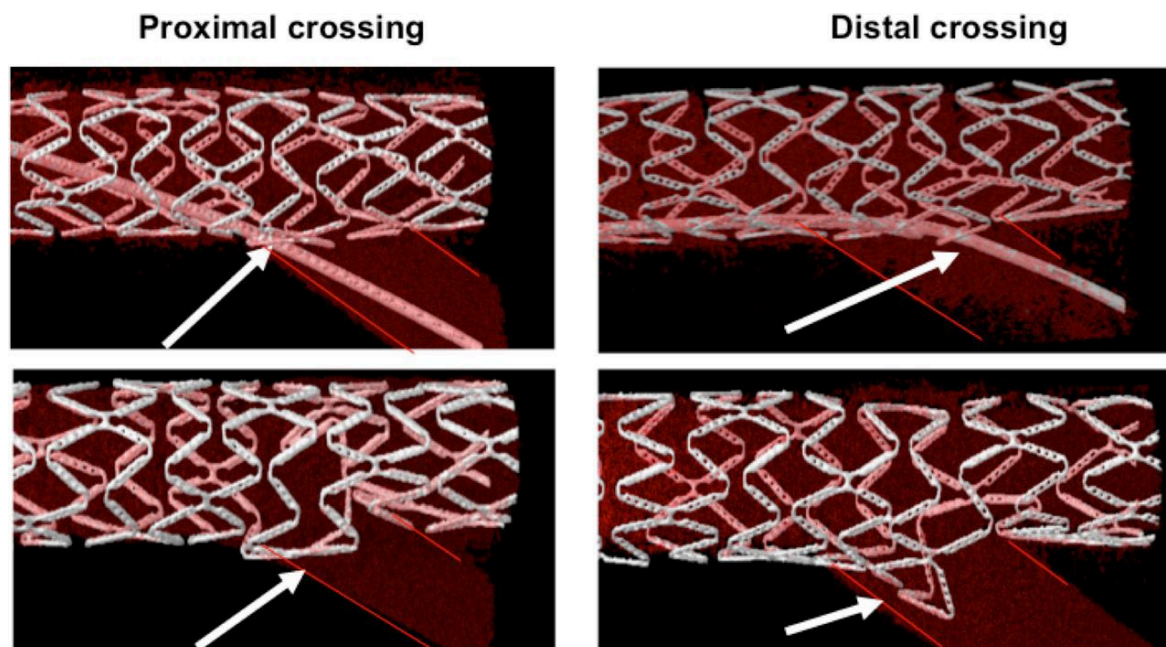


Link-free (LF) type



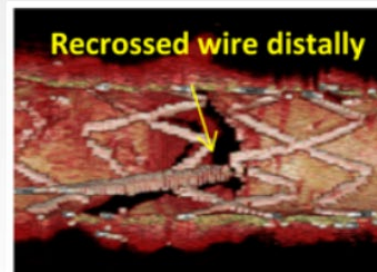
Link-connecting (LC) type

Tip: When re-crossing into sidebranch, catch ostium as you *withdraw* wire in main vessel from distal to proximal

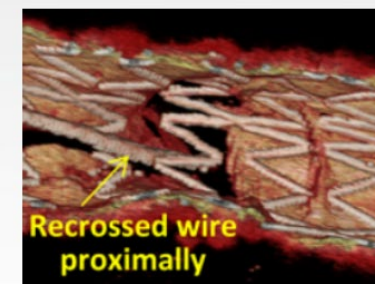


Sawaya et al, JACC Cardiovasc Interv: 9 (18) 1861-1878

Link free and
Distal



Non-LFD

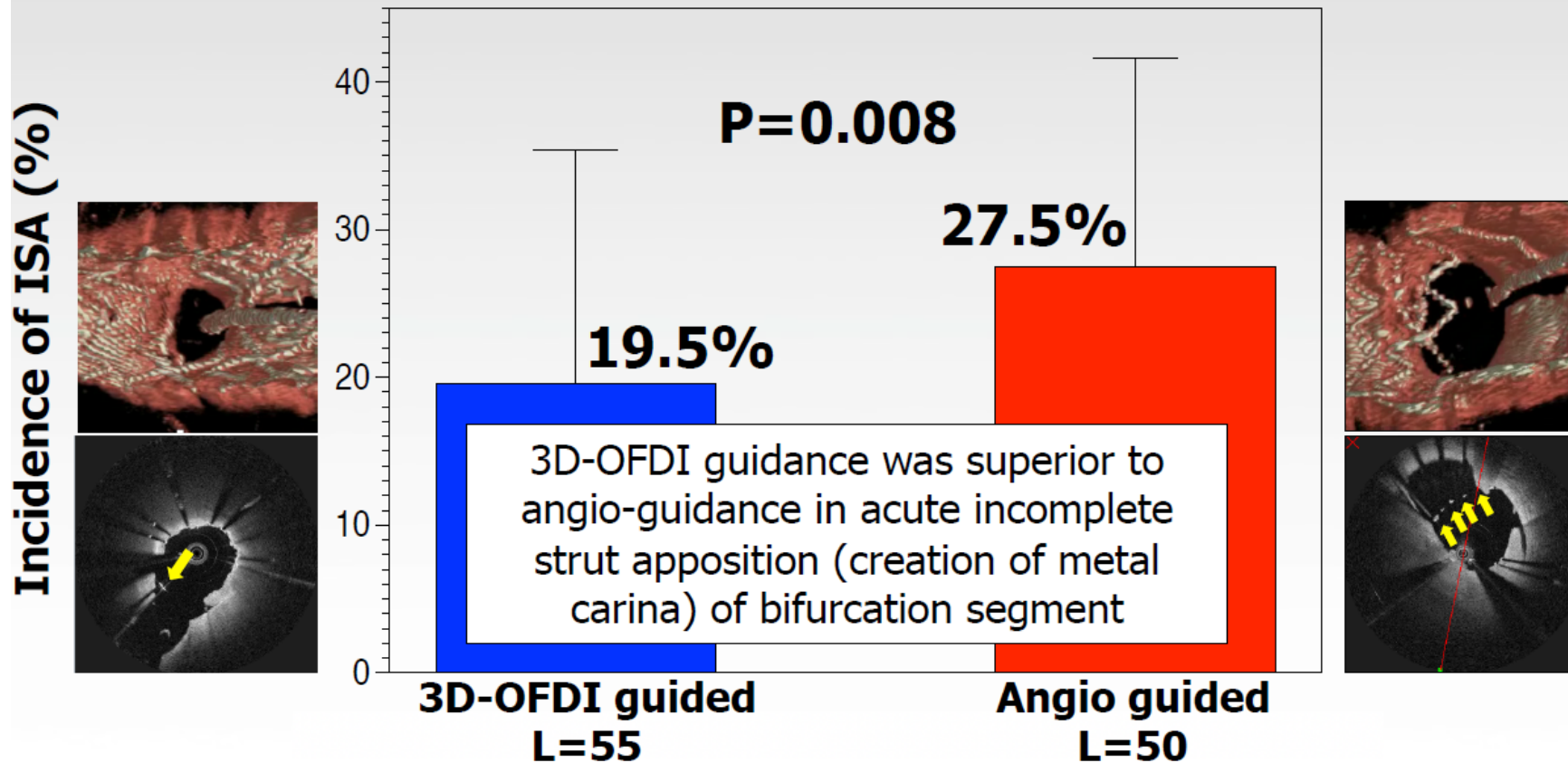


V.S

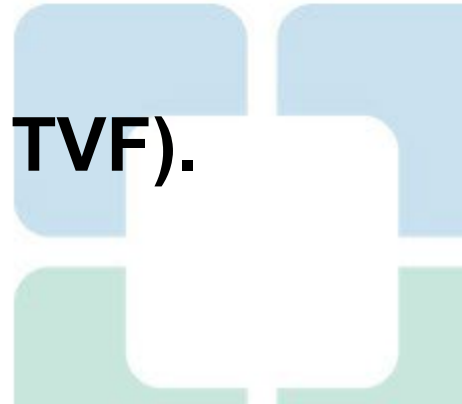


European Bifurcation Club

Incomplete Stent Apposition at bifurcation Primary endpoint:

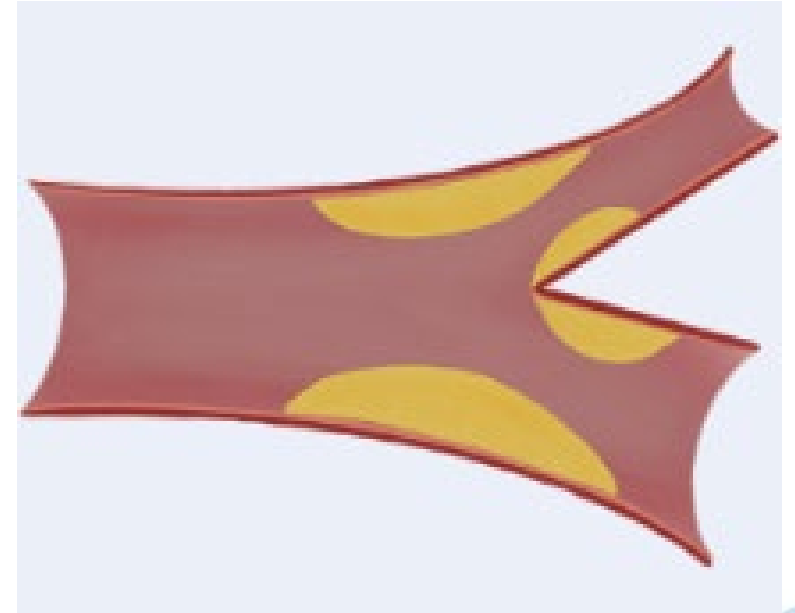


Benefits of Intravascular Imaging in Bifurcations

- **Helps decide whether revascularization is necessary**
 - **Can identify whether a one-stent crossover technique (the default strategy) is sufficient or whether a two-stent technique may be more appropriate**
 - **Appropriately size the stent (diameter and length) and select the optimum landing zones**
 - **Optimize the final result (expansion, apposition, edge dissection, and geographic miss).**
 - **Clinical indicates improved outcomes (death, MACE, TVF).**
- 

Left Main Coronary Artery (LMCA)

- LMCA supplies blood to >75% of the LV myocardium.
- Untreated patients with obstructive LMCA disease have a particularly poor prognosis.
- LMCA disease is difficult to assess angiographically because of the possible lack of a proximal reference.
- Atherosclerosis within the LMCA is usually diffuse, with frequent involvement of the bifurcation.
- Calcific disease is also common in the LMCA which can make appropriate stent expansion difficult.
- Complications with LM PCI can rapidly lead to hemodynamic deterioration.



Comparison of usefulness for bifurcation treatment between IVUS and OCT

	IVUS	OCT
Pre-procedure		
Co-registration with angiogram	++	++
Sizing of vessel	++	+
Sizing of lumen	++	++
Assessment of plaque distribution	++	+
Plaque characterization	++	+
Assessment of SB ostium in the pullback of MV	X	++
Determination of landing zone and stent length	++	++
During stent implantation		
Guidance of position of the guidewire towards the SB	X	++
Post-procedure		
Evaluation of stent dimensions according to flow conservation law	++	++
Stent underexpansion	++	++
Edge dissection	+	++
ISA	+	++
Anatomic subgroups		
LMT lesion, assessment of ostium	++	+, X
No need for contrast media	++	X

Onuma Y, et al. Joint consensus on the use of OCT in coronary bifurcation lesions by the European and Japanese bifurcation clubs. EuroIntervention 2019;14(15):e1568-e77.

OCTOBER Trial

OCT or Angiography in Complex Bifurcation Lesions

THE NEW ENGLAND JOURNAL OF MEDICINE

ORIGINAL ARTICLE

OCT or Angiography Guidance for PCI in Complex Bifurcation Lesions

N.R. Holm, L.N. Andreasen, O. Neghabat, P. Laanmets, I. Kumsars, J. Bennett, N.T. Olsen, J. Odenstedt, P. Hoffmann, J. Dens, S. Chowdhary, P. O'Kane, S.-H. Bülow Rasmussen, M. Heigert, O. Havndrup, J.P. Van Kuijk, S. Biscaglia, L.J.H. Mogensen, L. Henareh, F. Burzotta, C. H. Eek, D. Mylotte, M.S. Ulinas, L. Koltowski, P. Knaapen, S. Calic, N. Witt, I. Santos-Pardo, S. Watkins, J. Lønborg, A.T. Kristensen, L.O. Jensen, F. Calais, J. Cockburn, A. McNeice, O.A. Kajander, T. Heestermaas, S. Kische, A. Eftekhari, J.C. Spratt, and E.H. Christiansen, for the OCTOBER Trial Group*

ABSTRACT

BACKGROUND
Imaging-guided percutaneous coronary intervention (PCI) is associated with better clinical outcomes than angiography-guided PCI. Whether routine optical coherence tomography (OCT) guidance in PCI of lesions involving coronary-artery branch points (bifurcations) improves clinical outcomes as compared with angiographic guidance is uncertain.

METHODS
We conducted a multicenter, randomized, open-label trial at 38 centers in Europe. Patients with a clinical indication for PCI and a complex bifurcation lesion identified by means of coronary angiography were randomly assigned in a 1:1 ratio to OCT-guided PCI or angiography-guided PCI. The primary end point was a composite of major adverse cardiac events (MACE), defined as death from a cardiac cause, target-lesion myocardial infarction, or ischemia-driven target-lesion revascularization at a median follow-up of 2 years.

RESULTS
We assigned 1201 patients to OCT-guided PCI (600 patients) or angiography-guided PCI (601 patients). A total of 111 patients (18.5%) in the OCT-guided PCI group and 116 (19.3%) in the angiography-guided PCI group had a bifurcation lesion involving the left main coronary artery. At 2 years, a primary end-point event had occurred in 59 patients (10.1%) in the OCT-guided PCI group and in 83 patients (14.1%) in the angiography-guided PCI group (hazard ratio, 0.70; 95% confidence interval, 0.50 to 0.98; $P=0.035$). Procedure-related complications occurred in 41 patients (6.8%) in the OCT-guided PCI group and 34 patients (5.7%) in the angiography-guided PCI group.

CONCLUSIONS
Among patients with complex coronary-artery bifurcation lesions, OCT-guided PCI was associated with a lower incidence of MACE at 2 years than angiography-guided PCI. (Funded by Abbott Vascular and others; OCTOBER ClinicalTrials.gov number, NCT03171311.)

The authors' full names, academic degrees, and affiliations are listed in the Appendix. Dr. Holm can be contacted at niels.holm@clin.au.dk or at the Department of Cardiology, Aarhus University Hospital, Palle Juul-Jensens Blvd. 99, 8200 Aarhus N, Denmark.

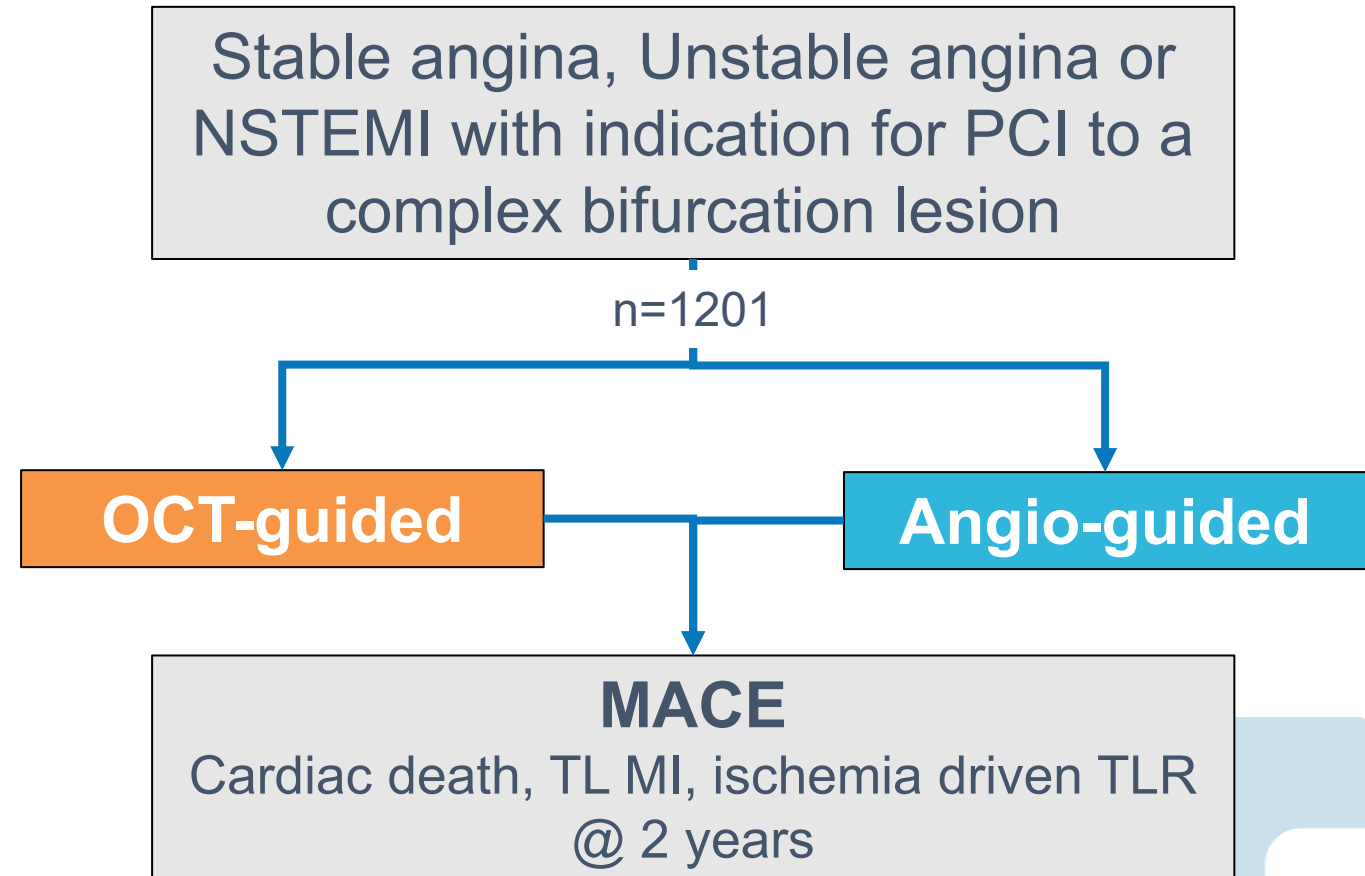
*A full list of the members of the OCTOBER Trial Group is provided in the Supplementary Appendix, available at NEJM.org.

Drs. Holm and Andreasen contributed equally to this article.

This article was published on August 27, 2023, and updated on September 7, 2023, at NEJM.org.

N Engl J Med 2023;389:1477-87.
DOI: 10.1056/NEJMoa2302770
Copyright © 2023 Massachusetts Medical Society.

N ENGL J MED 389:16 NEJM.ORG OCTOBER 19, 2023 1477

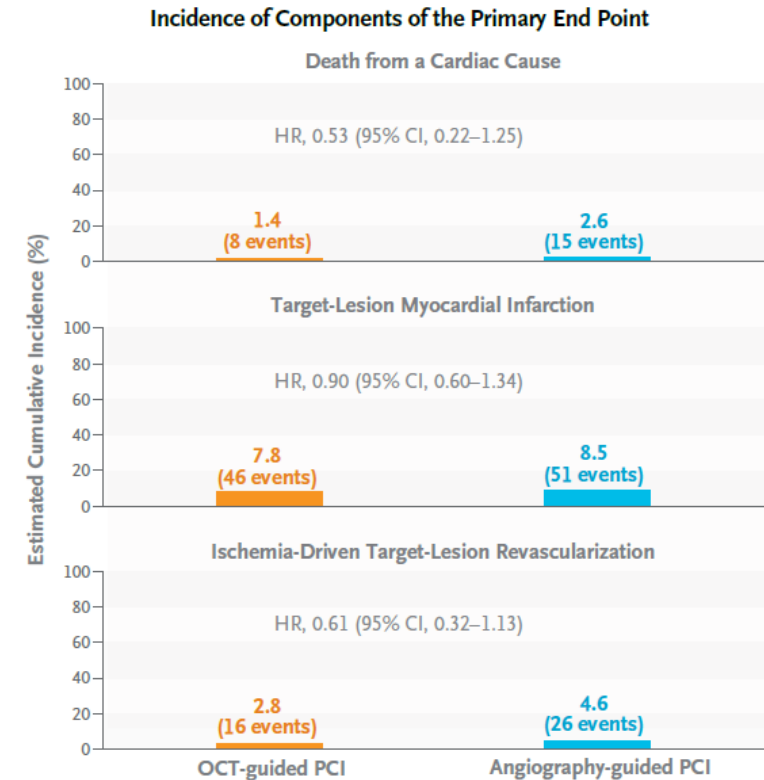
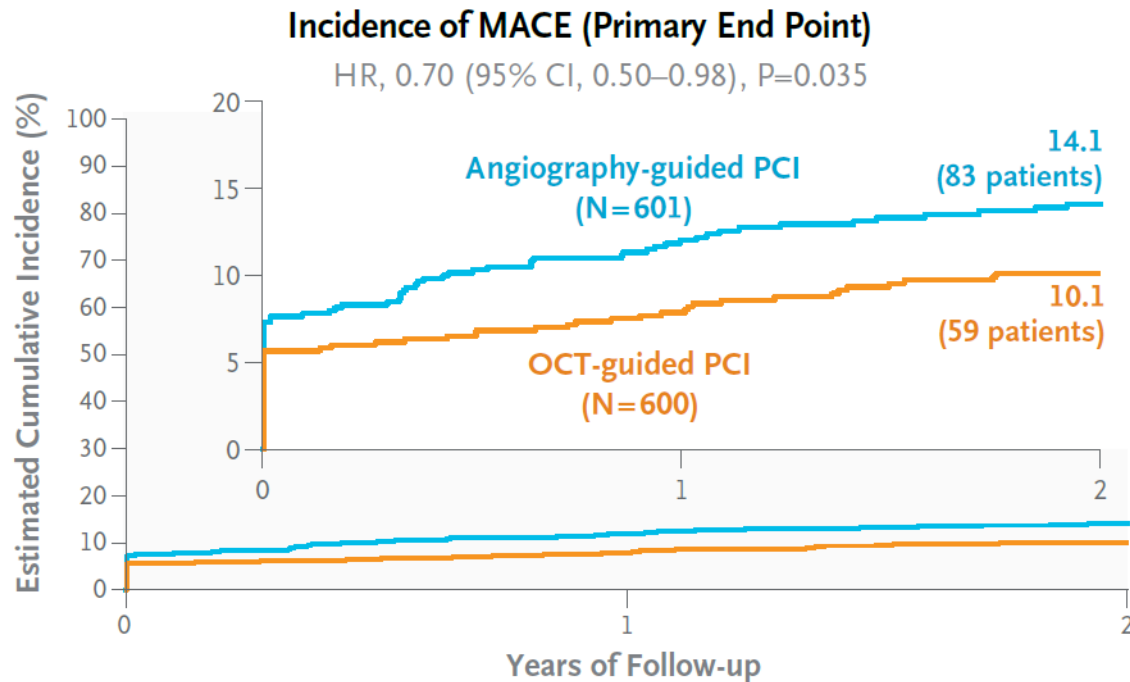


OCTOBER Trial: Procedures

Characteristic	Total (N=1201)	OCT-Guided PCI (N=600)	Angiography- Guided PCI (N=601)
Median no. of diseased vessels (IQR)	2 (2–2)	2 (2–2)	2 (2–2)
Median no. of lesions to be treated (IQR)	1 (1–1)	1 (1–1)	1 (1–1)
Trial bifurcation vessels — no. of patients (%)			
LMCA–LAD–LCx	227 (18.9)	111 (18.5)	116 (19.3)
LAD–D	847 (70.5)	425 (70.8)	422 (70.2)
LCx–OM	111 (9.2)	55 (9.2)	56 (9.3)
RCA–PDA–PLA	16 (1.3)	9 (1.5)	7 (1.2)
Main-vessel treatment, median total stent length (IQR) — mm	36 (24–50)	38 (28–51)	33 (23–48)
Side-branch treatment			
Side branch stented — no. of patients/total no. (%)	770/1198 (64.3)	388/597 (65.0)	382/601 (63.6)
Median total stent length (IQR) — mm	23 (15–28)	23 (15–28)	23 (15–28)
Median total balloons (IQR) — no.	7 (5–9)	7 (5–10)	6 (5–9)
Largest balloon diameter — mm	4.1±0.02	4.2±0.03	4.0±0.02
Secondary lesions treated — no. of patients (%)	231 (19.2)	106 (17.7)	125 (20.8)

OCTOBER Trial

OCT or Angiography in Complex Bifurcation Lesions



Conclusions

- **Intravascular imaging has multiple uses in bifurcations**
 - Location and extent of disease in a bifurcation
 - Determine the technique to use
 - Optimize the result
- **Intravascular imaging has the ability to decrease MACE and TVF rates with PCI**



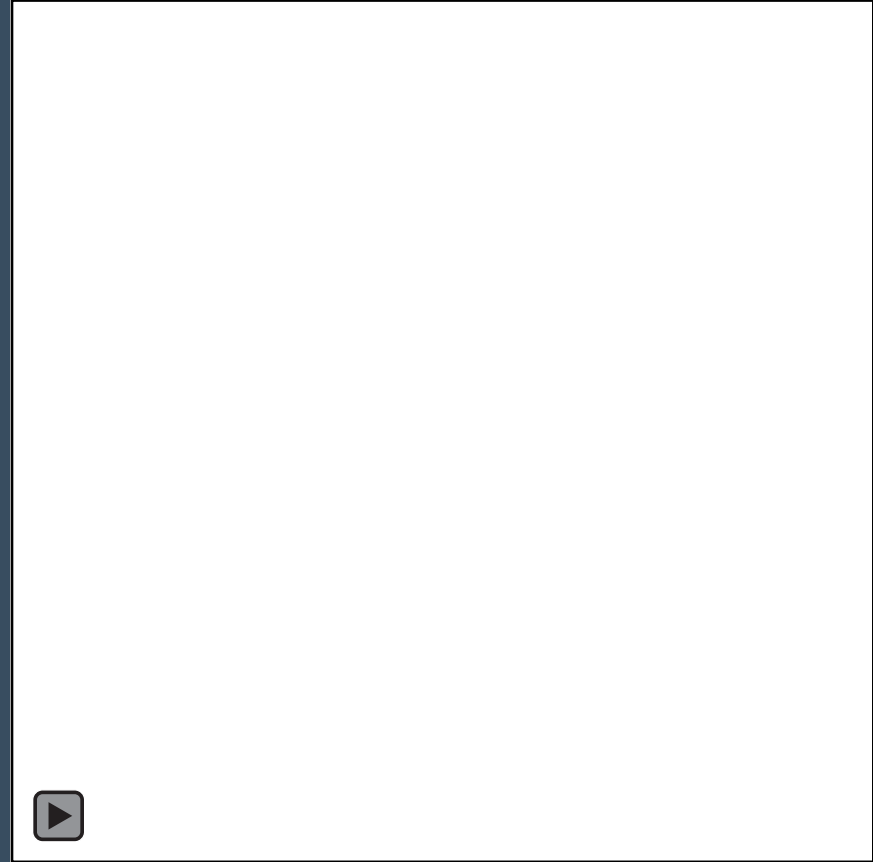
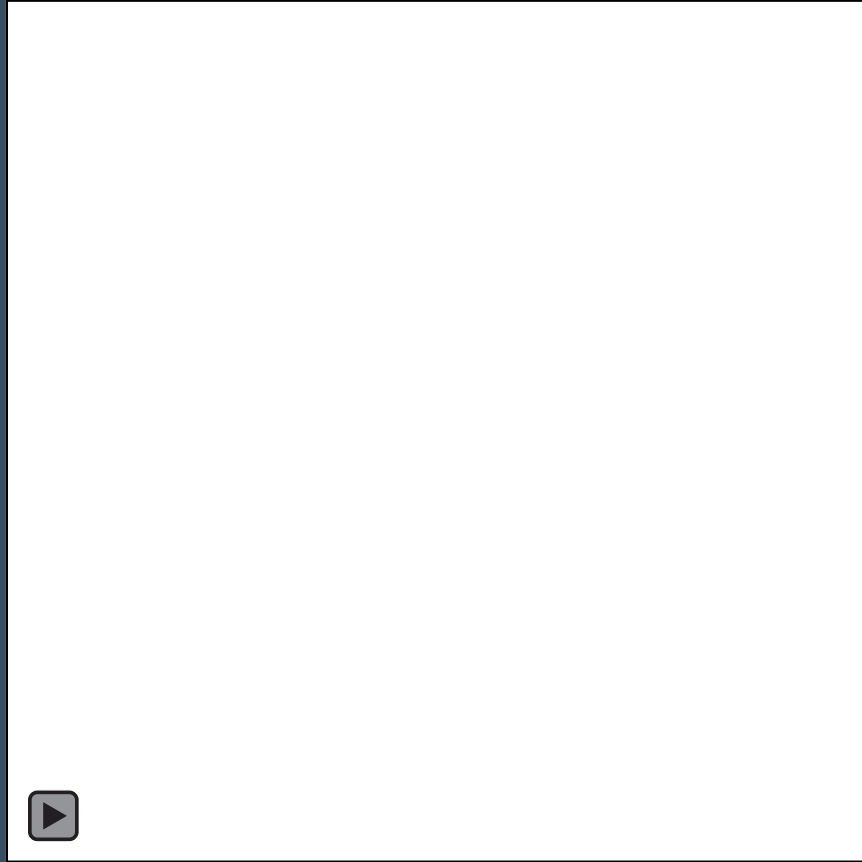
Mauricio G. Cohen, MD
Cell 305-873-4513



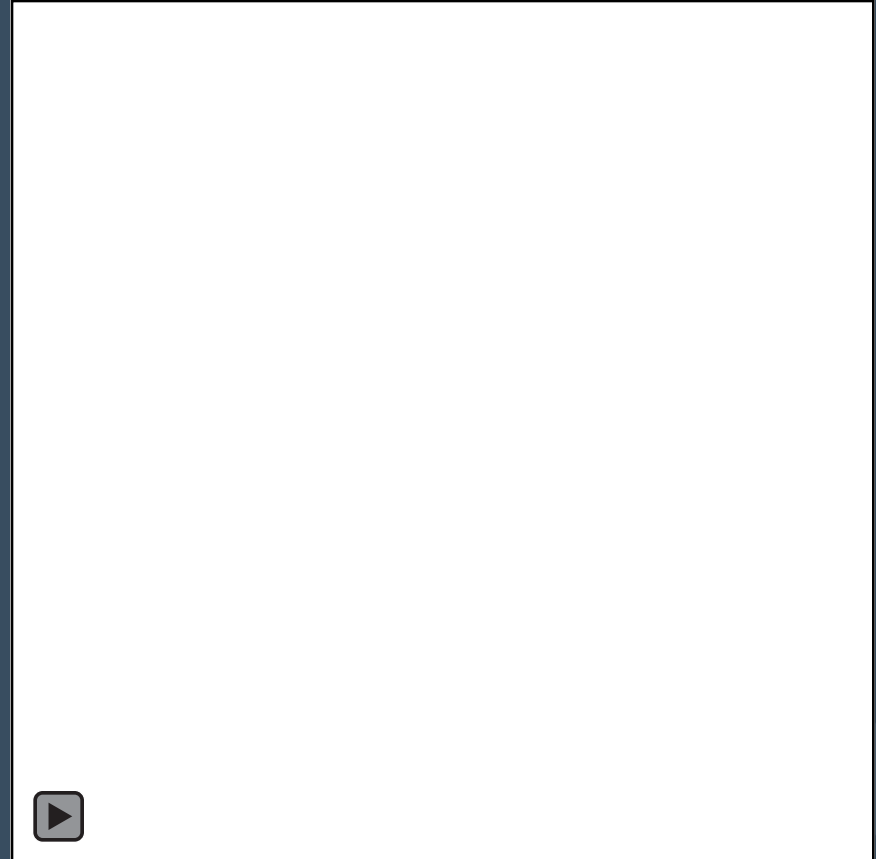
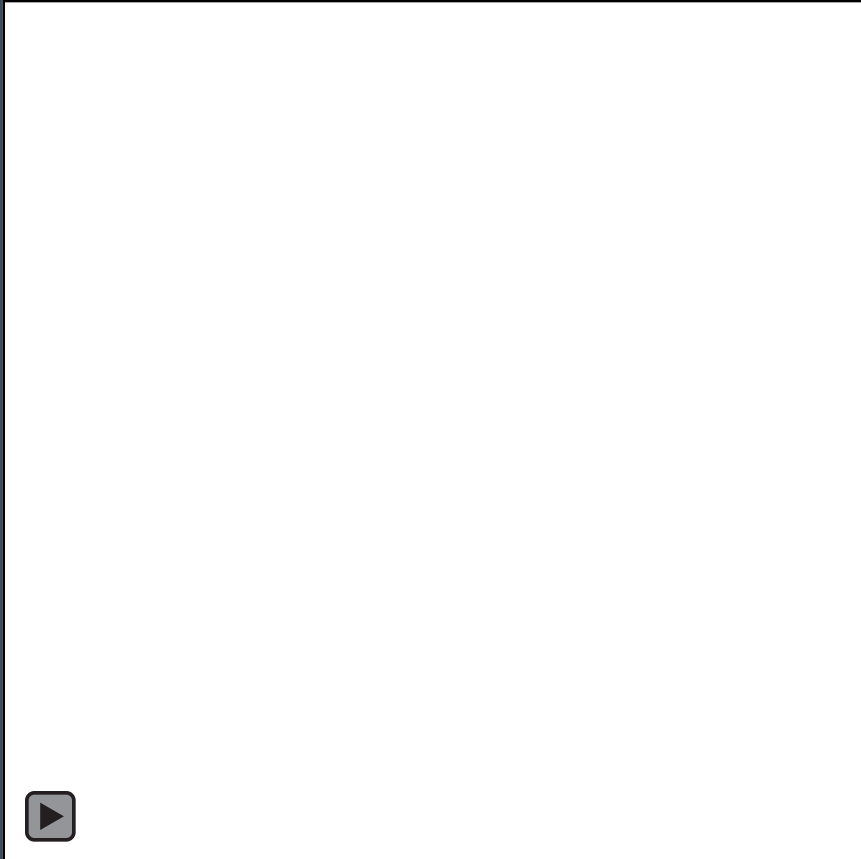
Every life deserves world class care.

Let's start with a case

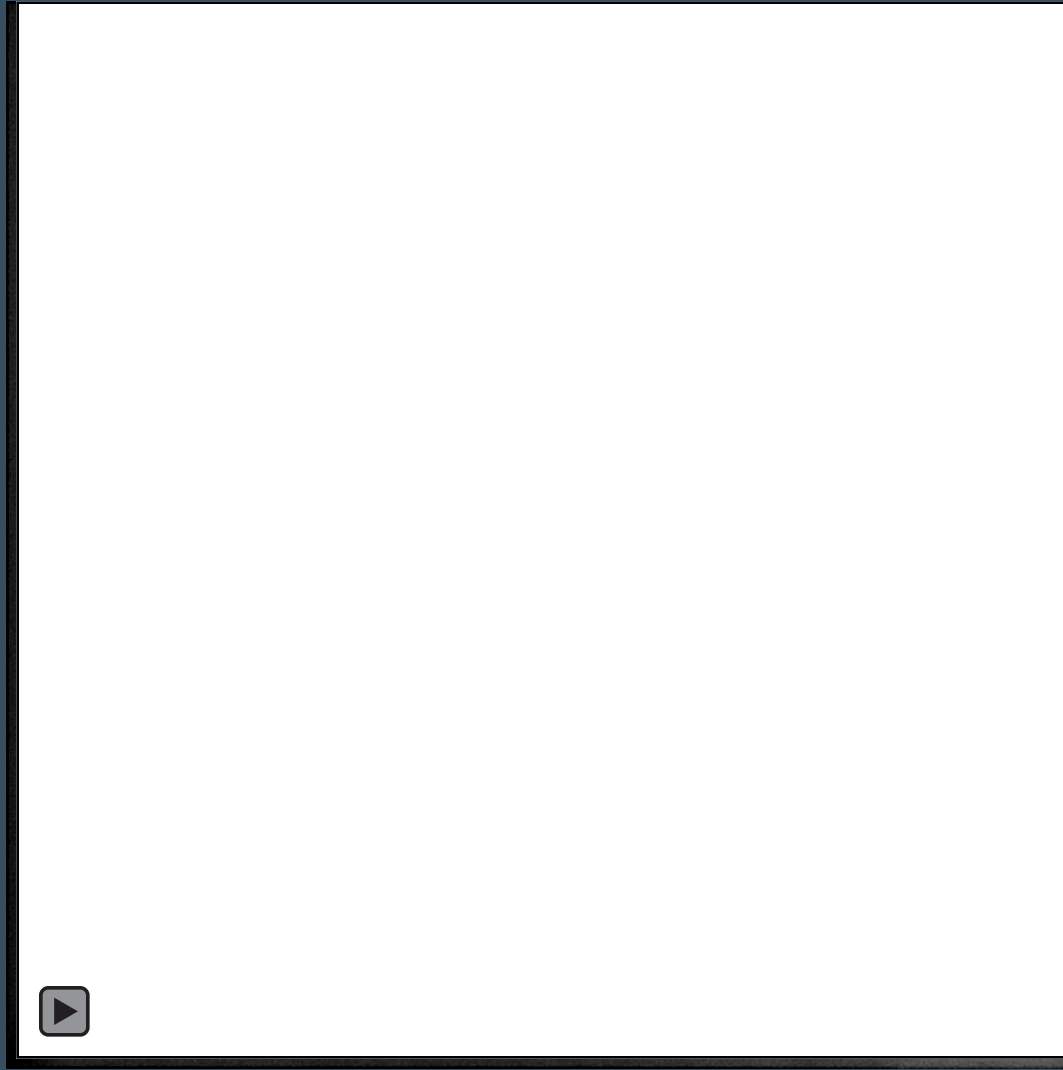
75M w/ no known cardiac history, uncontrolled T2DM on insulin c/b retinopathy, neuropathy and ESRD on iHD, HTN, HLD, prior smoker, abnormal MPI suggesting antero-septal ischemia with a decreased LVEF ~30%, new from LVEF 50-55% on TTE in 10/2019



Let's start with a case



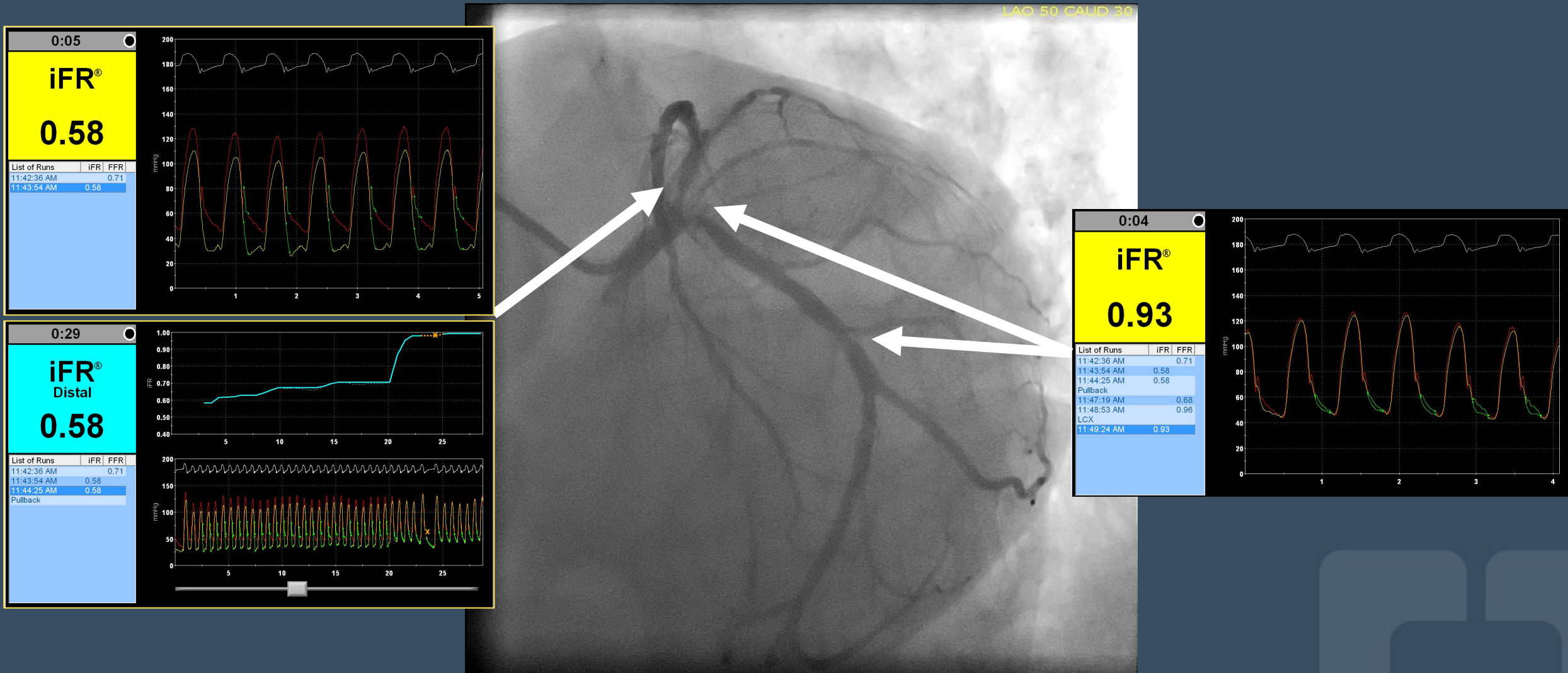
Where are the lesions? What do I do?



So... I call my best friends:

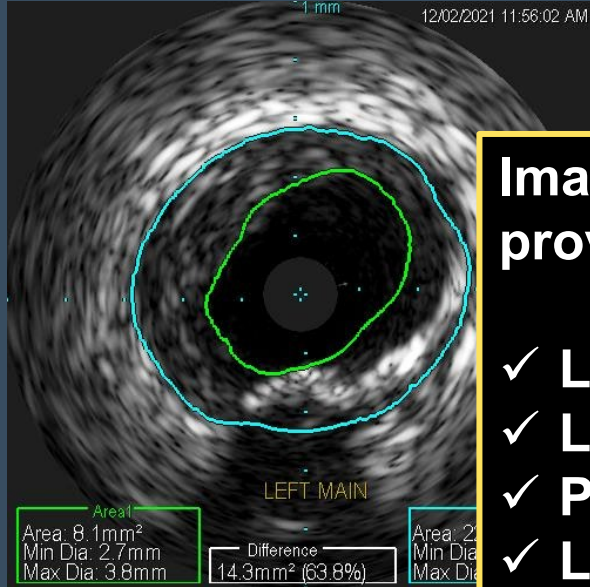
- ❑ Imaging (IVUS & OCT)
- ❑ Physiology (FFR, iFR)

Where are the lesions? What do I do?



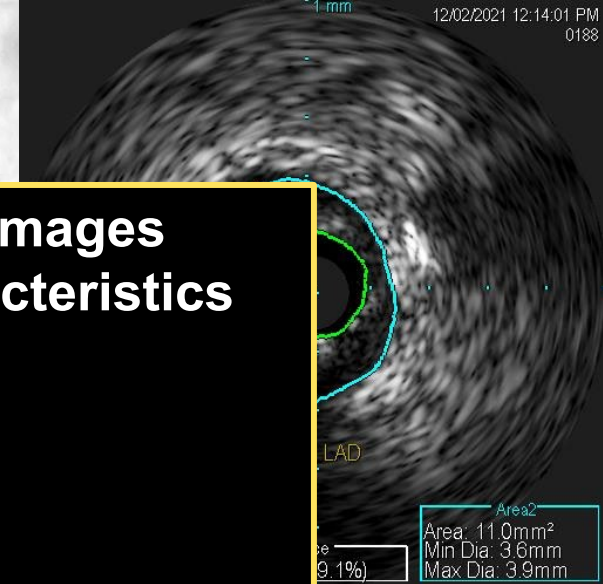
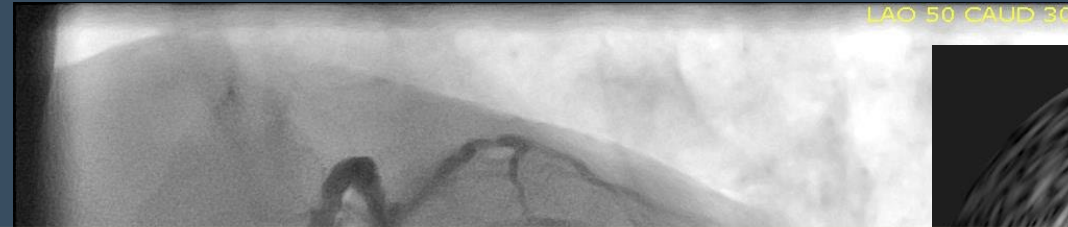
Now we know that the patient has ostial LAD disease... The question now is CABG or PCI?

Where are the lesions? What do I do?



**Imaging provides detailed cross-sectional images
provide accurate evaluation of lesion characteristics**

- ✓ Lumen dimensions
- ✓ Lesion length
- ✓ Plaque morphology
- ✓ Location
- ✓ Thrombus
- ✓ Dissection
- ✓ Stent apposition and expansion



The lesion is ostial, calcified, and extends into the LM → CABG