



What Events Happened in the Imaging Field in 2023?

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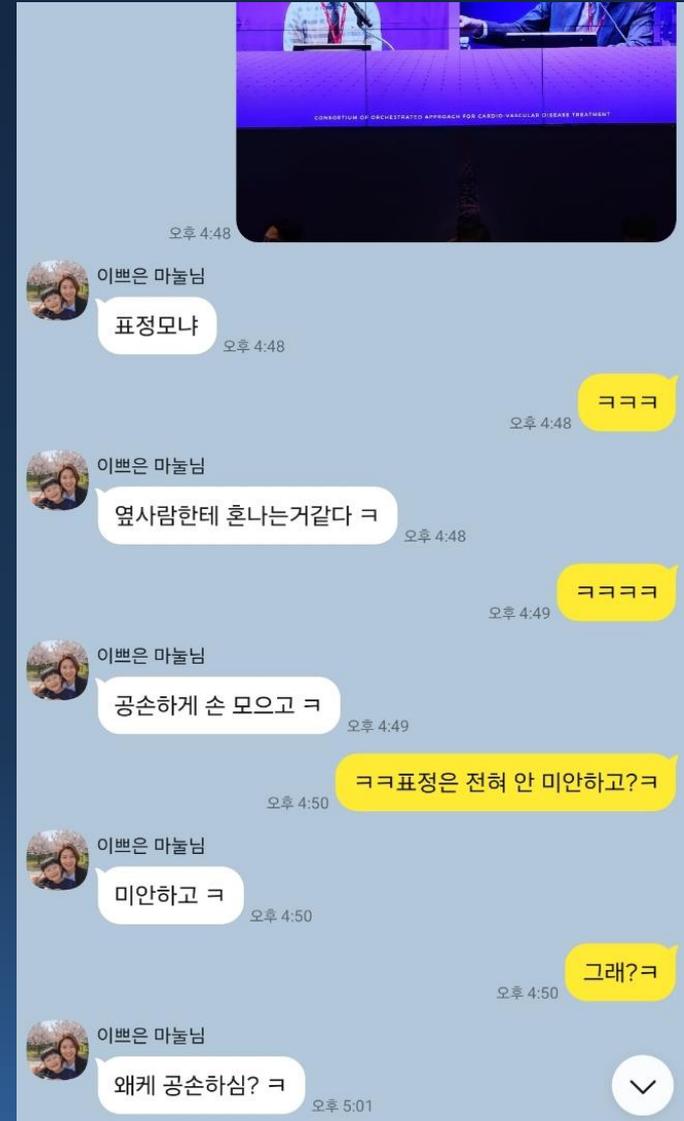
Type of Intravascular imaging system

	IVUS	OCT
Energy source	Ultrasound	Near-infrared light
Wavelength, μm	35-80	1.3
Resolution, μm	40-200 (axial); 200-300 (lateral)	15-20 (axial); 20-40 (lateral)
Maximum scan diameter, mm	15	7
Tissue penetration, mm	10	1-2.5

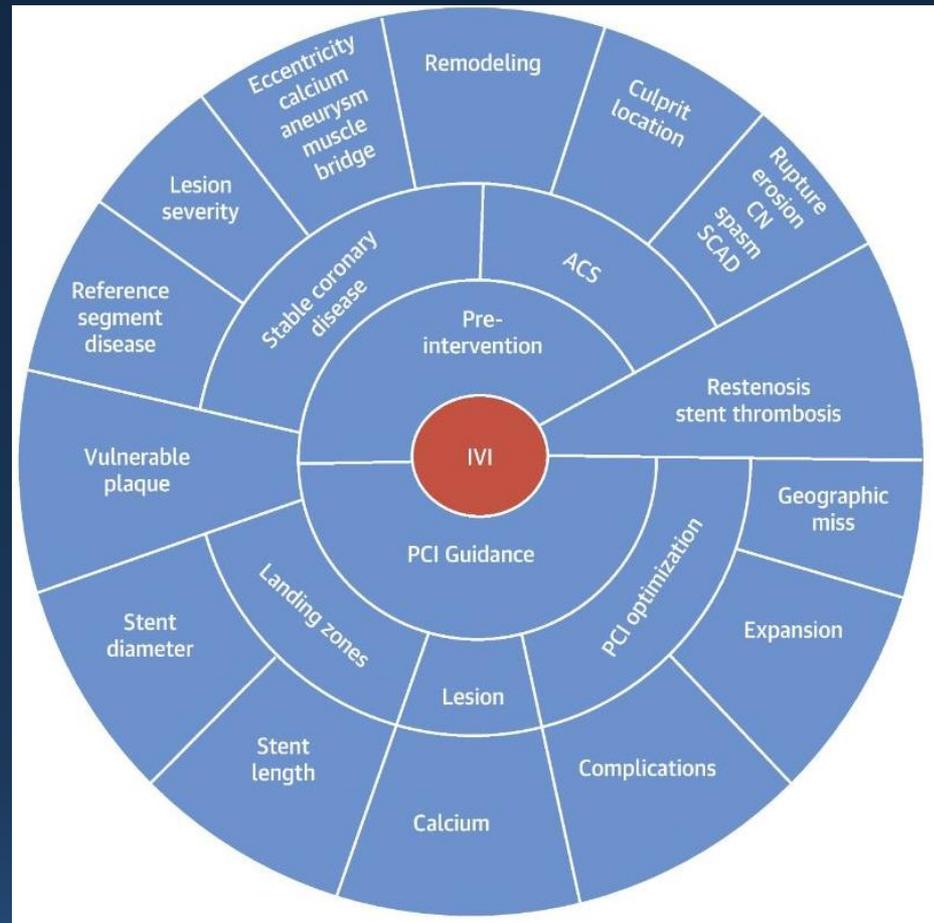
Intravascular ultrasound	Imaging characteristics	Optical coherence tomography
	● Plaque burden	●
●	● Calcium severity	●
	● Large vessel imaging	●
	● Aorto-ostial disease	●
	● Stent sizing (EEM)	●
	● Stent Expansion	●
●	● Malapposition	●
●	● Stent edge dissection	●
●	● Tissue protrusion	●
●	● Stent deformation	●
●	● Thrombus	●



why is intravascular imaging?



why is intravascular imaging?



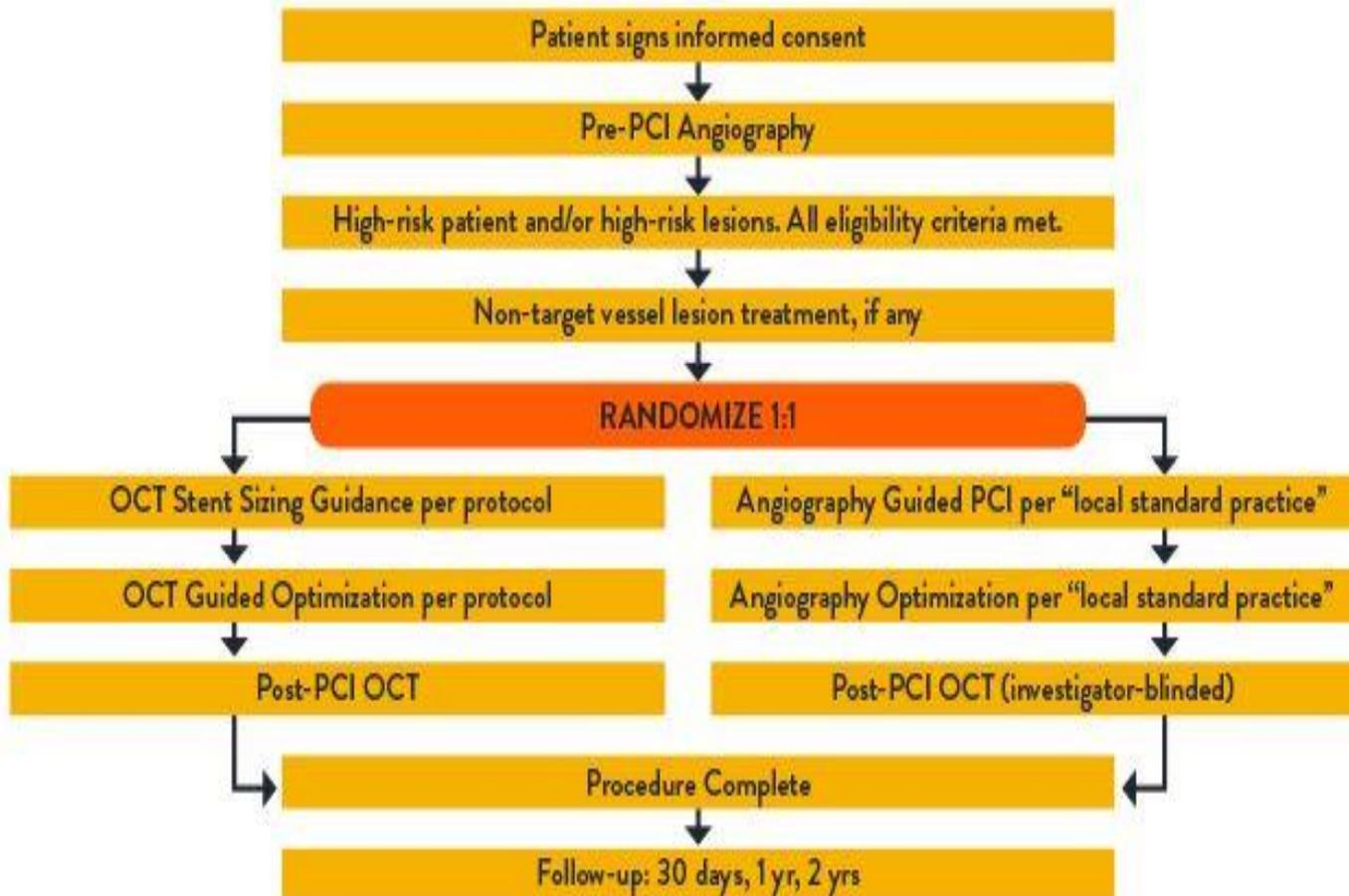
They provide tomographic or cross-sectional images of the Coronary that include the lumen, vessel wall, plaque burden, plaque composition and distribution, and even peri-vascular structures—information promised, but rarely provided angiographically.

Intravascular imaging improved clinical outcomes?

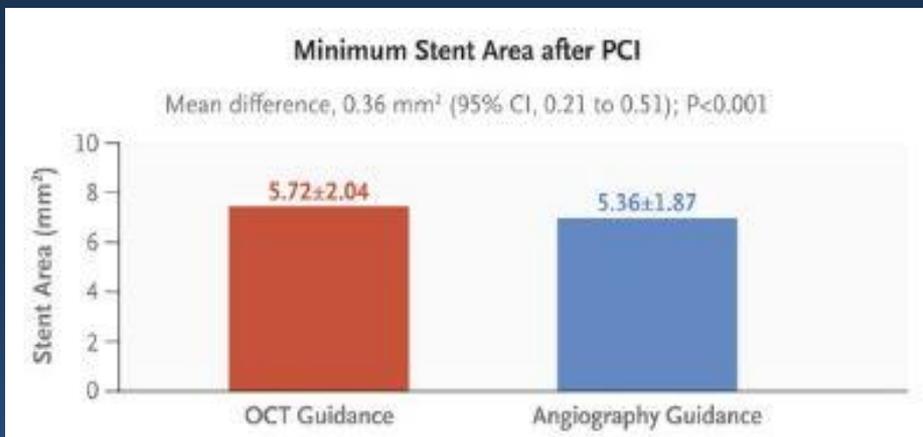
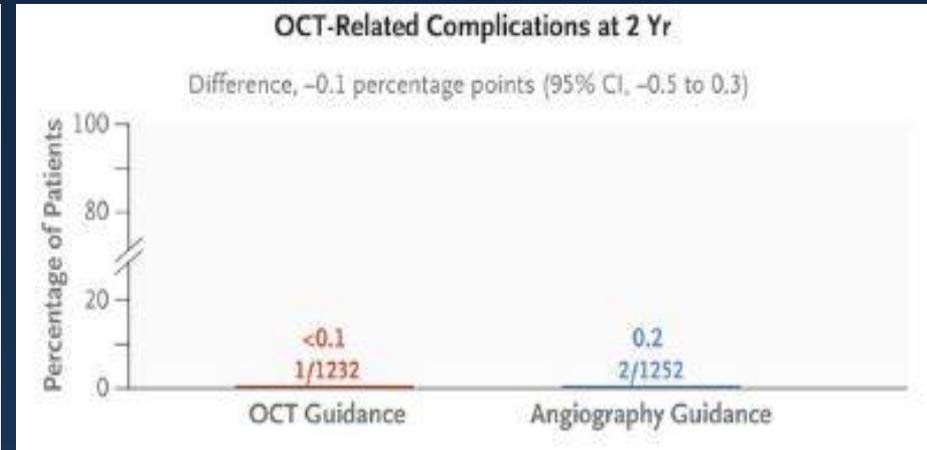
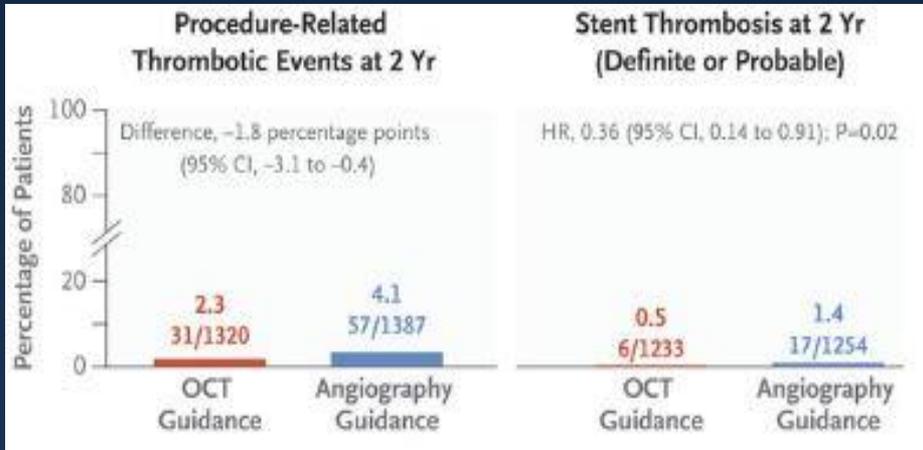
ILUMIEN IV trial

#ESCCongress

OCT versus angiography



Intravascular imaging improved clinical outcomes?



Conclusion

Optical coherence tomography (OCT)-guided percutaneous coronary intervention (PCI) leads to a larger minimum stent area but does not reduce the 2-year rate of target vessel failure compared with angiography-guided PCI.



Intravascular imaging improved clinical outcomes?

OCTOBER trial

#ESCCongress

OCT-guided or angiography-guided PCI in complex bifurcation lesions

Enrollment

Angiographic inclusion criteria:

- Native coronary bifurcation de novo lesion
- $\geq 50\%$ stenosis in MV
- $\geq 50\%$ SB stenosis within 5 mm from SB ostium
- Reference size ≥ 2.75 mm in MV and ≥ 2.5 mm in SB
- Objective evidence of MV territory myocardial ischaemia if stenosis is $< 80\%$ in angiography

Angiographic exclusion criteria:

- Severe tortuosity
- CTO with indication for treatment
- Massive thrombus in LMCA
- Medina 0.0.1, 0.1.0, 1.1.0 and 1.0.0 lesions

Screen failure registry

Randomization 1:1
1200 patients

OCT guiding

Systematic treatment protocol

"Standard guiding"

Angiographic guiding
(IVUS optional)

30-day clinical follow up

1-year clinical follow up

Primary endpoint: Combined endpoint of median two-year MACE for superiority
(cardiac death, target lesion myocardial infarction, ischaemic driven target lesion revascularization)

3-year clinical follow up

4-year clinical follow up

5-year clinical follow up

10-year all-cause mortality

Intravascular imaging improved clinical outcomes?

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)

Intravascular imaging improved clinical outcomes?

Primary endpoint

Major adverse cardiac events (MACE), defined as a composite of cardiac death, target lesion myocardial infarction, and ischaemia-driven target lesion revascularisation, after 2 years



Rate%

10.1%



14.1%

Kaplan-Meier estimated hazard ratio 0.70
95% CI 0.50-0.98
p=0.035

Secondary endpoints

Differences in secondary clinical endpoints after 2 years did not reach statistical significance, but the trial was not powered for these endpoints

All-cause mortality



=
VS.



2.4%

4.0%

Hazard ratio 0.56
95% CI 0.28-1.10

Cardiac death



=
VS.



1.4%

2.6%

Hazard ratio 0.53
95% CI 0.22-1.25

Target lesion myocardial infarction



=
VS.



7.8%

8.5%

Hazard ratio 0.90
95% CI 0.60-1.34

Target lesion revascularisation



=
VS.



3.1%

5.0%

Hazard ratio 0.63
95% CI 0.35-1.15

Conclusion

In patients with complex bifurcation lesions, optical coherence tomography (OCT)-guided percutaneous coronary intervention (PCI) is associated with better outcomes after 2 years than angiography-guided PCI.

Intravascular imaging improved clinical outcomes?

Intravascular Imaging-Guided or Angiography-Guided Complex PCI

Study Design

RENOVATE-COMPLEX-PCI Trial (NCT03381872)

1,620 Patients with Complex Coronary Artery Lesions Undergoing PCI

* Definition of Complex Coronary Artery Lesions

- ① True bifurcation (Median 1,1,1/1,0,1/0,1,1) with side branch ≥ 2.5 mm
- ② Chronic total occlusion (≥ 3 months) as target lesion
- ③ PCI for unprotected left main disease
- ④ Implanted stent length ≥ 38 mm
- ⑤ Multivessel PCI (≥ 2 vessels treated at one PCI session)
- ⑥ Multiple stent needed (≥ 3 more stent per patient)
- ⑦ In-stent restenosis lesion as target lesion
- ⑧ Severely calcified lesion (encircling calcium in angiography)
- ⑨ Ostial lesion in LAD, LCX, and RCA

Randomization (2:1) for Treatment Strategy of Target Lesions
(Stratified by acute coronary syndrome and participating centers)

Imaging-Guided Strategy

N = 1,080

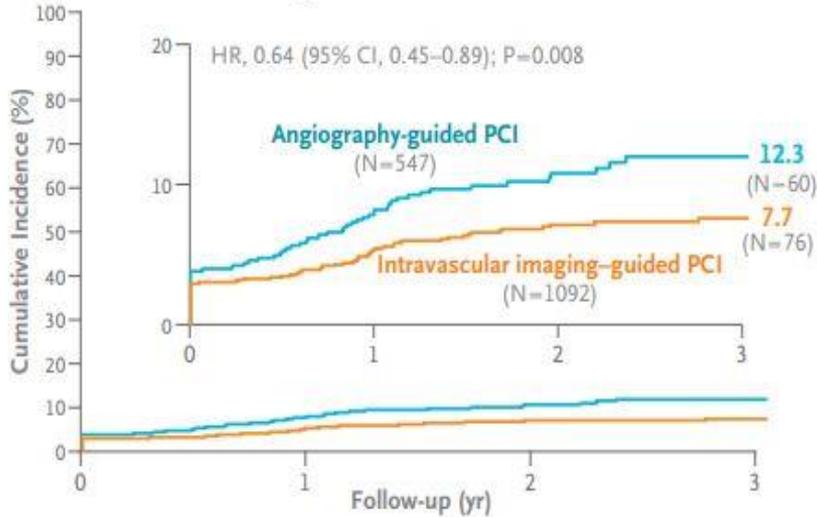
Angiography-Guided Strategy

N = 540

All patients were followed until 1 year after last patient enrollment.

Intravascular imaging improved clinical outcomes?

Target-Vessel Failure at 3 Yr



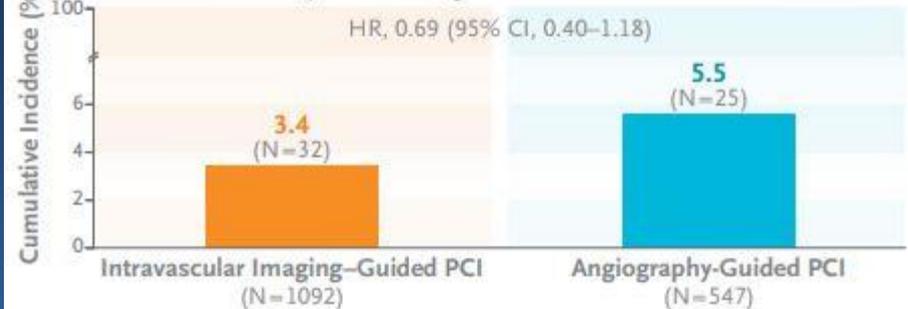
Death from Cardiac Causes



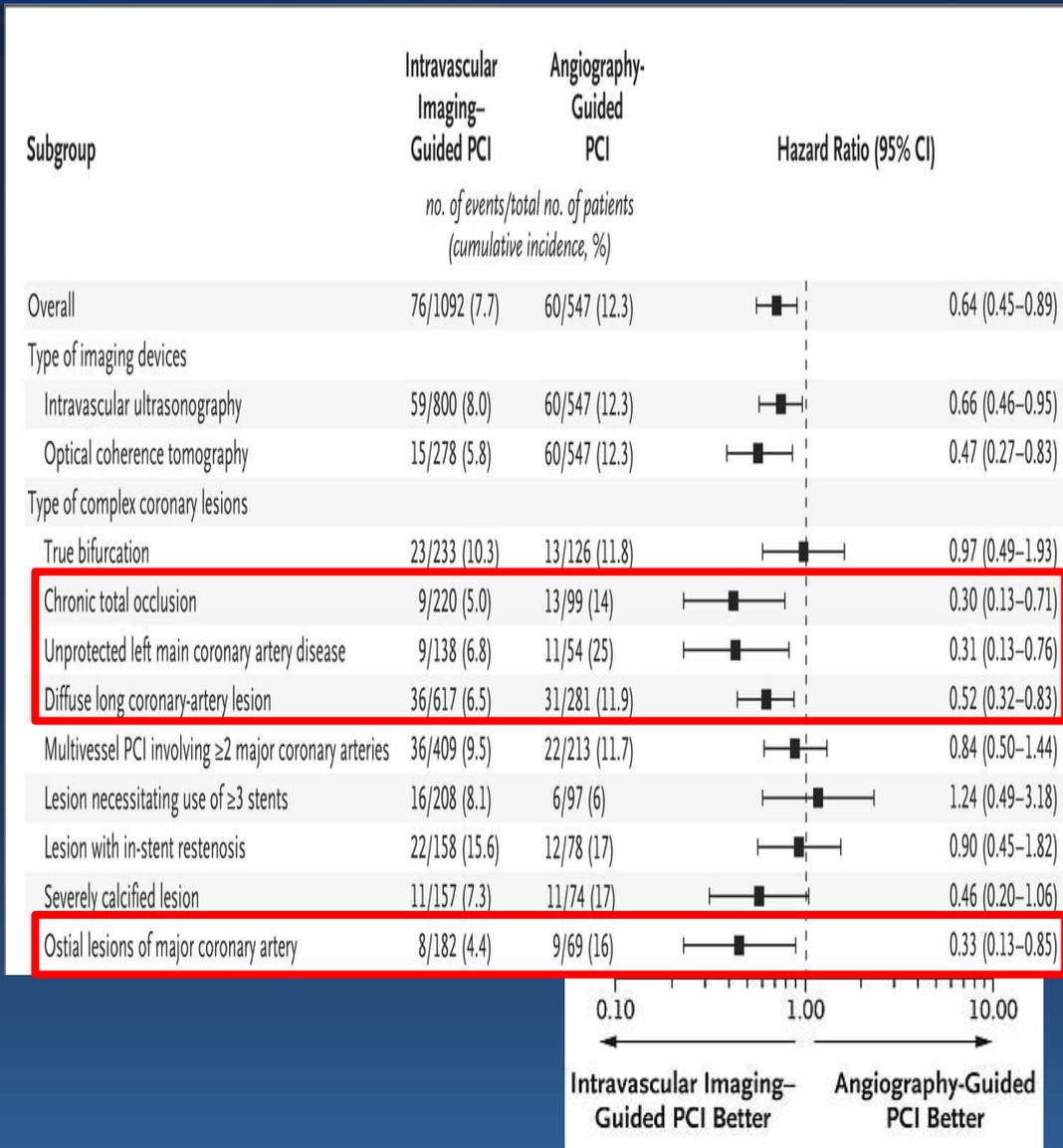
Target-Vessel-Related Myocardial Infarction



Clinically Driven Target-Vessel Revascularization

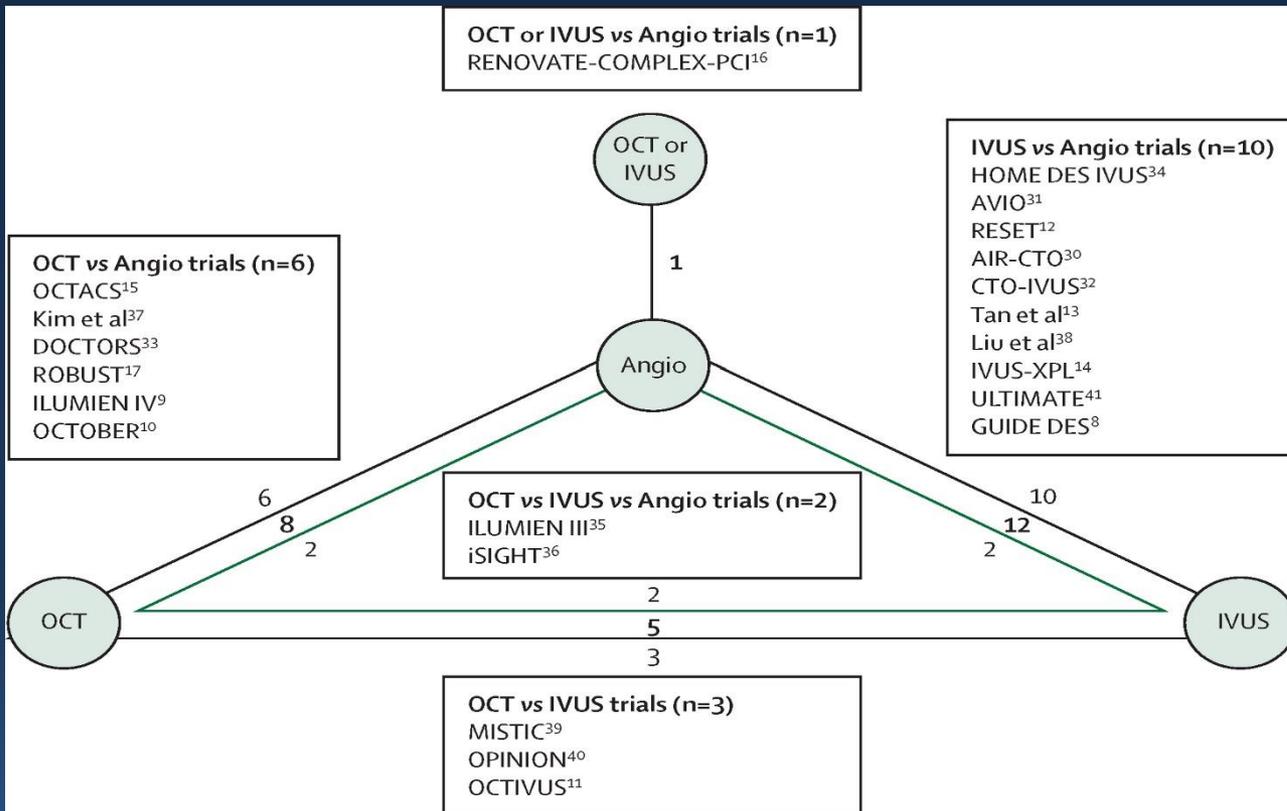


Intravascular imaging improved clinical outcomes?



Intravascular imaging improved clinical outcomes?

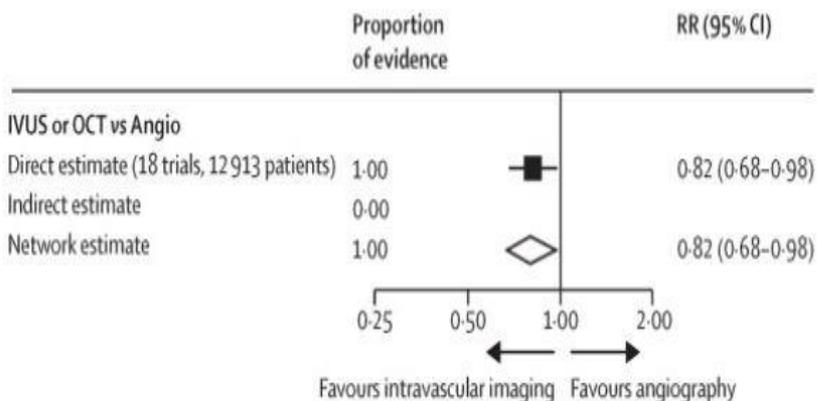
Intravascular imaging-guided coronary drug-eluting stent implantation: an updated network meta-analysis



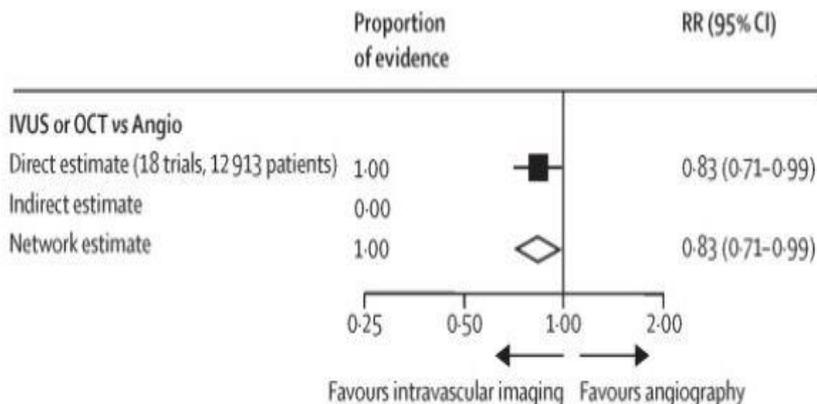
22 RCT trial, 15,964 patient enrolled

Intravascular imaging improved clinical outcomes?

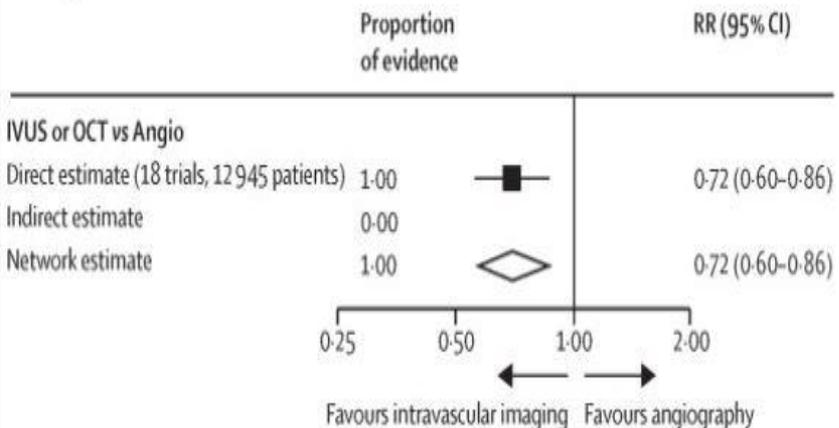
A Target vessel-myocardial infarction



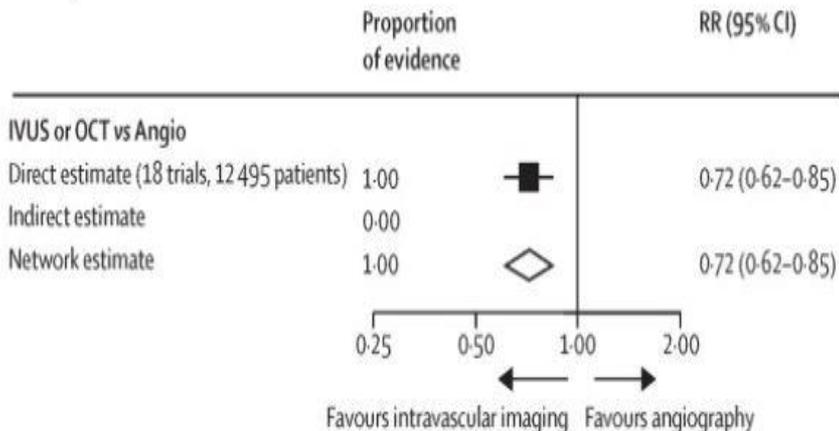
B All myocardial infarction



A Target lesion revascularisation

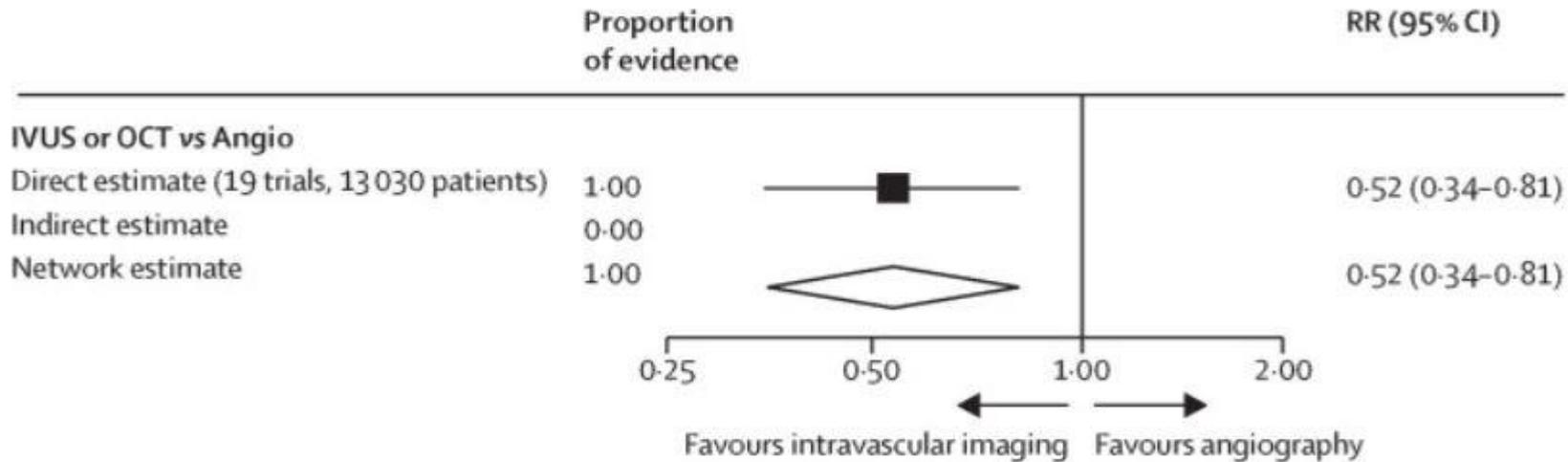


B Target vessel revascularisation



Intravascular imaging improved clinical outcomes?

A Stent thrombosis (definite or probable)



Intravascular-imaging-guided PCI **improves clinical outcomes** compared with angiography-guided PCI in patients.

Which is better IVUS or OCT?

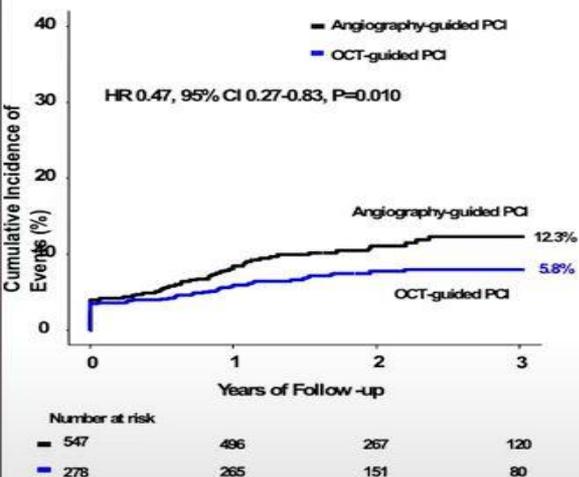
➤ RENOVATE-COMPLEX PCI trial

Procedural characteristics

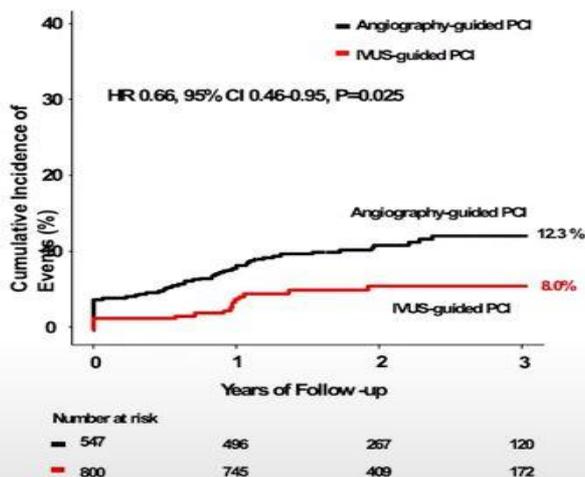
Total no. of target lesions treated	1.5±0.7	1.5±0.7	1.5±0.7
Intravascular imaging device used — no./total no. (%)‡	1091/1639 (66.6)	1078/1092 (98.7)	13/547 (2.4)
Intravascular ultrasonography	813/1091 (74.5)	800/1078 (74.2)	13/13 (100)
Optical coherence tomography	278/1091 (25.5)	278/1078 (25.8)	0/13

OCT-guided PCI vs. IVUS-guided PCI vs. Angiography-PCI

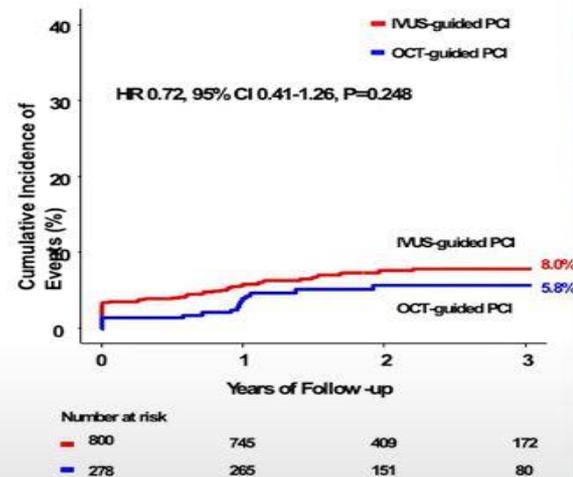
OCT-guided PCI vs. Angiography-guided PCI



IVUS-guided PCI vs. Angiography-guided PCI



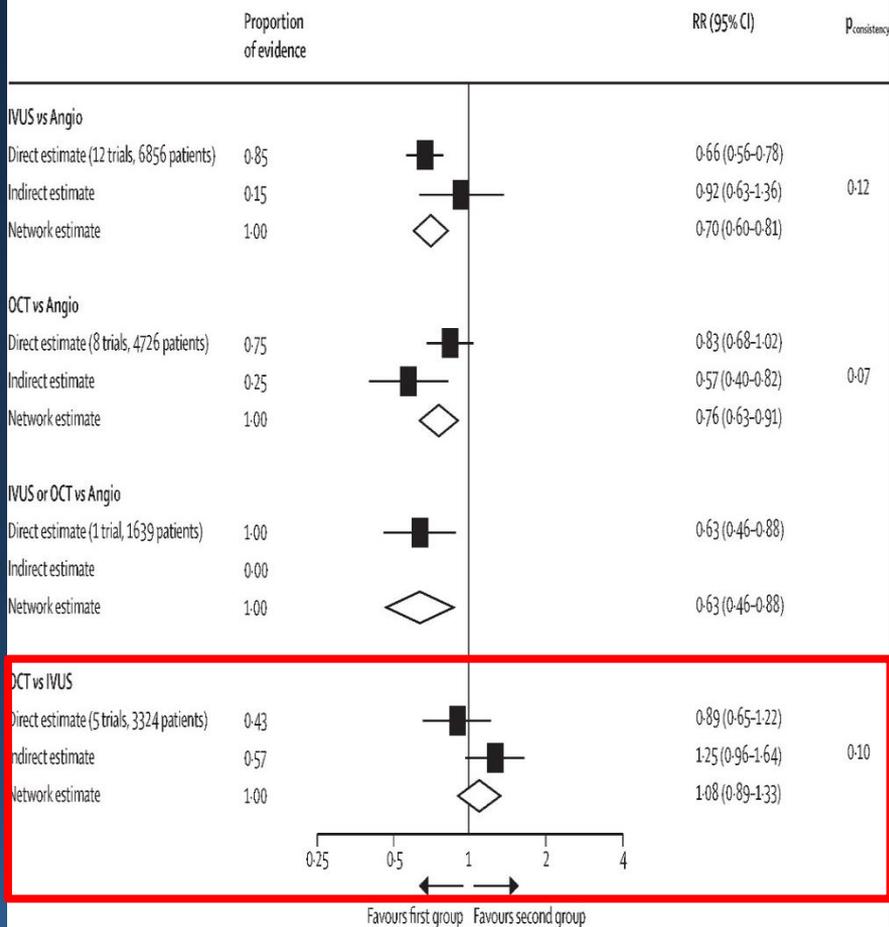
OCT-guided PCI vs. IVUS-guided PCI



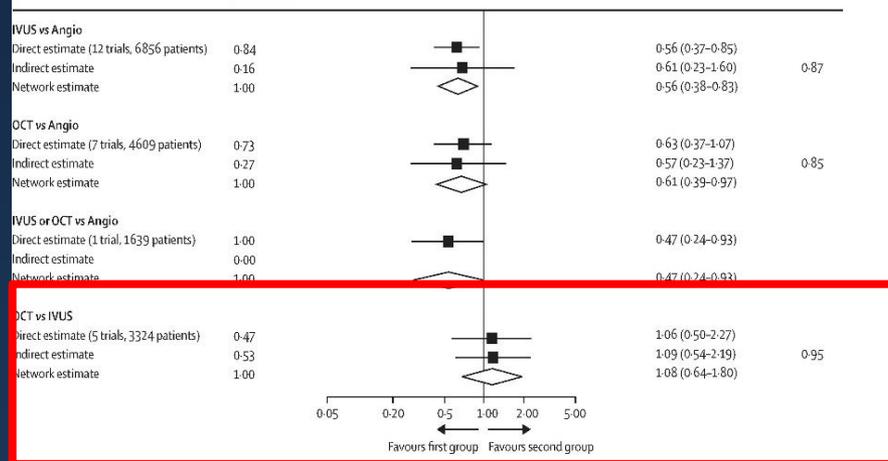
Which is better IVUS or OCT?

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

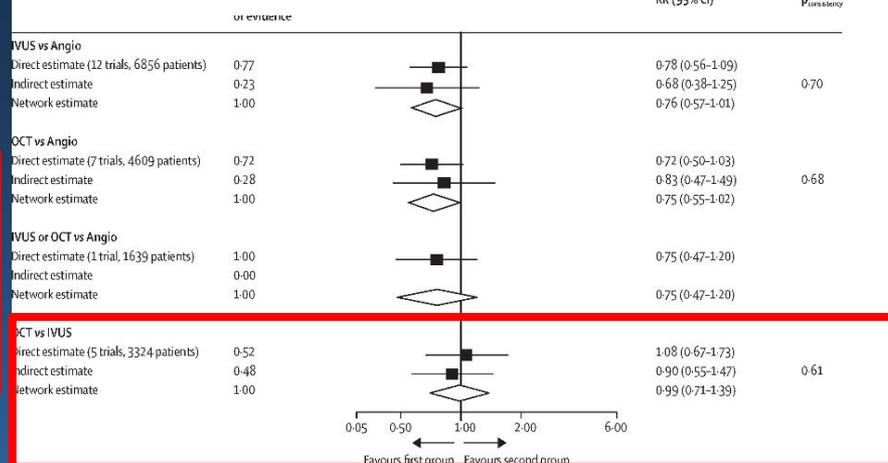
Target lesion failure



Cardiac death

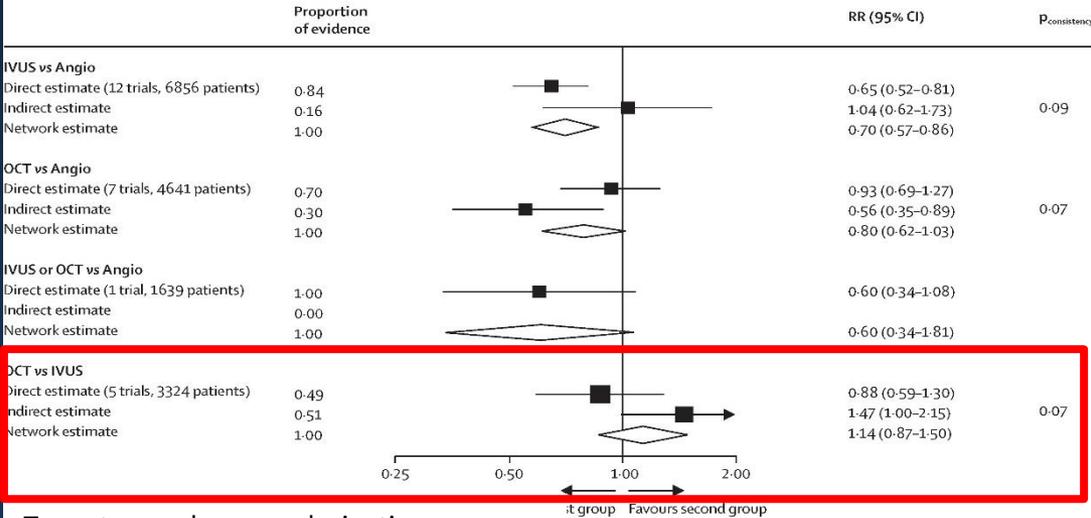


All cause death

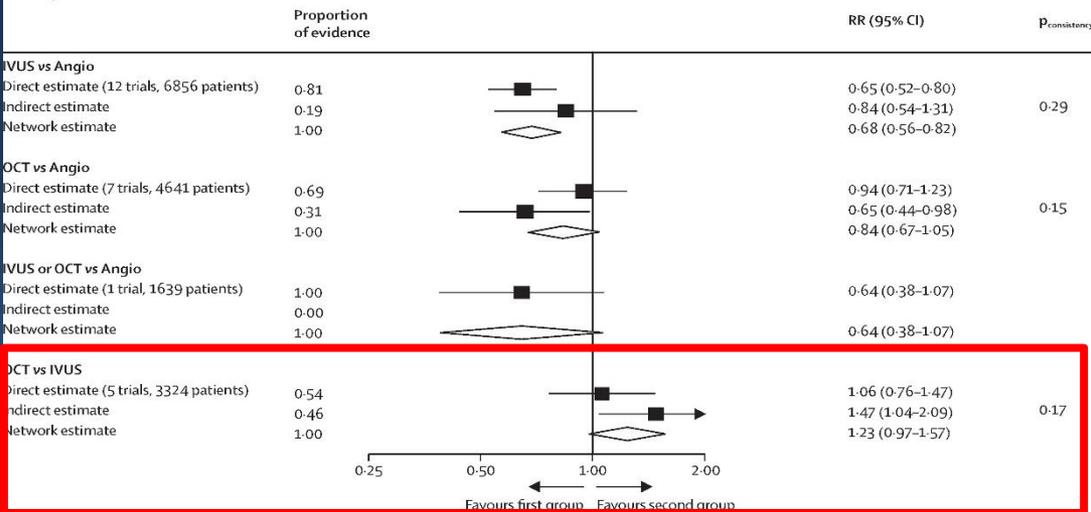


which is better IVUS or OCT?

Target vessel MI



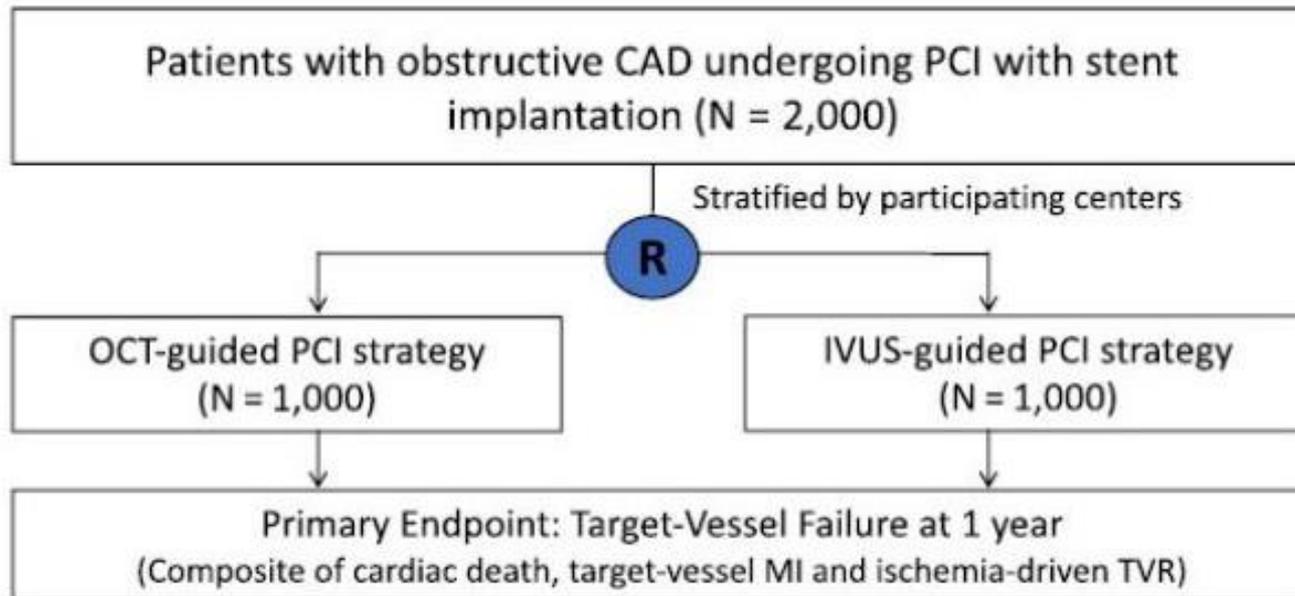
Target vessel revascularization



which is better IVUS or OCT?

Optical Coherence Tomography versus Intravascular Ultrasound
Guided Percutaneous Coronary Intervention

OCTIVUS Trial



which is better IVUS or OCT?

Primary endpoint

Composite of death from cardiac causes, target vessel myocardial infarction or ischaemia-driven target vessel revascularisation at 1 year, which was powered for noninferiority of the OCT group as compared with the IVUS group (noninferiority margin, 3.1 percentage points)



Rate%

2.5%



3.1%

risk difference, -0.6 percentage points
upper boundary of the one-sided
97.5% CI 0.97; $p < 0.001$ for noninferiority

Safety endpoints

Incidence of contrast-induced nephropathy
was similar



=



1.4%

1.5%

Incidence of major procedural complications
was lower with



vs.



$p = 0.048$

2.2%

3.7%

Conclusion

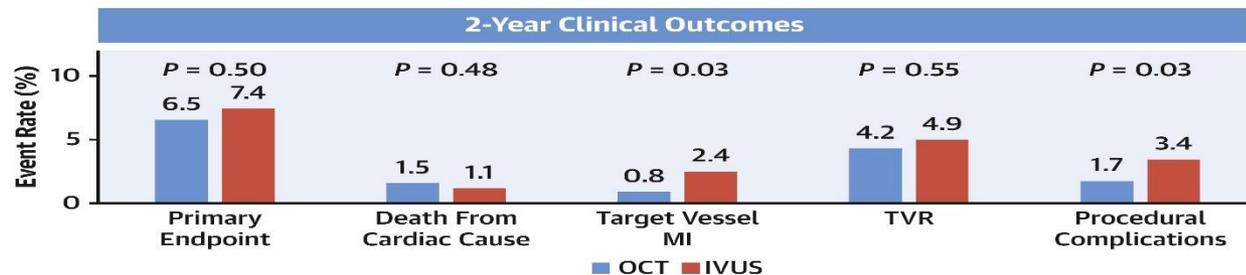
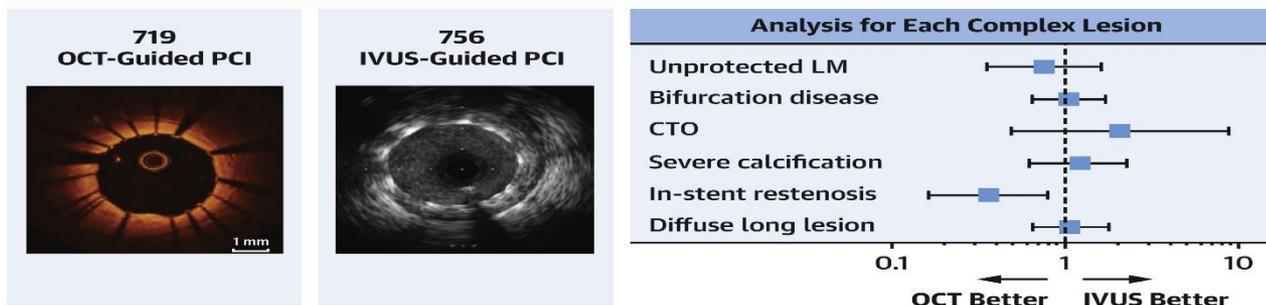


Optical coherence tomography (OCT) is non-inferior to intravascular ultrasound (IVUS) for guiding percutaneous coronary intervention (PCI) in patients with diverse coronary artery lesions.

which is better IVUS or OCT?

CENTRAL ILLUSTRATION: Optical Coherence Tomography- vs Intravascular Ultrasound-Guided Percutaneous Coronary Intervention for Complex Coronary Artery Disease

1,475 Patients With Complex Coronary Lesions in the OCTIVUS Trial



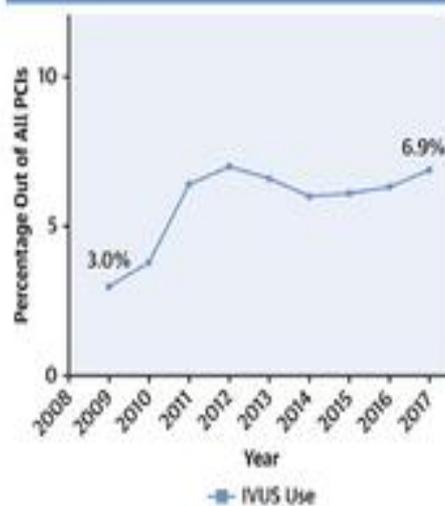
Kang D-Y, et al. J Am Coll Cardiol. 2024;83(3):401-413.

Compared with angiography guidance, intravascular imaging guidance of coronary stent implantation with OCT or intravascular ultrasound enhances both the **safety and effectiveness** of PCI.

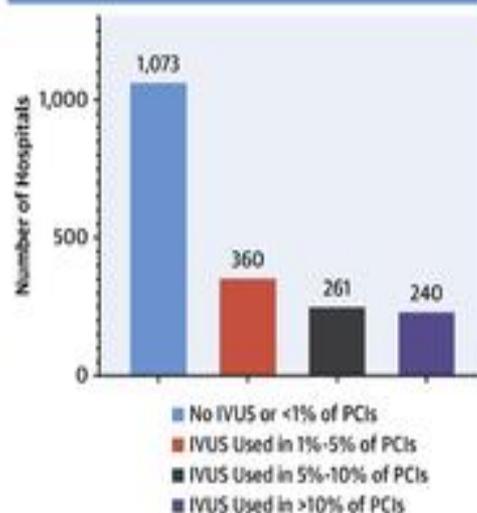
Limitation: Intravascular Imaging guided PCI

	2014 K-PCI (n=44,967)	2016 K-PCI (n=48,823)
Use of IVUS, n(%)	12,846(28.6)	13,418(27.5)

A Trend of IVUS Use in PCI Over the Study Period



B Variability in IVUS Utilization Across U.S. Hospitals



Limitation: Intravascular Imaging guided PCI

- Longer-procedure time
- Procedure-oriented complications:
No reflow, iatrogenic coronary dissection,
and distal embolization
- Higher cost

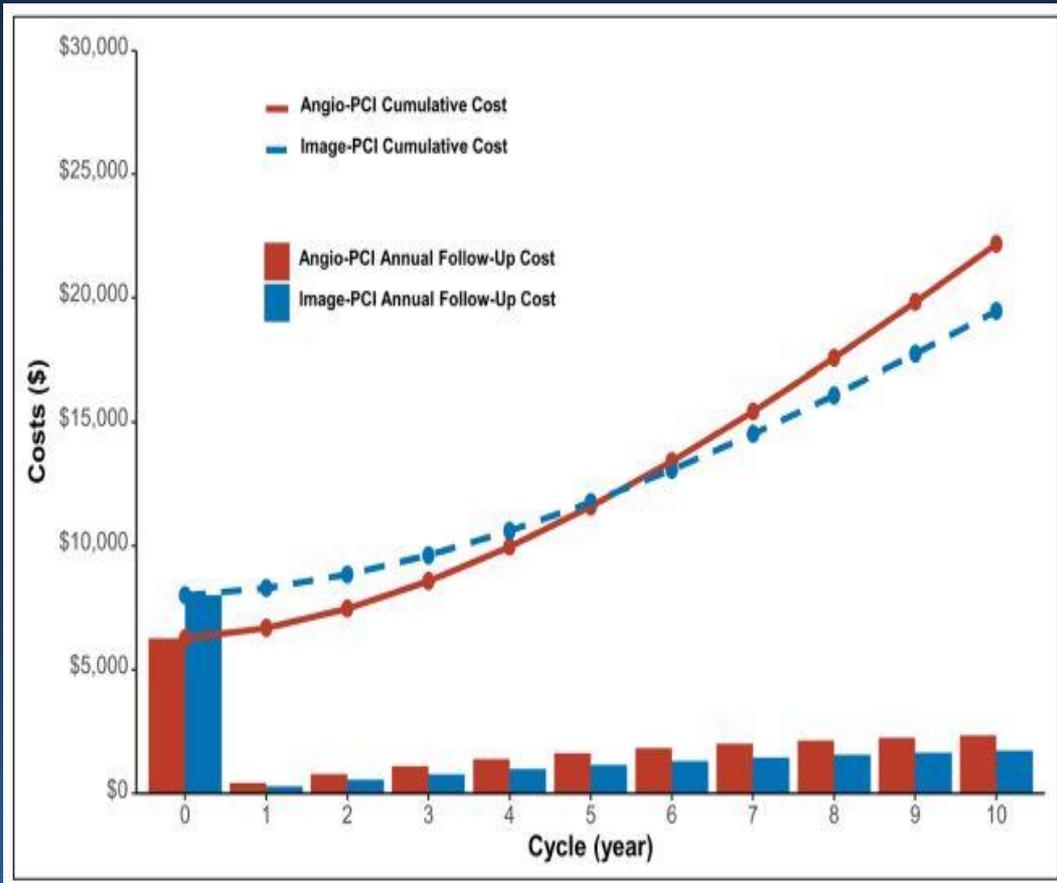
Limitation: Intravascular Imaging guided PCI

- Longer-procedure time
- Procedure-oriented complications:
No reflow, iatrogenic coronary dissection,
and distal embolization
- **Higher cost**

Cost Effectiveness

Cost-Effectiveness of Intravascular Imaging-Guided Complex PCI: Prespecified Analysis of RENOVATE-COMPLEX-PCI Trial

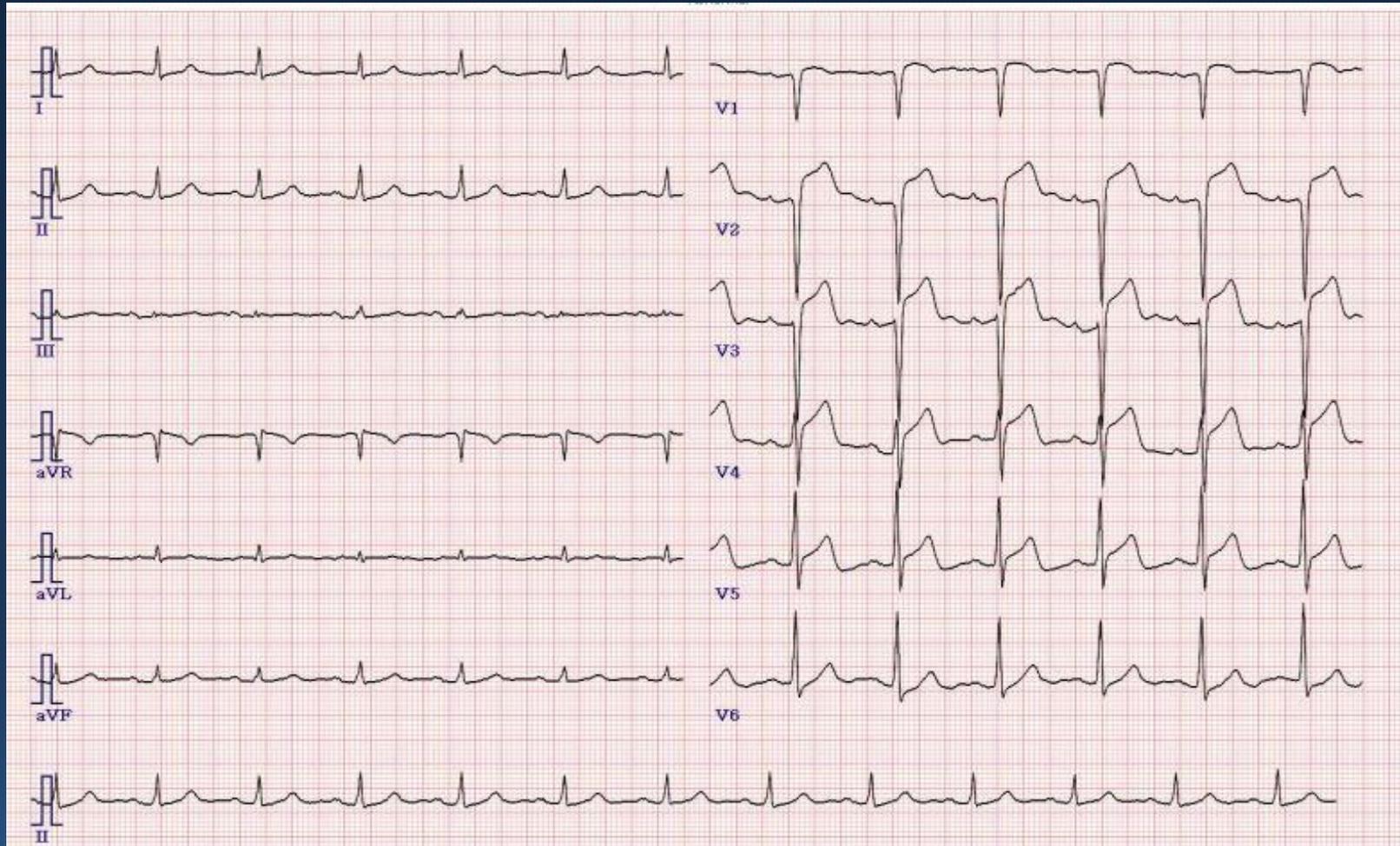
Transition probability	RENOVATE-COMPLEX-PCI	Meta-analysis of 20 trials
	HR (95% CI)	OR (95% CI)
Death		
All-cause death after PCI	Probability in image-PCI: 0.021; Angio-PCI: 0.035	0.90 (0.69–1.17)
	0.71 (0.44–1.15)	
All-cause death after MI	Probability in image-PCI: 0.213; Angio-PCI: 0.300	0.90 (0.69–1.17)
	0.71 (0.44–1.15)	
Spontaneous MI	Probability in image-PCI: 0.007; Angio-PCI: 0.015	0.79 (0.63–0.99)
	0.66 (0.23–1.90)	
Target vessel revascularization	Probability in image-PCI: 0.016; Angio-PCI: 0.028	0.61 (0.52–0.72)
	0.69 (0.40–1.18)	
Cost, \$*		
Medical cost at index hospitalization	Image-PCI: 8005 (6352–8998); Angio-PCI: 6269 (4594–7337)	
Medical cost at event		
Death from any cause	9235 (7543–10 928) ²⁶	
Spontaneous MI	7338 (7111–7564) ²⁶	
Target vessel revascularization	7292 (6988–7595) ²⁶	



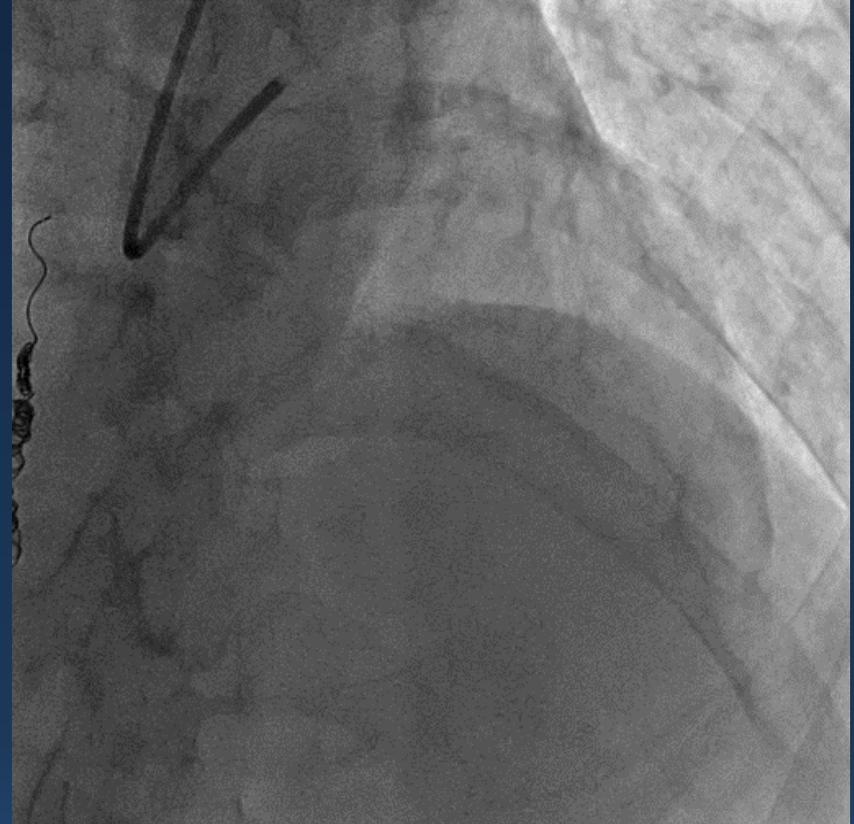
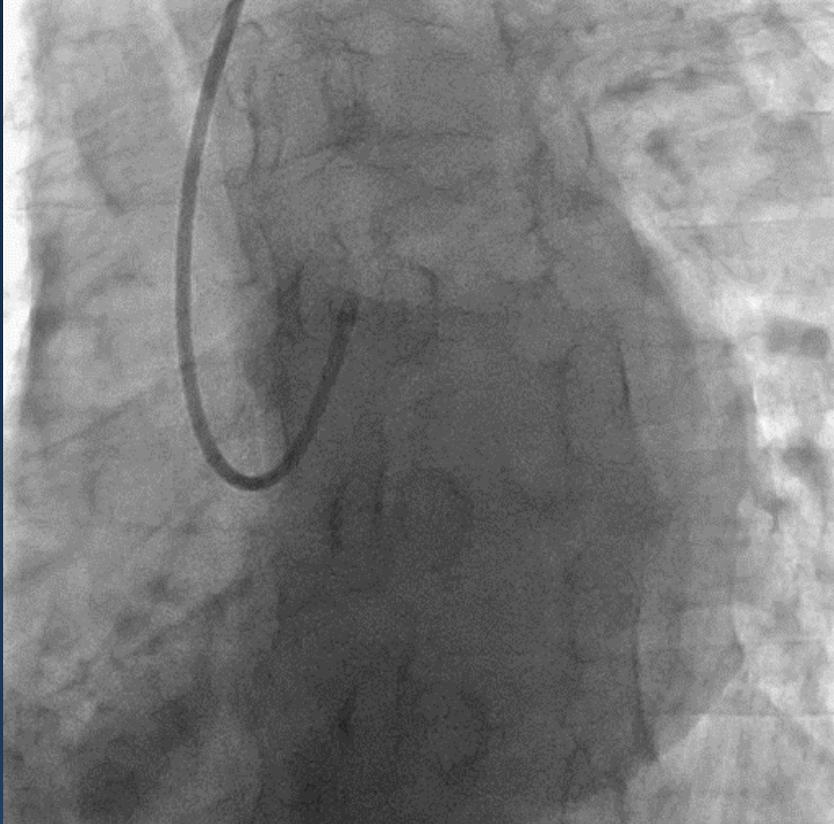
CASE

- **Male / 66**
- **C/C: Chest pain**
- **PHx : DM/HTN(+/+)**
- **Current smoker(+)**

CASE



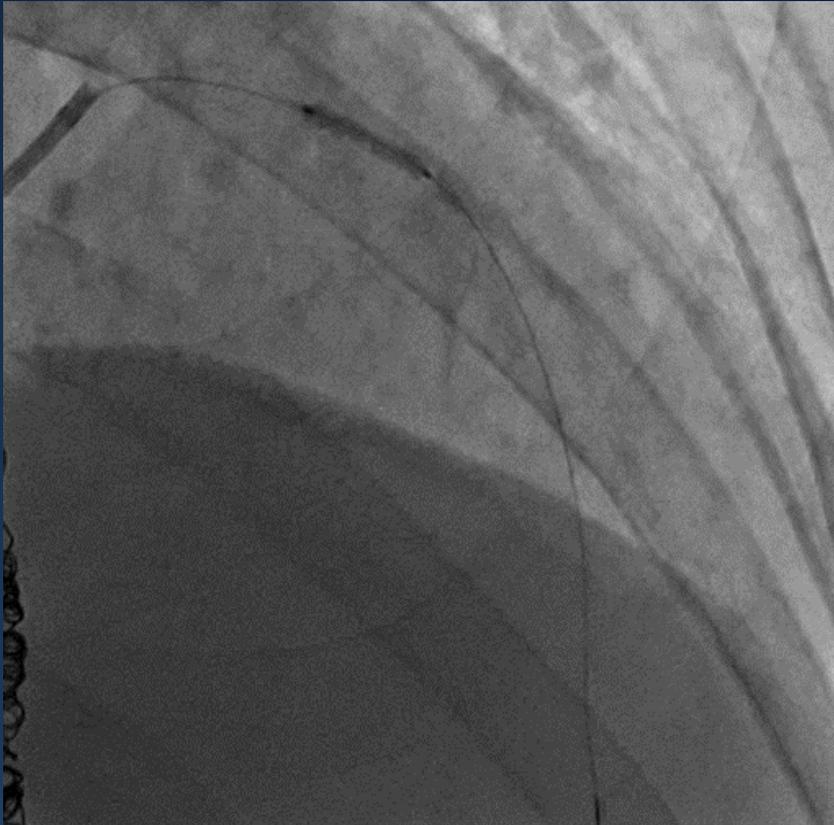
CASE



Left main : 50% stenosis

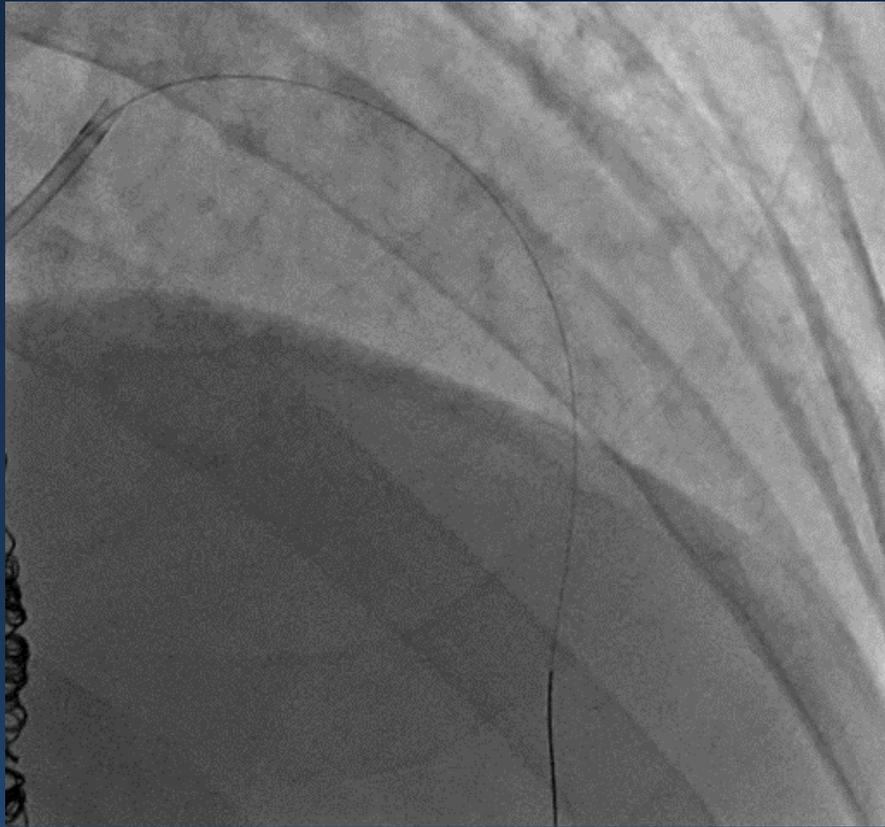
LAD : pLAD Total occlusion, TIMI 0

CASE

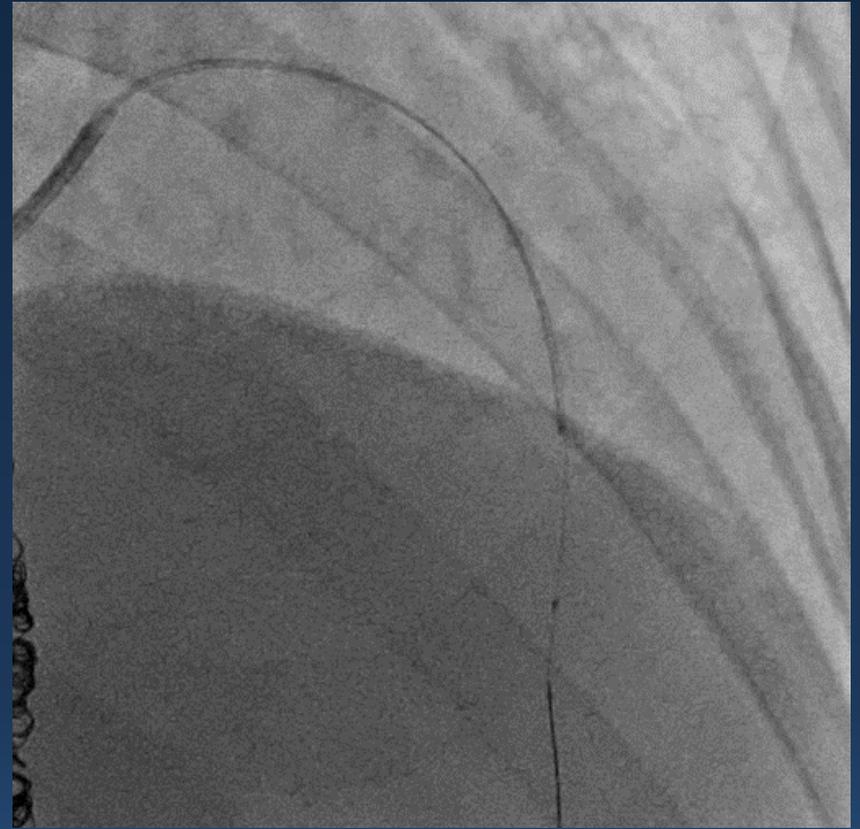


2.5/15mm Semi compliant balloon
Thrombus aspiration
Abciximab IC injection

CASE

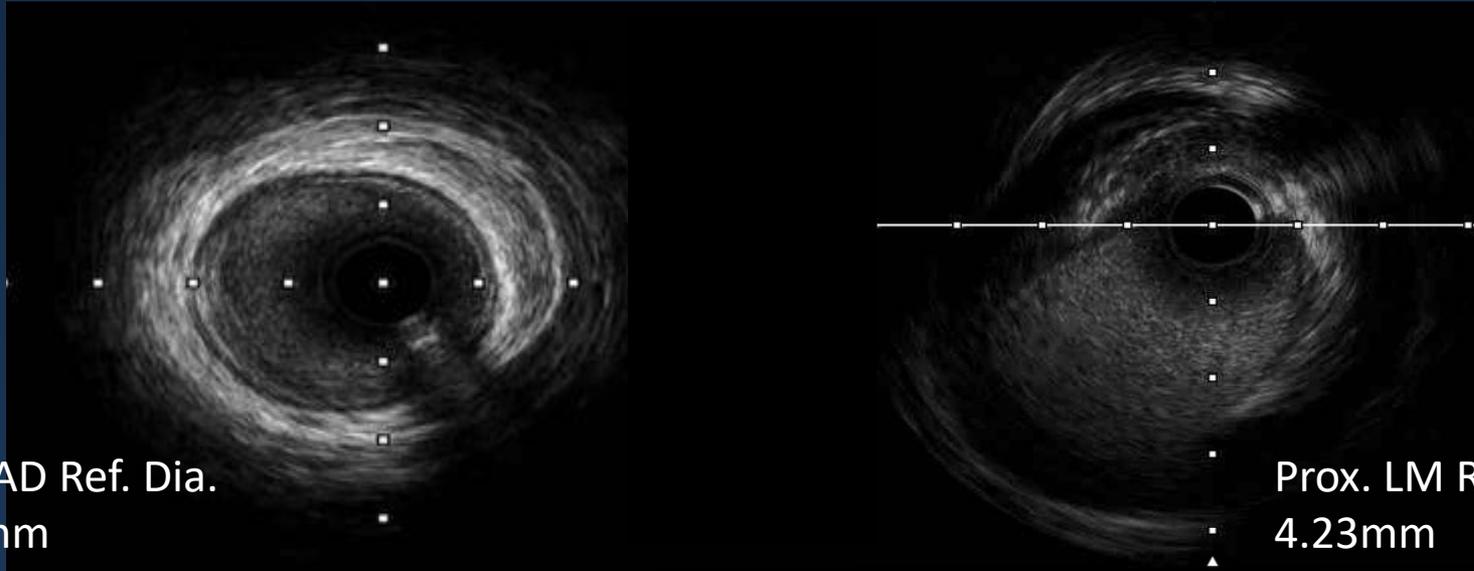


Diffuse LAD+LM lesion



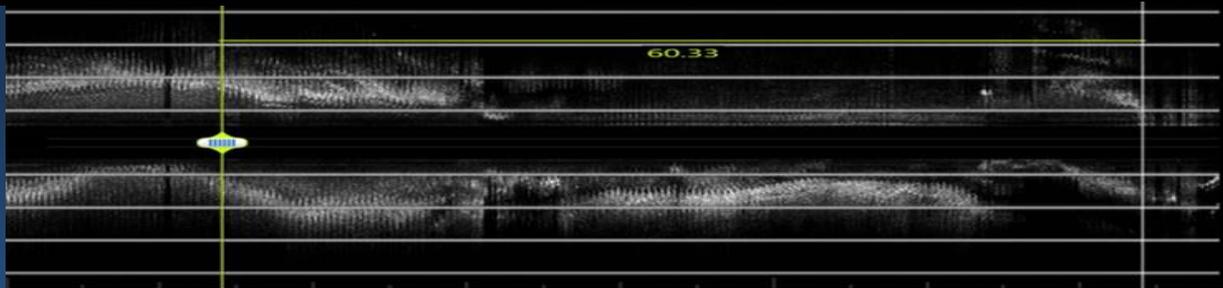
IVUS

CASE



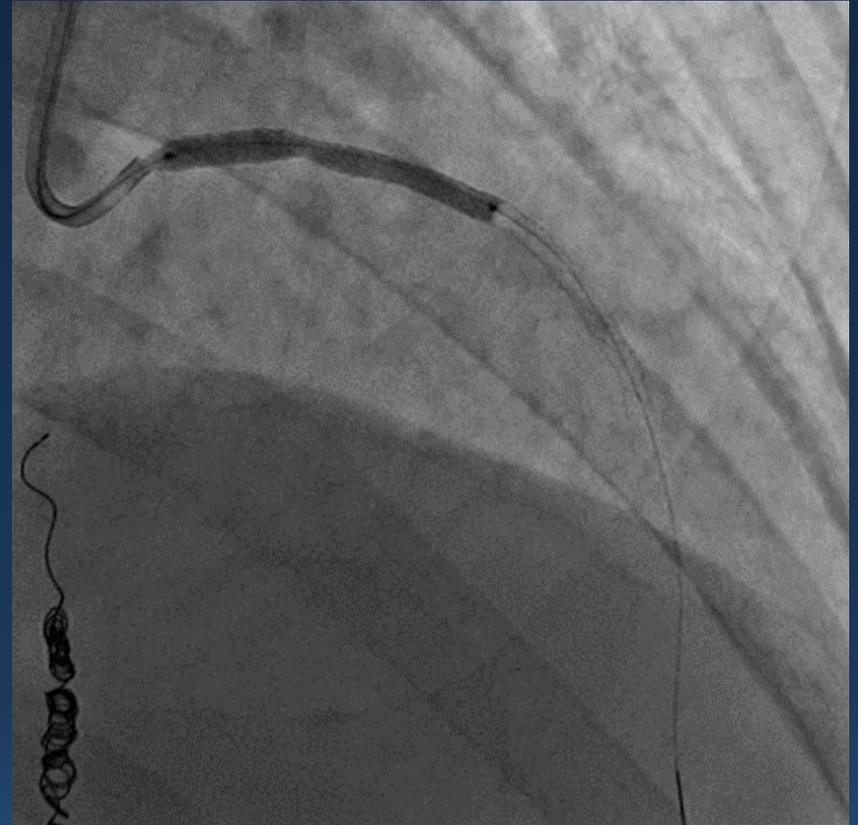
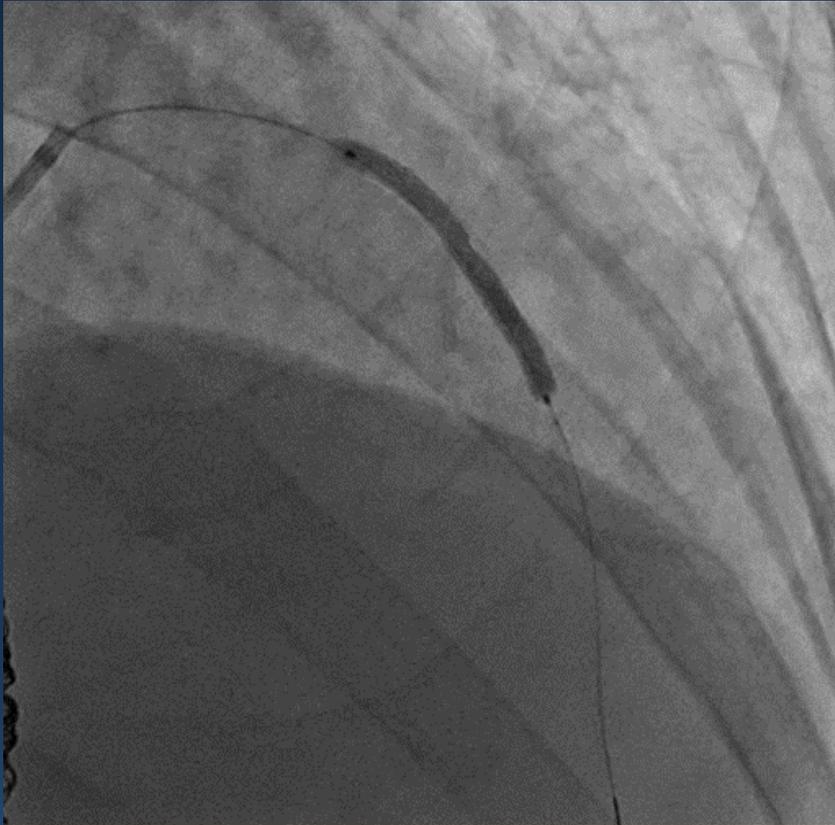
Dis. LAD Ref. Dia.
3.14mm

Prox. LM Ref. Dia.
4.23mm



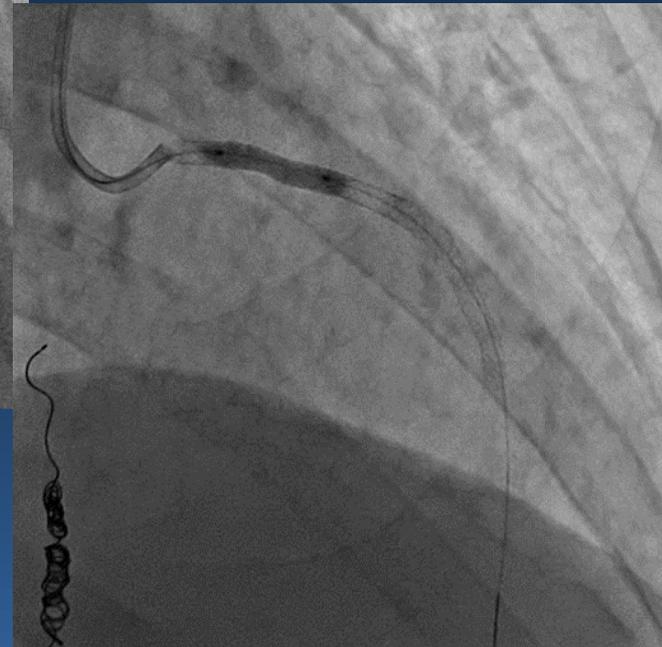
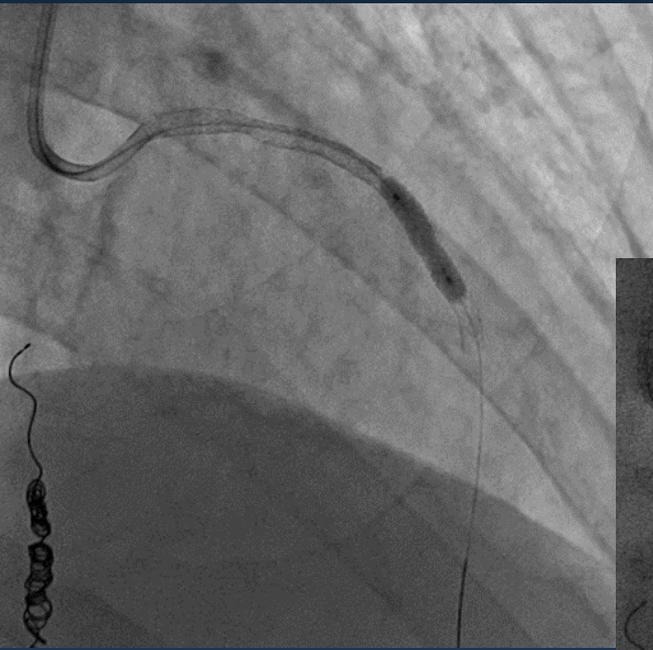
Length : 60.33mm

CASE



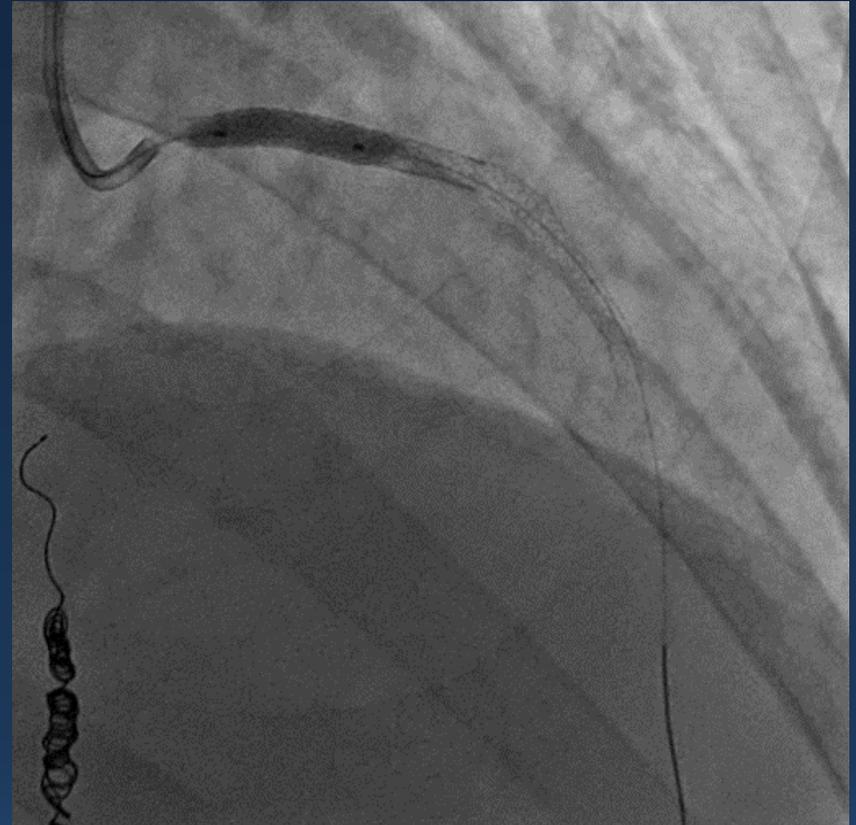
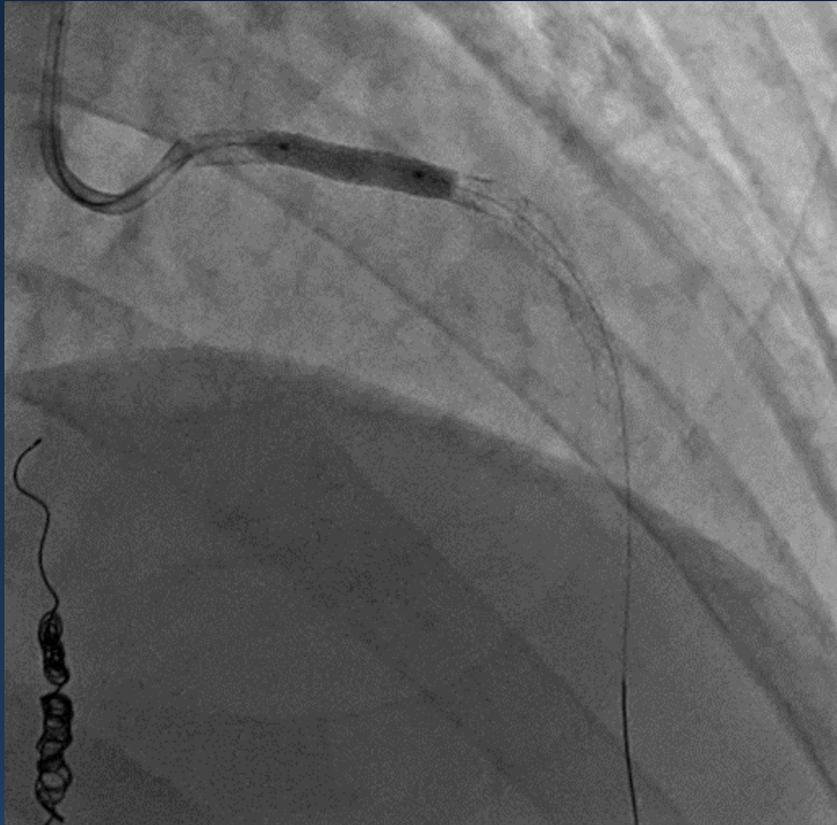
DES 3.0/32mm + DES 4.0/32mm in mLAD to LM

CASE



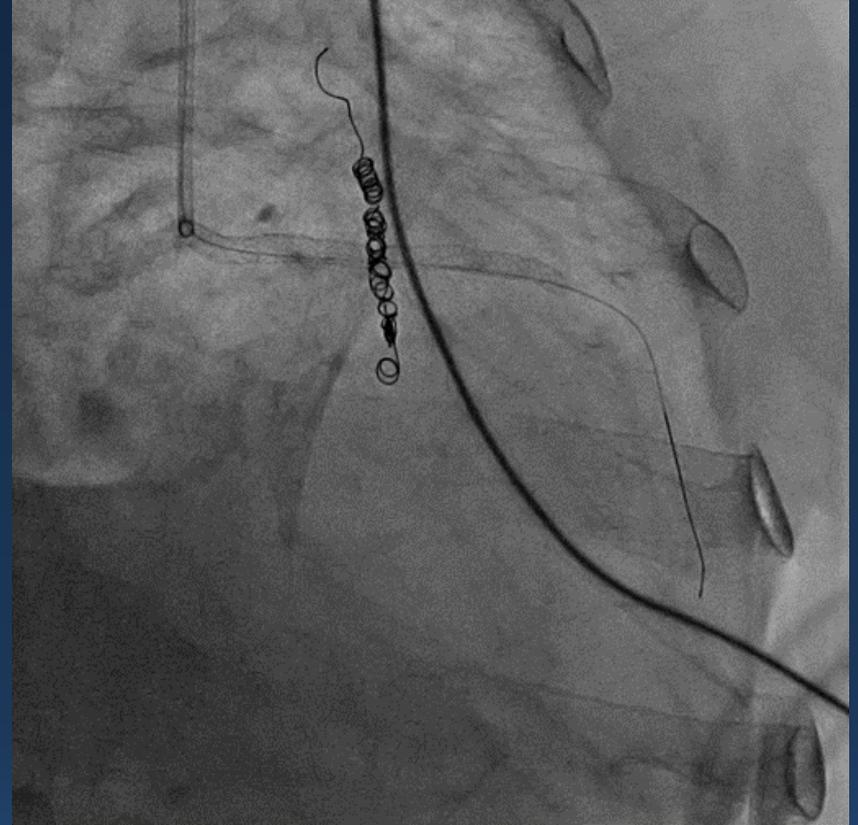
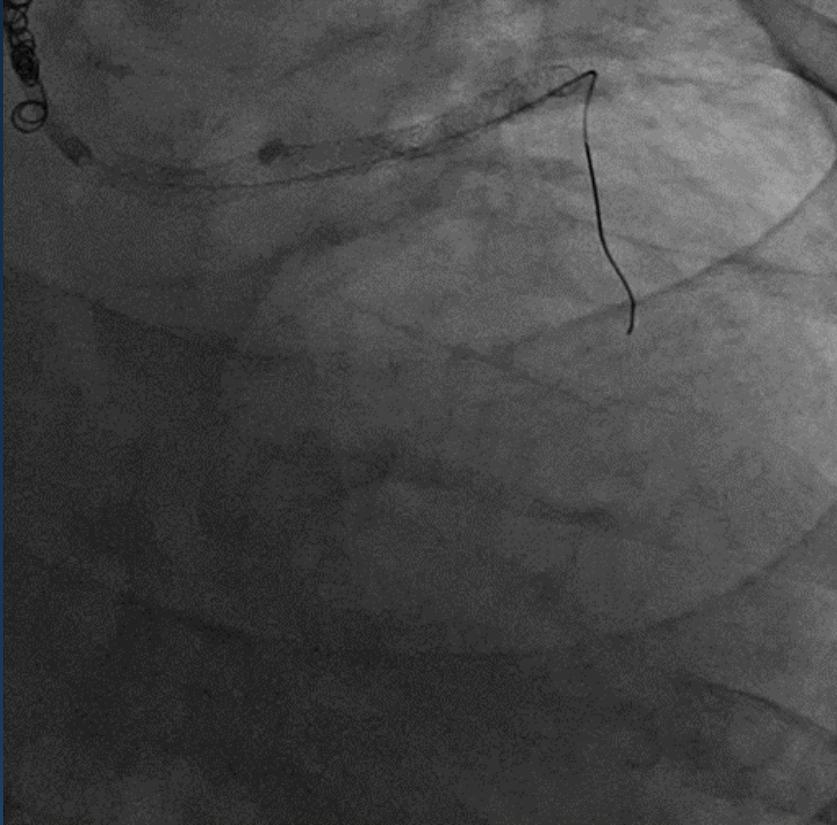
Adjunctive balloon : NC 3.5/15mm in m-pLAD

CASE



Adjunctive balloon : NC 4.0/15mm up 20 atm in pLAD to LM

CASE

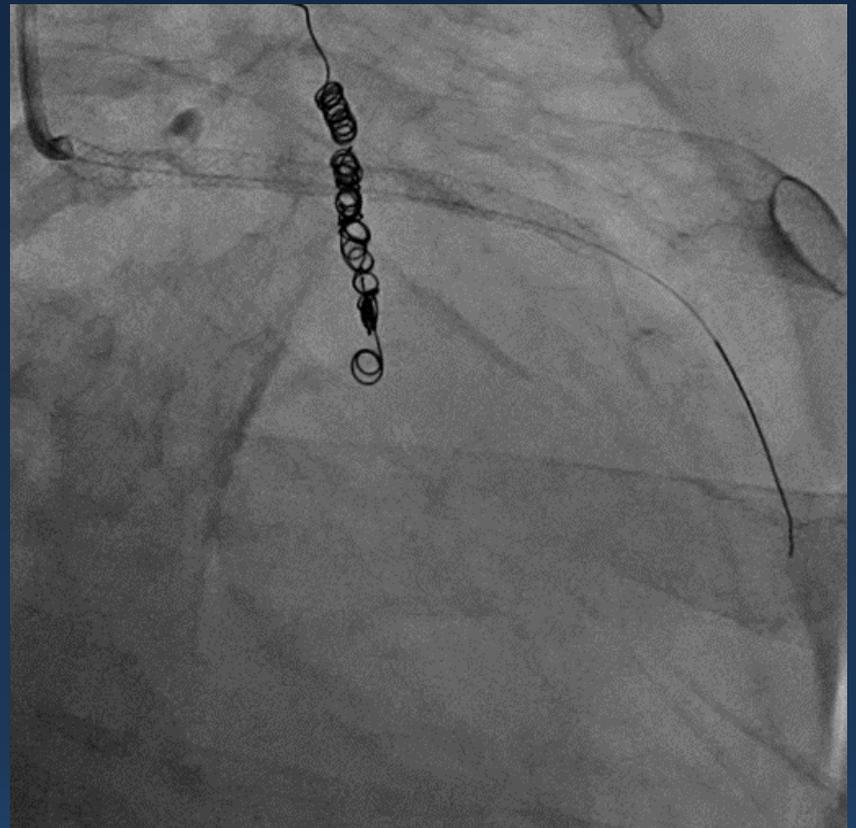


pLAD perforation (Ellis type III cavity spilling)

CASE



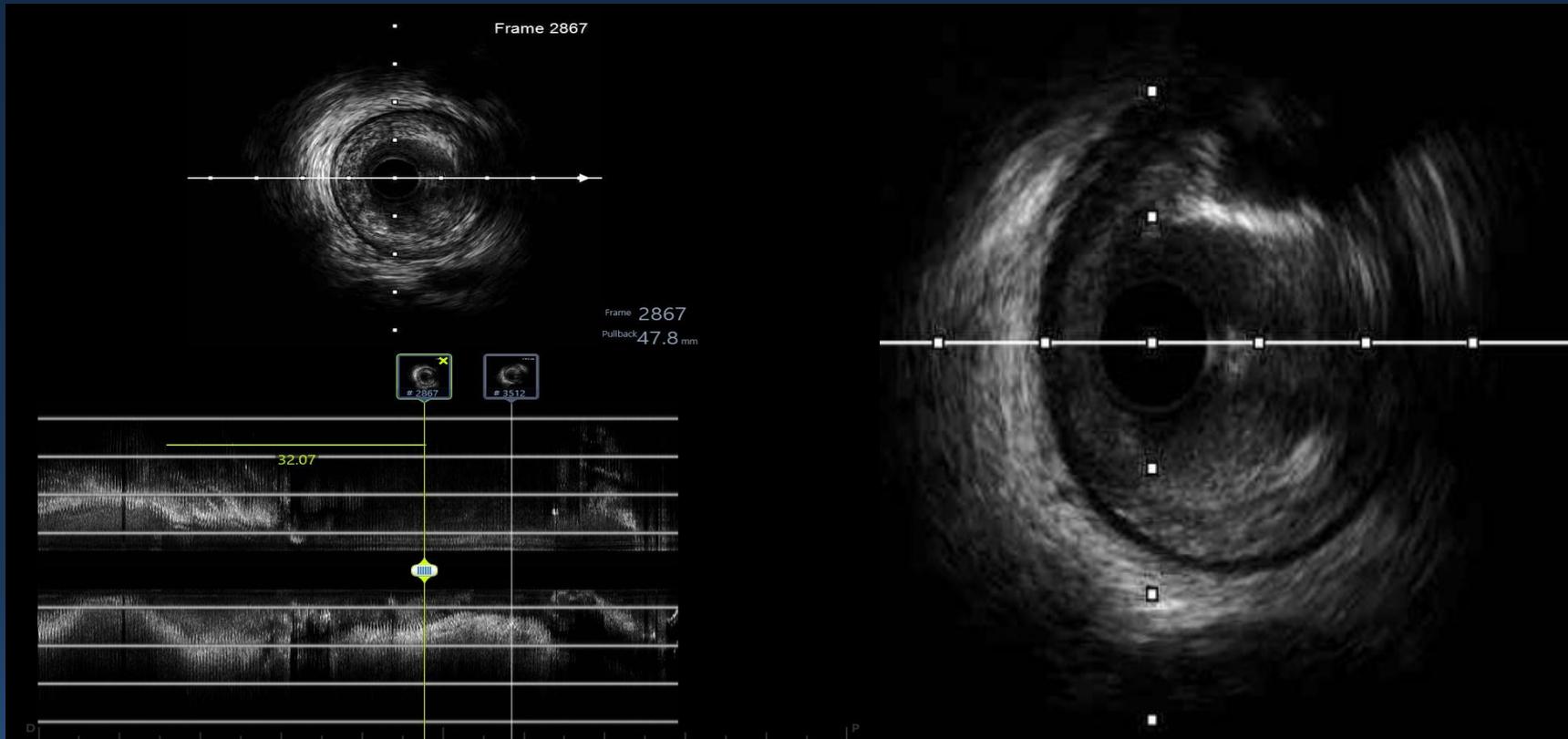
NC balloon 4.0/15mm
balloon tamponing



CS emergency op.

CASE

Oversizing of Stent & Adjunctive balloon Ignore calcification



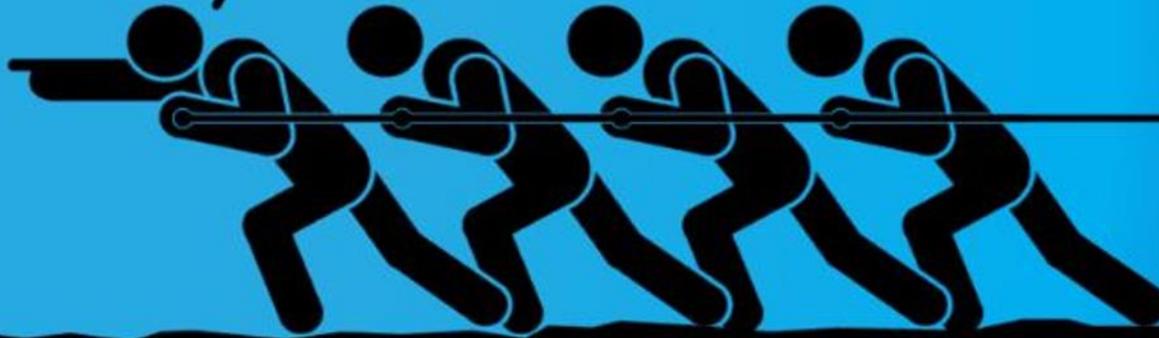
Overlap site ~ pLAD mean Ref. Dia. 3.6mm

Conclusion

- Intravascular-imaging improves clinical outcomes
- > Image **correct interpretation** is an important

Facilitator

"Let's Go!"



Improve clinical
outcomes

THANK YOU FOR YOUR ATTENTION

