

Imaging-Guided Optimization in Complex PCI

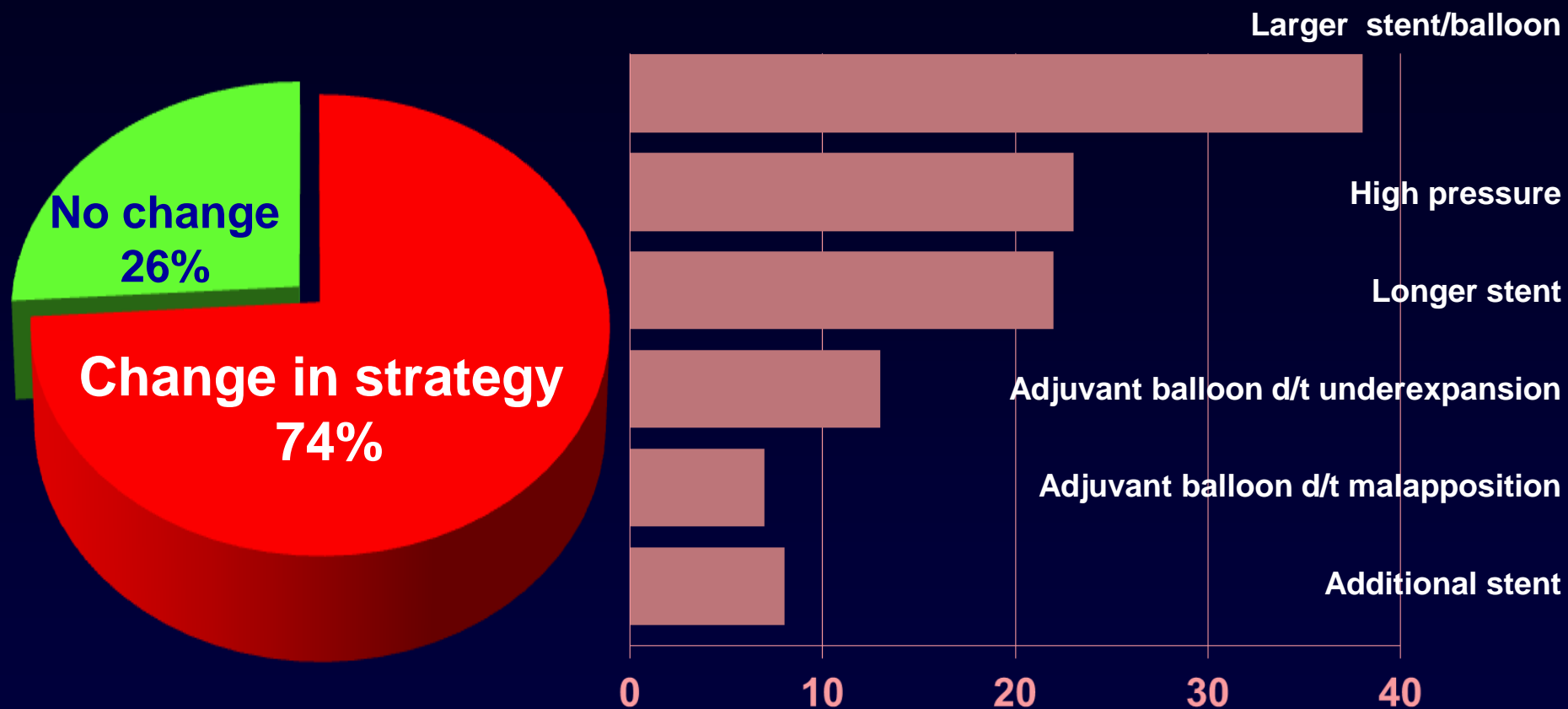
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Conflict of Interest

- I have nothing to disclose

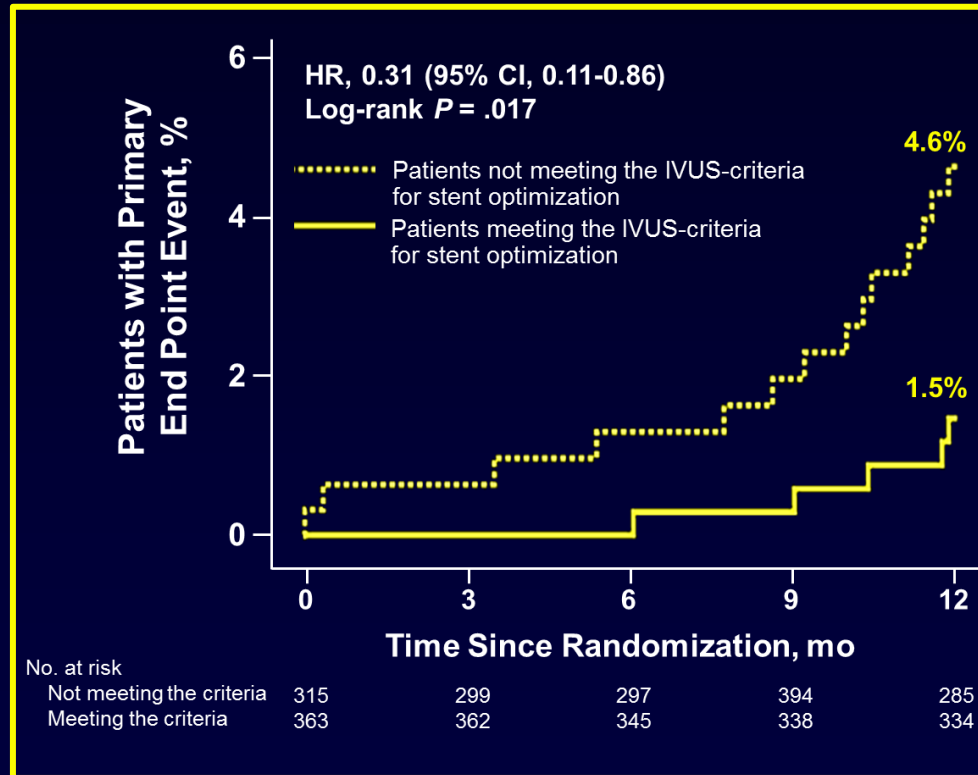
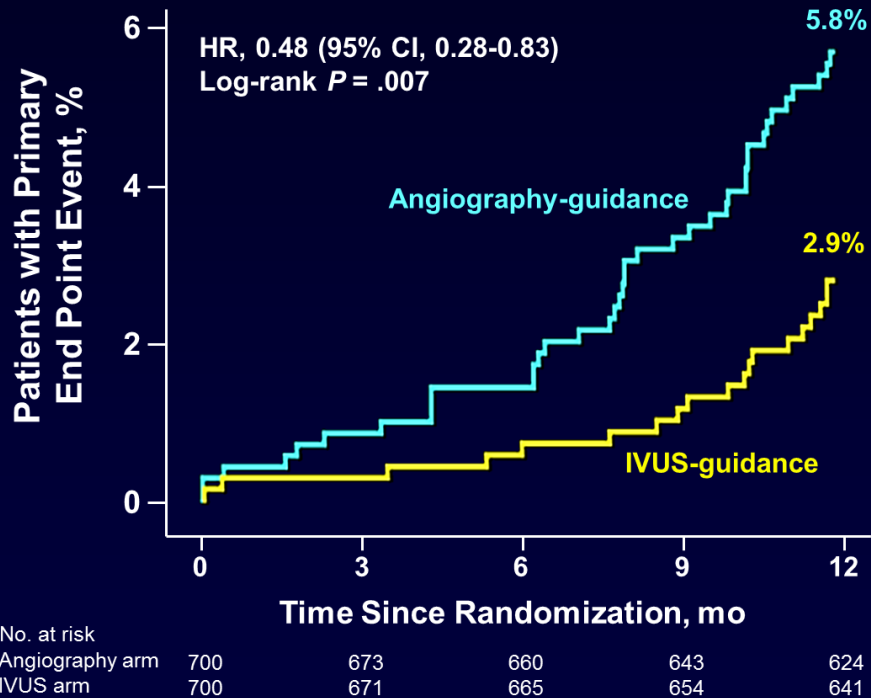
How the IVUS information influenced the procedure? From ADAPT-DES Study



Witzenbichler B et al. Circulation. 2014;129:463-470

Diffuse long lesion: IVUS-XPL randomized trial

MACE: Cardiac death, MI, or TLR at 1 year

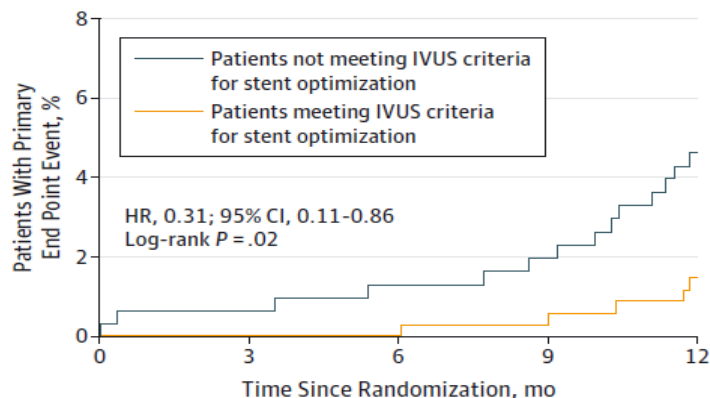


Hong SJ, Hong MK (corresponding author), et al. *JAMA* 2015;314:2155-63

Stent optimization is the matter

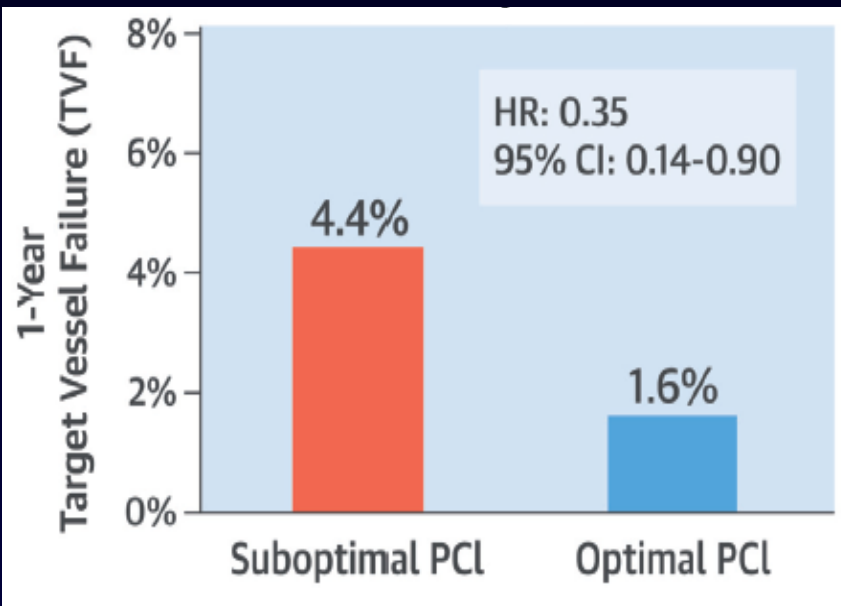
IVUS-XPL

B Patients in IVUS-guided PCI group who underwent IVUS-guided stent implantation^a



No. at risk	0	3	6	9	12
IVUS criteria					
Not meeting	315	299	297	394	285
Meeting	363	362	345	338	334

ULTIMATE

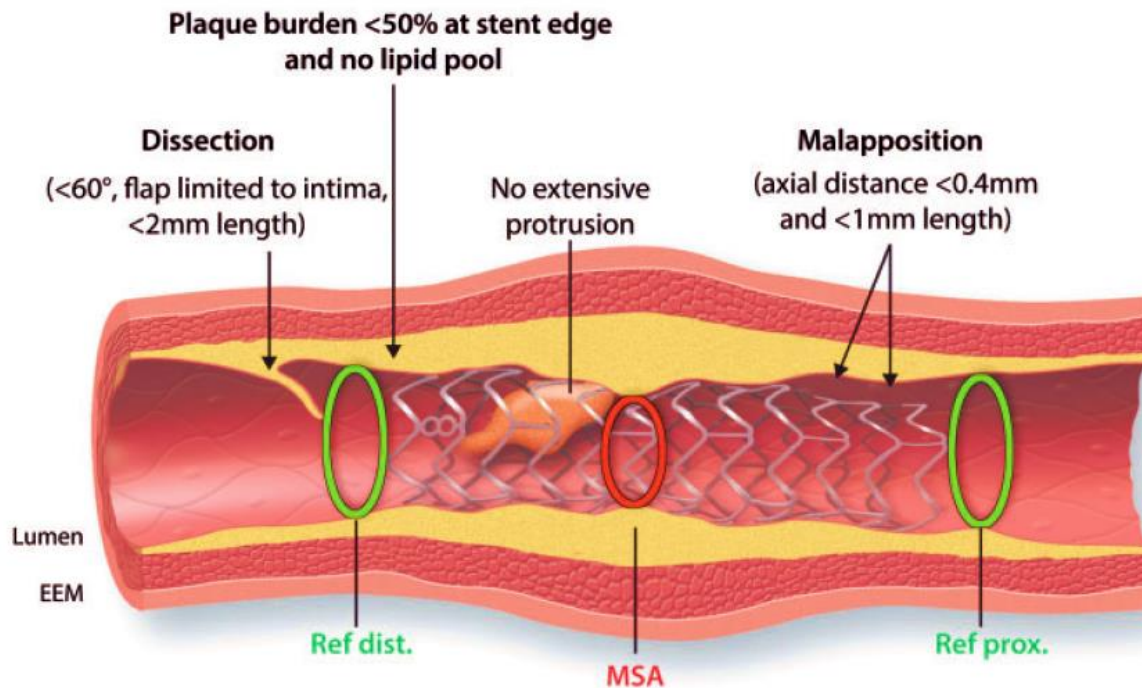


Optimal PCI according to optimization criteria further **improves clinical outcome** compared to suboptimal PCI.

Hong et al. JAMA 20215;314:2155-2163
Zhang et al. J Am Coll Cardiol 2018;72:3126-3137

Stent optimization and failure

Optimization targets after stent implantation



MSA > 5.5mm² (IVUS) and > 4.5mm² OCT

MSA/average reference lumen > 80%

Minimum stent area

Stent expansion

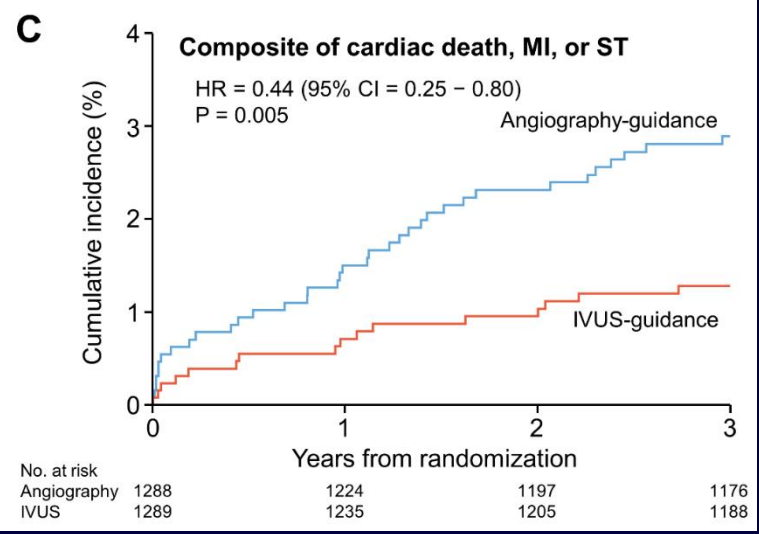
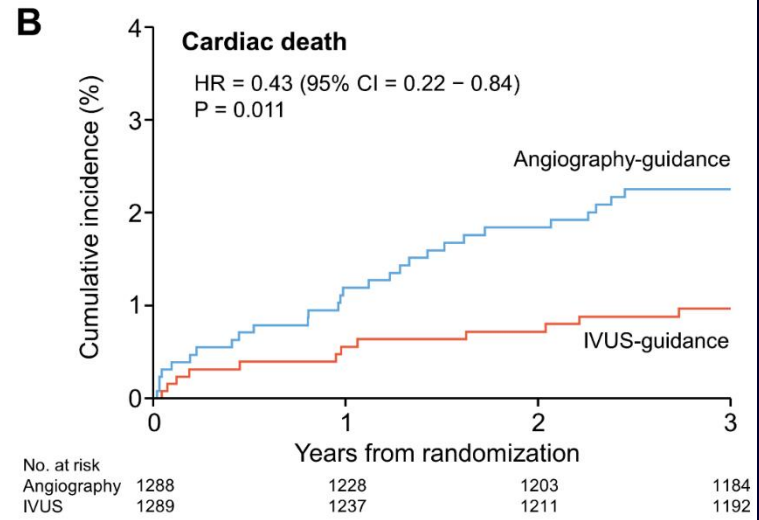
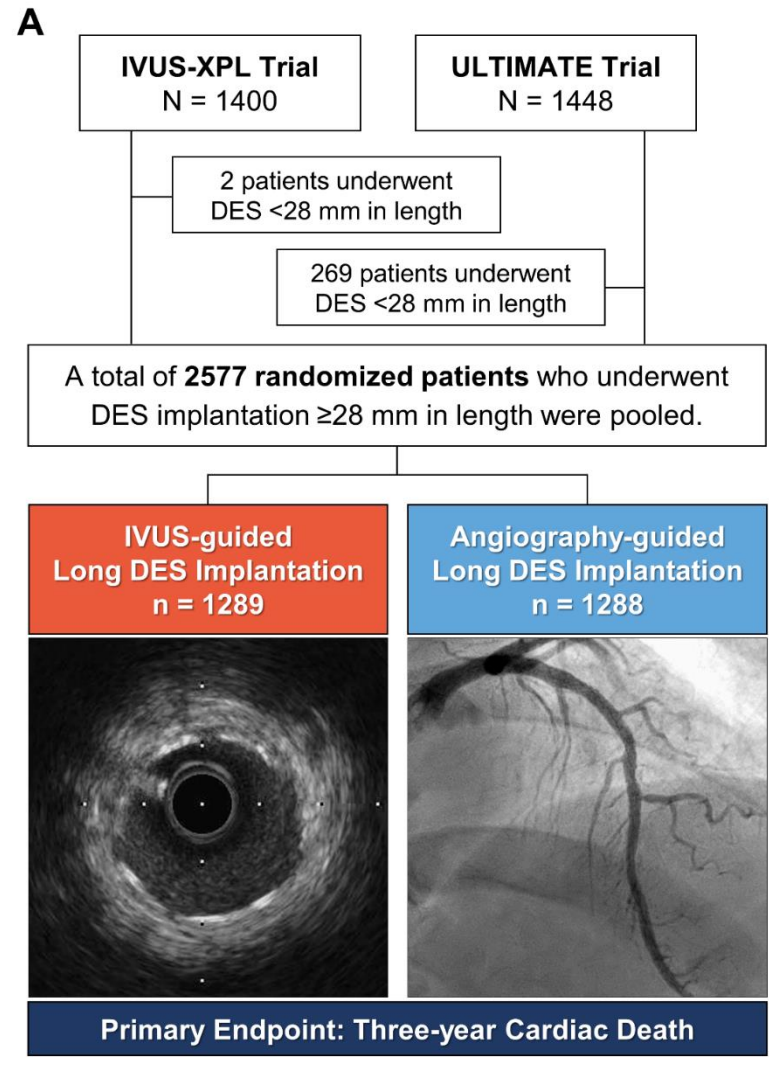
Malapposition

Tissue prolapse

Dissection

IVUS XPL and ULTIMATE

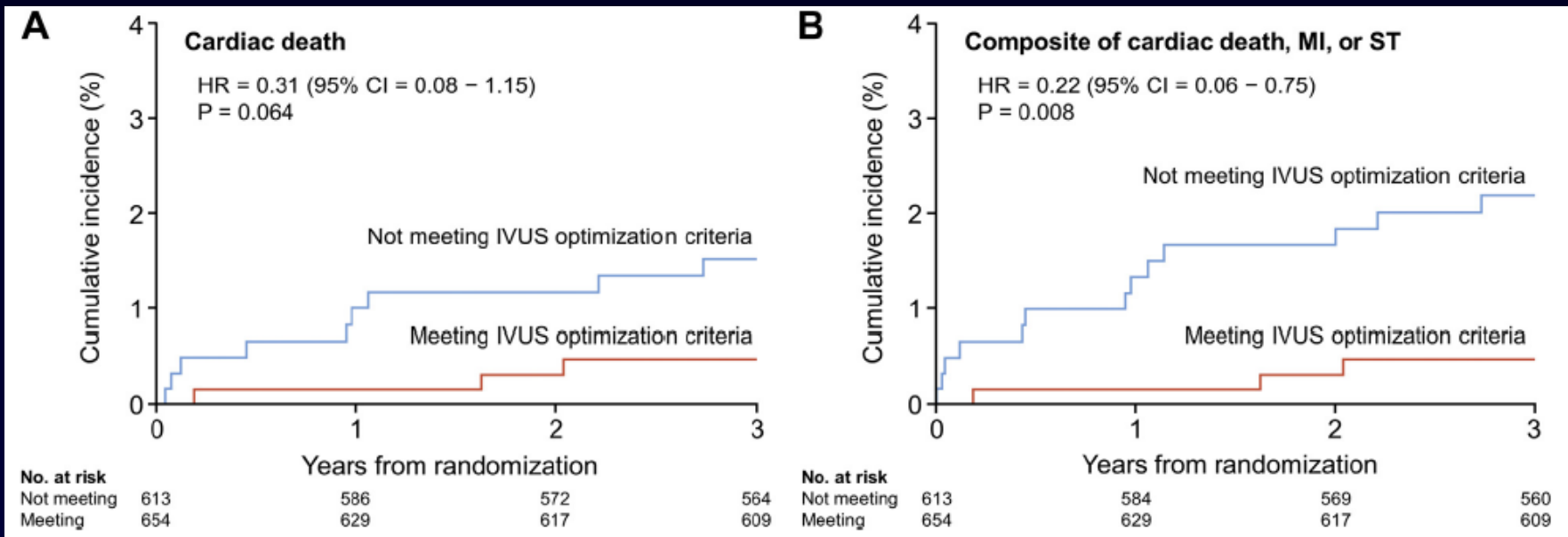
Long lesions



Hong SJ, Zhang JJ, Chen SL (corresponding), Hong MK (corresponding). *JACC Interv* 2022;15:208-216

For long lesion PCI

IVUS-XPL + ULTIMATE



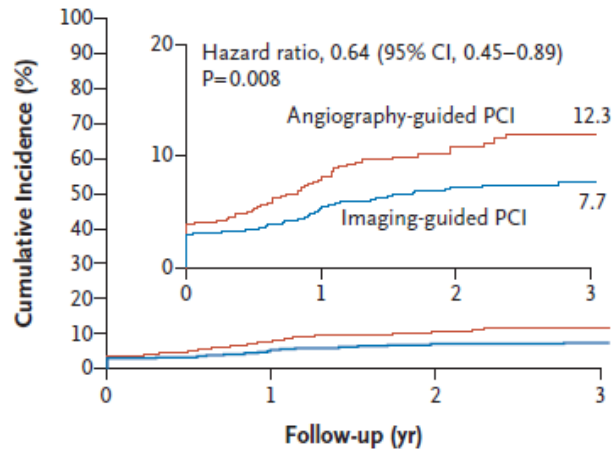
2,577 patients pooled from 2 randomized trials who underwent DES implantation for long coronary lesions.

Patients meeting the IVUS-defined optimization criteria had better clinical outcomes versus those not meeting IVUS-defined optimization criteria.

Hong et al. *J Am Coll Cardiol Intv* 2022;15:208-216

RENOVATE-COMPLEX-PCI trial

A Target-Vessel Failure



No. at Risk

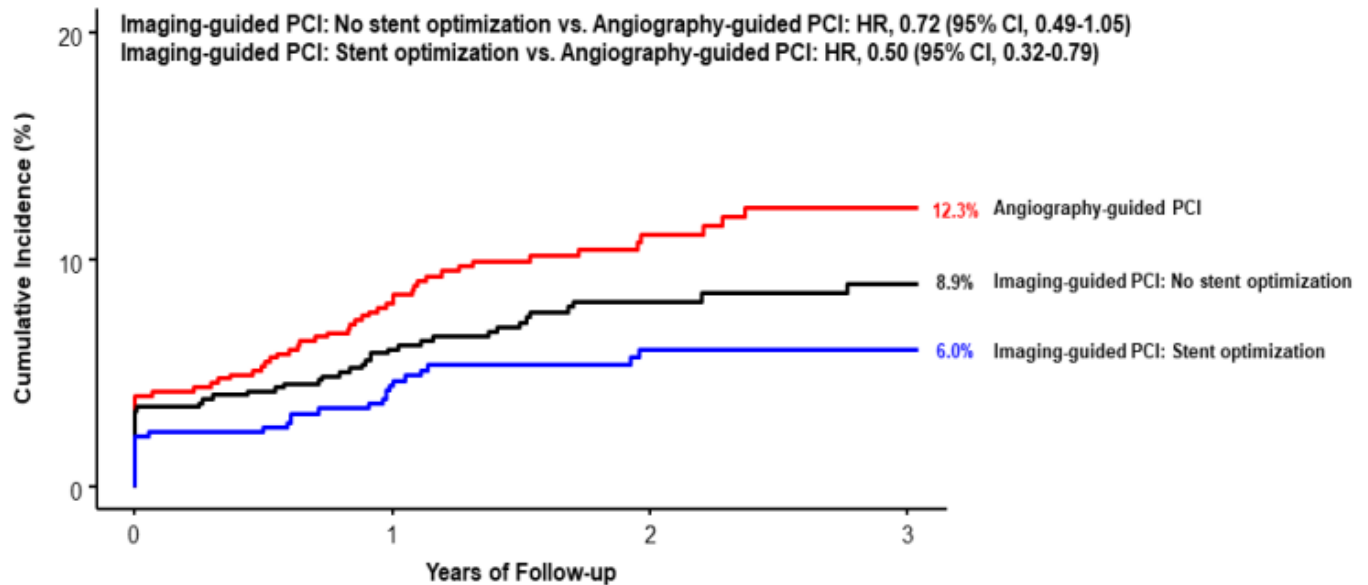
	0	1	2	3
Angiography-guided PCI	547	496	280	120
Imaging-guided PCI	1092	1023	591	255

Subgroup	Intravascular Imaging-Guided PCI no. of events/total no. of patients (cumulative incidence, %)	Angiography-Guided PCI no. of events/total no. of patients (cumulative incidence, %)	Hazard Ratio (95% CI)
Overall	76/1092 (7.7)	60/547 (12.3)	0.64 (0.45–0.89)
Type of imaging devices			
Intravascular ultrasonography	59/800 (8.0)	60/547 (12.3)	0.66 (0.46–0.95)
Optical coherence tomography	15/278 (5.8)	60/547 (12.3)	0.47 (0.27–0.83)
Type of complex coronary lesions			
True bifurcation	23/233 (10.3)	13/126 (11.8)	0.97 (0.49–1.93)
Chronic total occlusion	9/220 (5.0)	13/99 (14)	0.30 (0.13–0.71)
Unprotected left main coronary artery disease	9/138 (6.8)	11/54 (25)	0.31 (0.13–0.76)
Diffuse long coronary-artery lesion	36/617 (6.5)	31/281 (11.9)	0.52 (0.32–0.83)
Multivessel PCI involving ≥2 major coronary arteries	30/409 (9.3)	22/215 (11.7)	0.84 (0.50–1.44)
Lesion necessitating use of ≥3 stents	16/208 (8.1)	6/97 (6)	1.24 (0.49–3.18)
Lesion with in-stent restenosis	22/158 (15.6)	12/78 (17)	0.90 (0.45–1.82)
Severely calcified lesion	11/157 (7.3)	11/74 (17)	0.46 (0.20–1.06)
Ostial lesions of major coronary artery	8/182 (4.4)	9/69 (16)	0.33 (0.13–0.85)

1639 patients with complex coronary lesions – **11.7% unprotected LM**, 21.9% bifurcation
 Intravascular imaging-guided vs. Angiography-guided – **IVUS: 74.2%**, OCT: 25.8%
 Intravascular imaging-guided PCI led to a lower risk of TVF at 3 years.

RENOVATE-COMPLEX-PCI

Figure S3. Exploratory Analysis According to Treatment Group and Intravascular Imaging-Guided Optimization Results

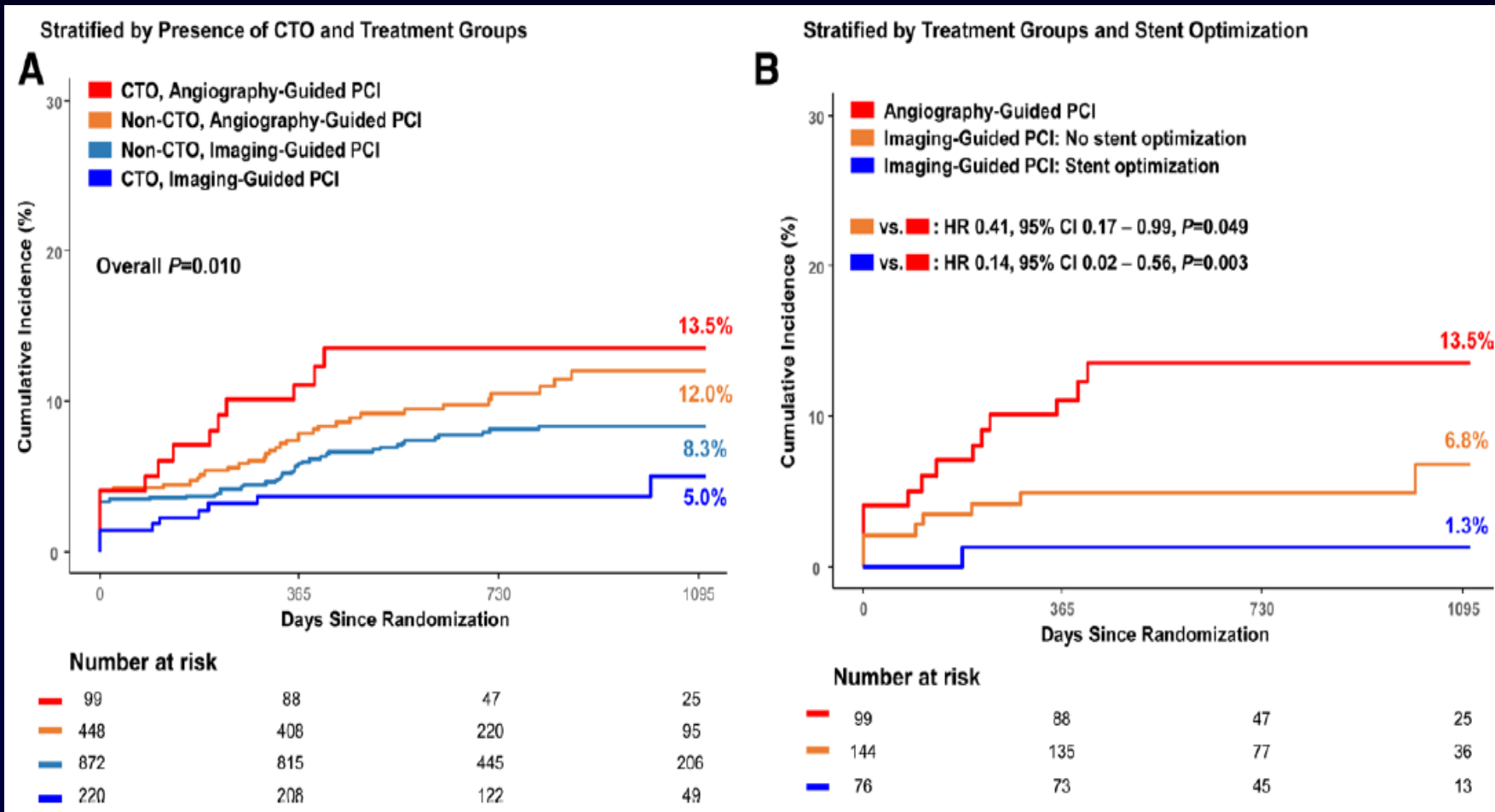


No. at Risk

Angiography-guided PCI	547	496	267	120
Imaging-guided PCI: No stent optimization	596	556	307	152
Imaging-guided PCI: Stent optimization	496	467	260	103

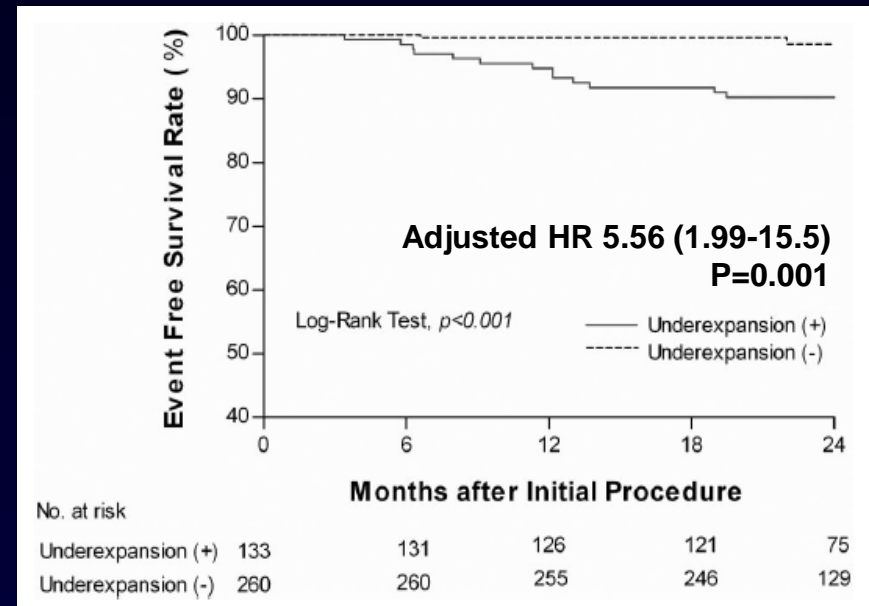
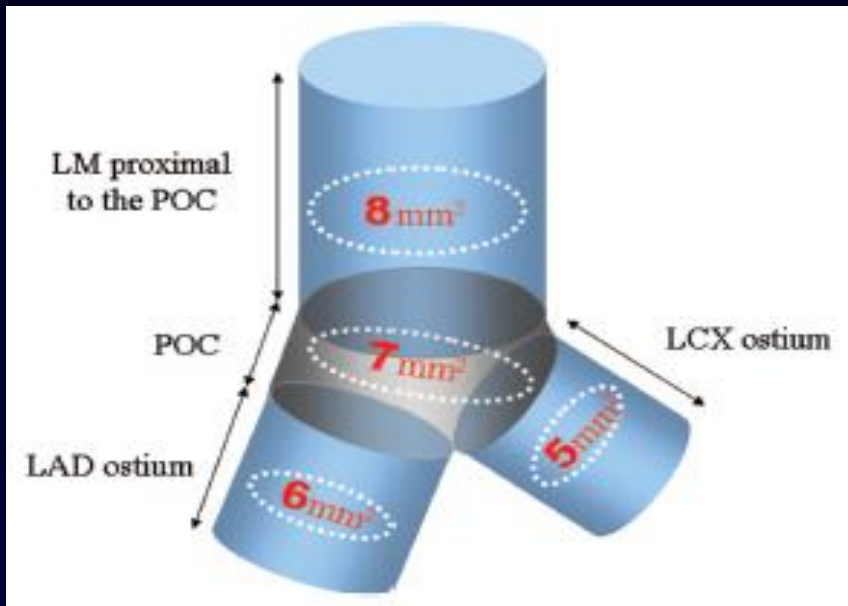
Lee. et al. *N Eng J Med* 2023;388:1668-1679

RENOVATE-COMPLEX-PCI: CTO subgroup



Hong D et al. *Circulation* 2023;148:903-905

Role of IVUS for LM PCI



IVUS-based criteria of **stent underexpansion for LM lesion**:

1) LM < 8.2 mm²; 2) POC < 7.2 mm²; 3) LAD ostium < 6.3 mm²; 4) LCX ostium < 5.0 mm²

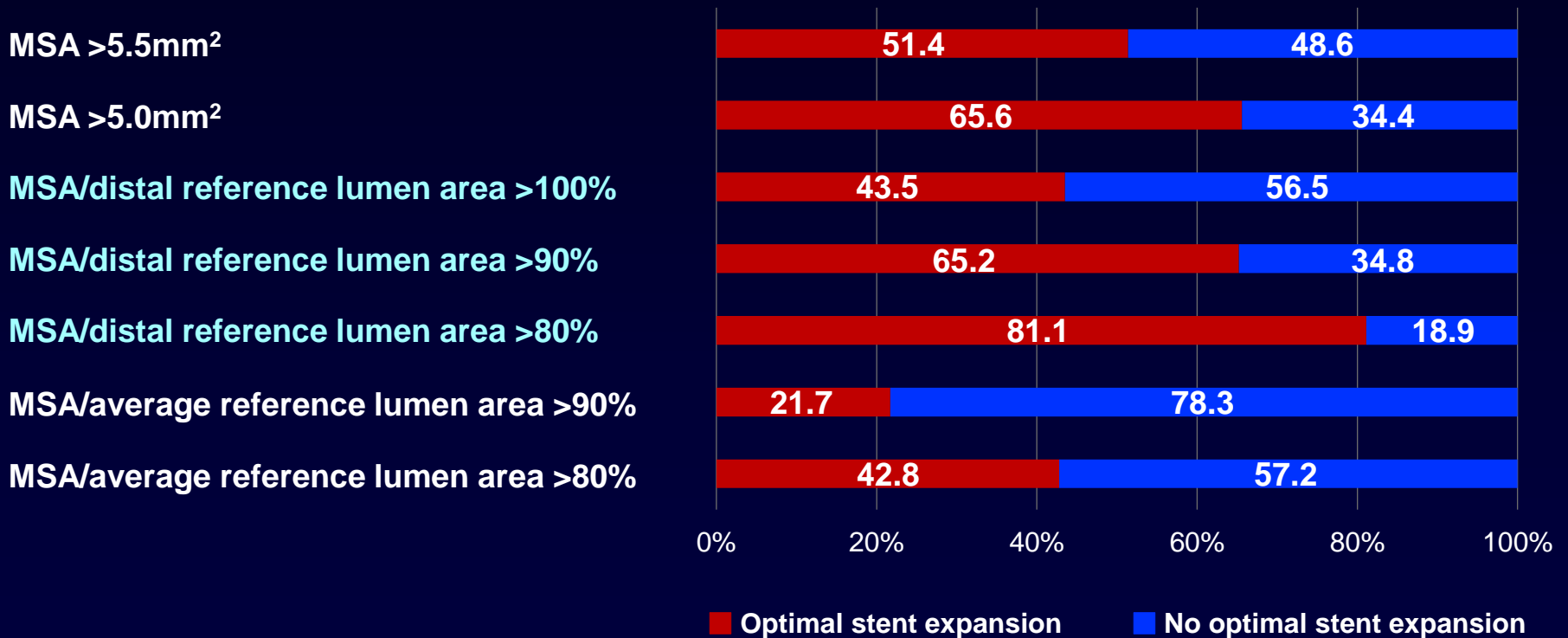
Stent underexpansion was an independent predictor for the occurrence of MACE.

Impact of IVUS-guided optimal stent expansion on long-term hard clinical outcomes (IVUS XPL and ULTIMATE)

Long lesions

Primary endpoint: cardiac death, MI or stent thrombosis at 3 years

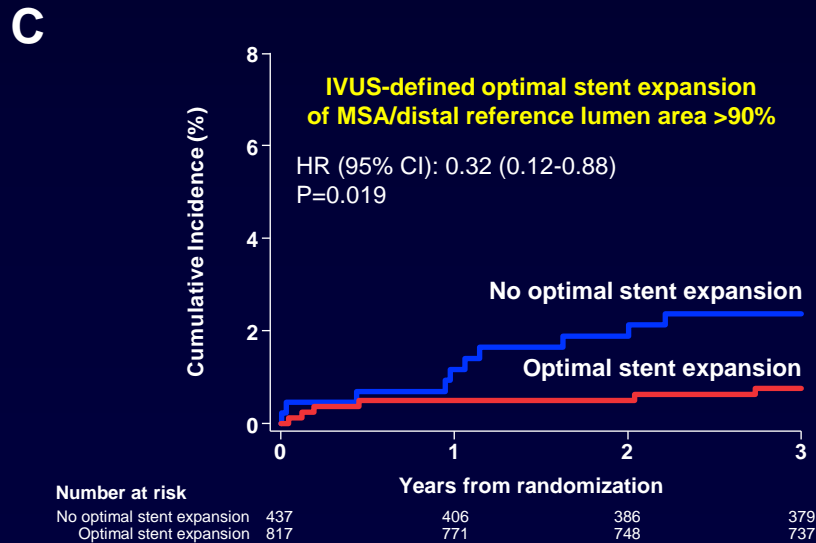
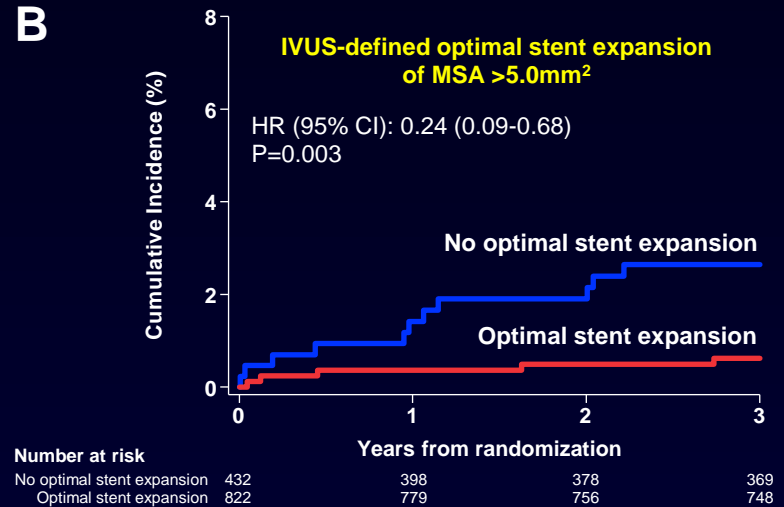
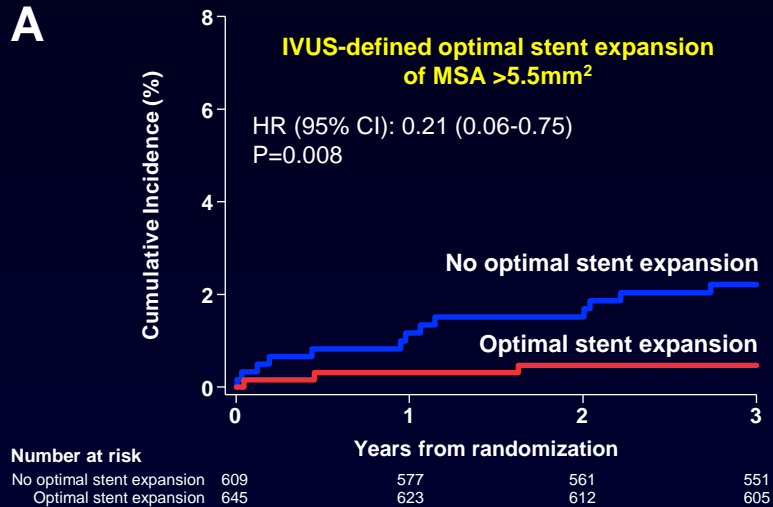
Distribution of patients according to different optimization criteria



Lee YJ, Zhang JJ, Chen SL (corresponding), Hong MK (corresponding). *Circ Cardiovasc Interv* 2021;14:e011124

Primary endpoint at 3 years

Long lesions

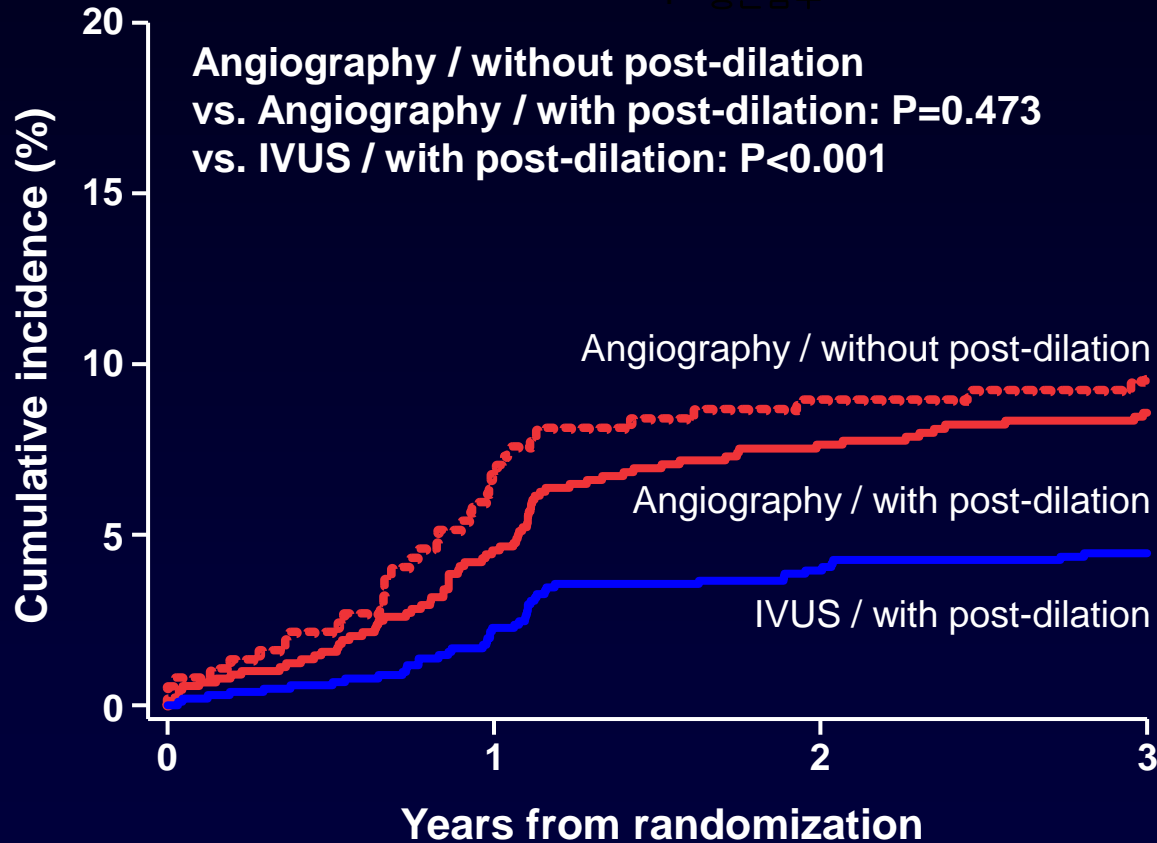


Lee YJ, Zhang JJ, Chen SL (corresponding), Hong MK (corresponding). *Circ Cardiovasc Interv* 2021;14:e011124

Is routine post-dilation during angiography-guided stent implantation as good as IVUS-guidance?

Primary endpoint at 3 years

Long lesions



Number at risk

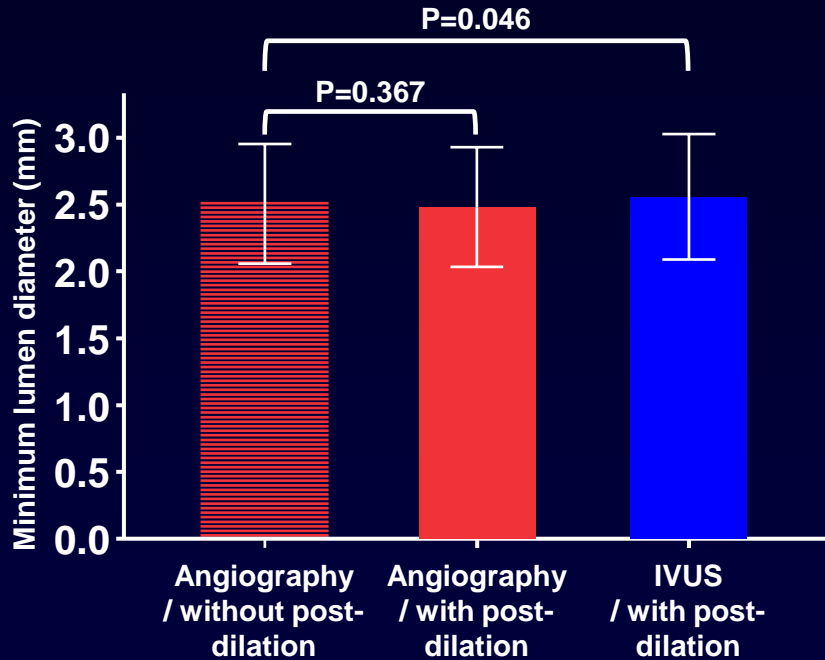
	0	1	2	3
Angiography / without post-dilation	383	343	330	322
Angiography / with post-dilation	905	835	796	780
IVUS / with post-dilation	1037	989	953	936

Lee YJ, Zhang JJ, Chen SL (corresponding), Hong MK (corresponding). *Circ Cardiovasc Interv* 2022;15:e011366

Is routine post-dilation during angiography-guided stent implantation as good as IVUS-guidance? (from IVUS-XPL and ULTIMATE trials)

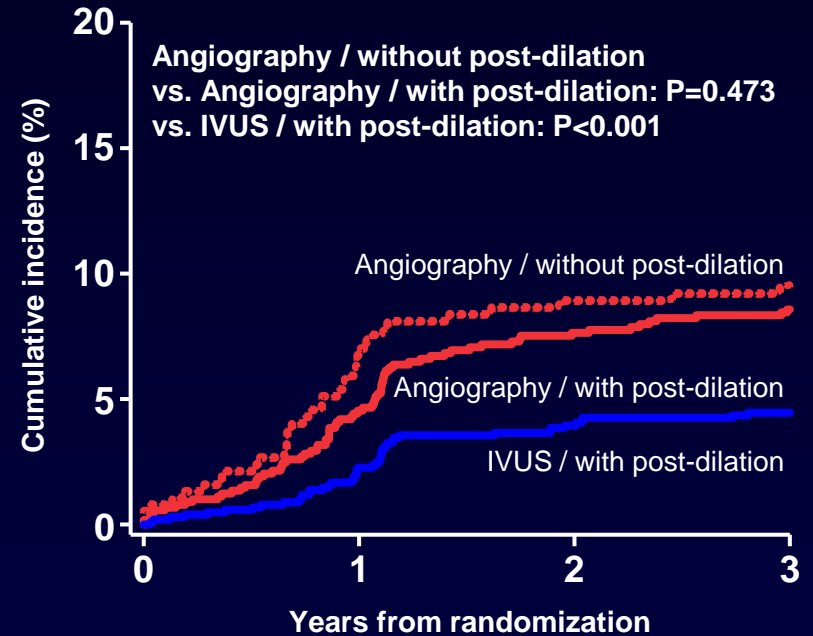
Post-procedural outcomes

Post-intervention minimum lumen diameter



Long-term clinical outcomes

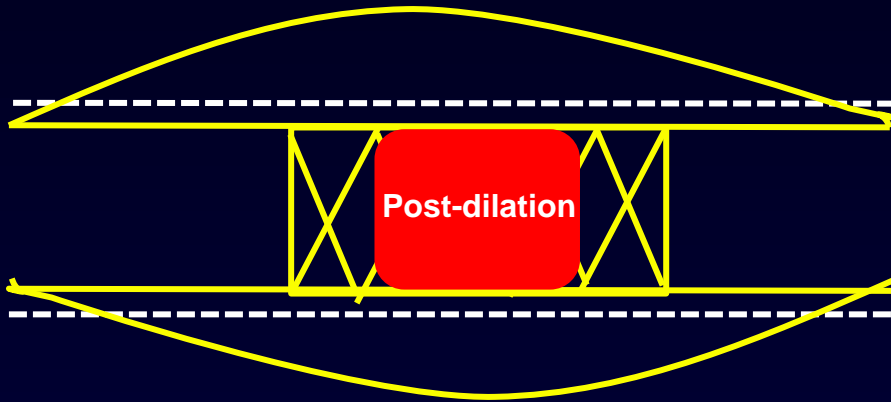
Composite of cardiac death, myocardial infarction, or target lesion revascularization at 3 years



Lee YJ, Zhang JJ, Chen SL (corresponding), Hong MK (corresponding). *Circ Cardiovasc Interv* 2022;15:e011366

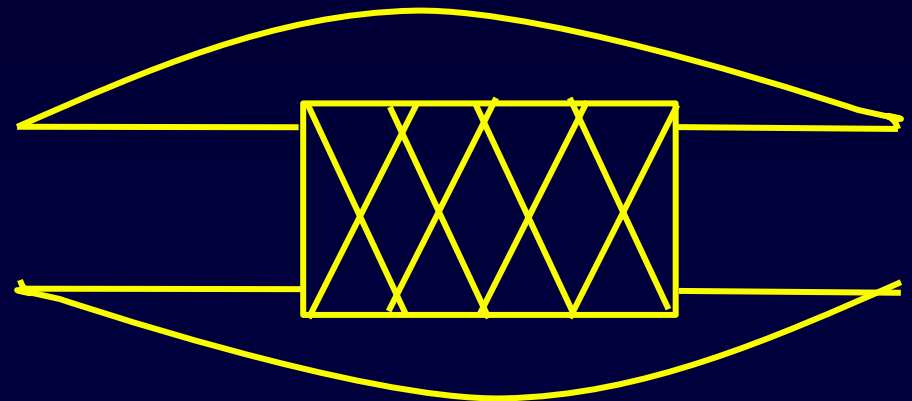
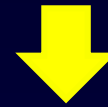
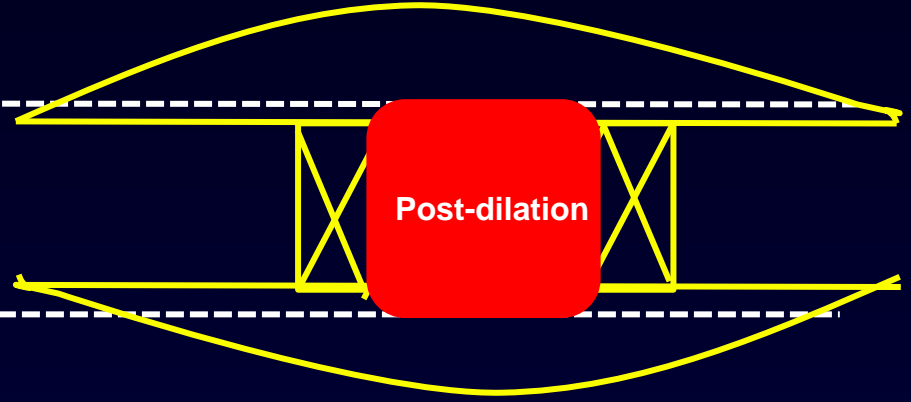
Angiography-guided post-dilation

Stent-to reference vessel diameter ratio between 1.0 and 1.1



IVUS-guided (like) post-dilation

Stent-to reference vessel diameter ratio between 1.1 and 1.3



Conclusion

- **The bigger by IVUS, the better**
- **DO** intravascular imaging for complex PCI
- **DO** your best to achieve optimal imaging criteria

How to be an intervention master?

Needs for intracoronary imaging	Non-complex PCI	Complex PCI
Interventionist with experience of imaging	No	Yes
Interventionist without experience of imaging	Yes	Yes

Resident of Cardiology  Interventional fellow  Independent Interventionist

Dreams will come true

