

Basic Concept & Interpretation IVUS: Post Intervention

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Disclosure Statement of Financial Interest

Within the past 12 months, I or my spouse/partner have had a financial Interest /arrangement or affiliation with the organization(s) listed below

Affiliation/Financial Relationship

Company

Grant/ Research Support:

Boston Scientific Corp.

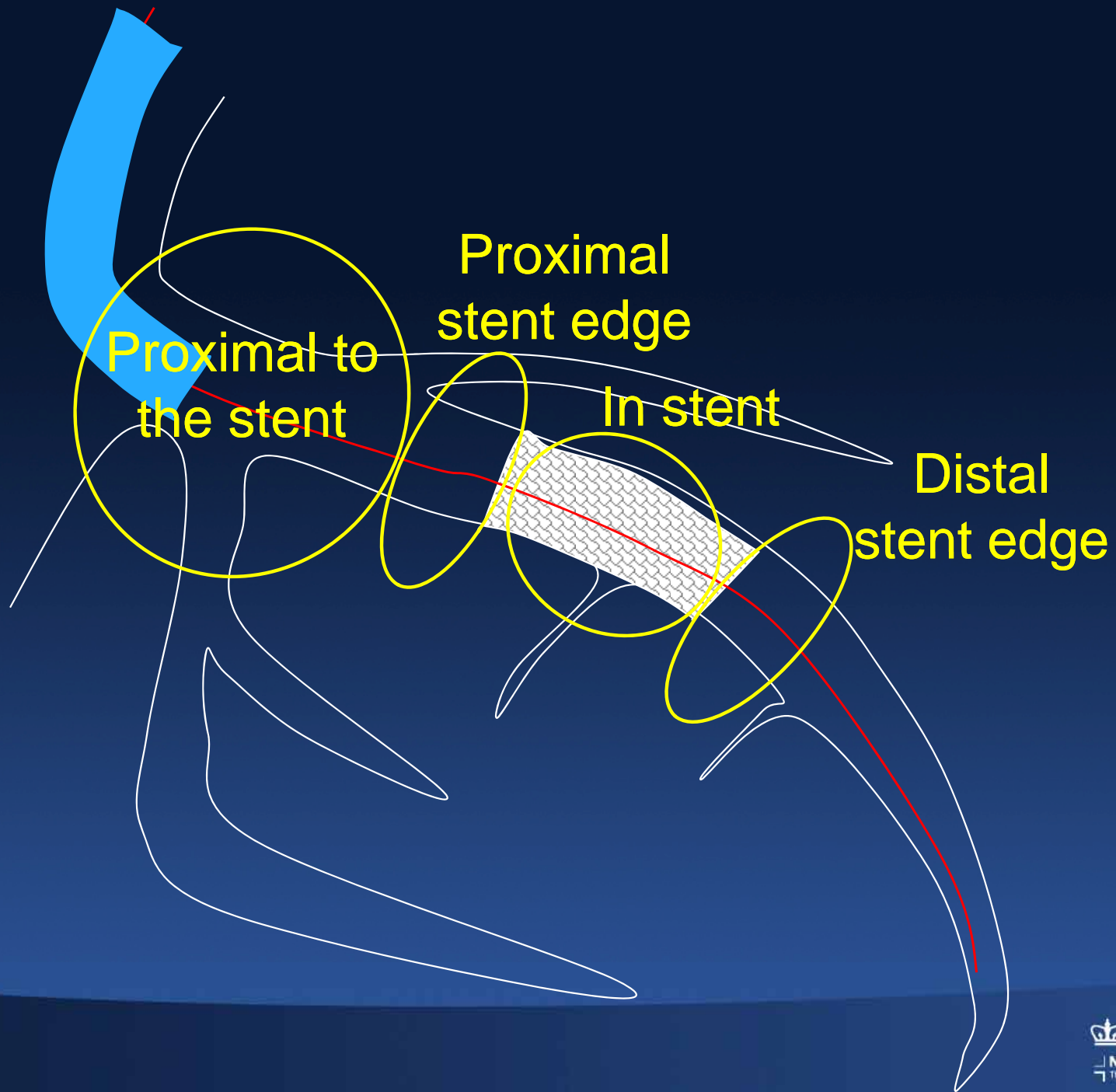
Consultant:

Boston Scientific Corp.

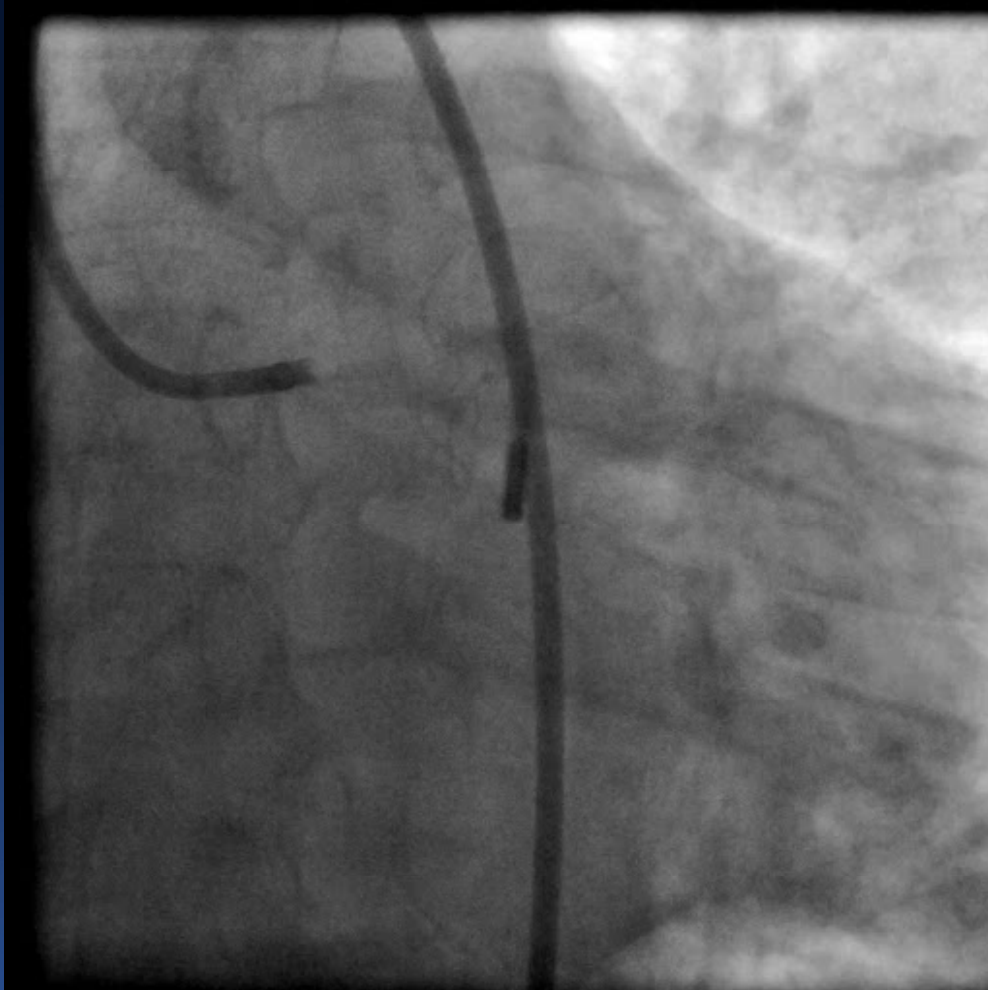
Speaker Fee:

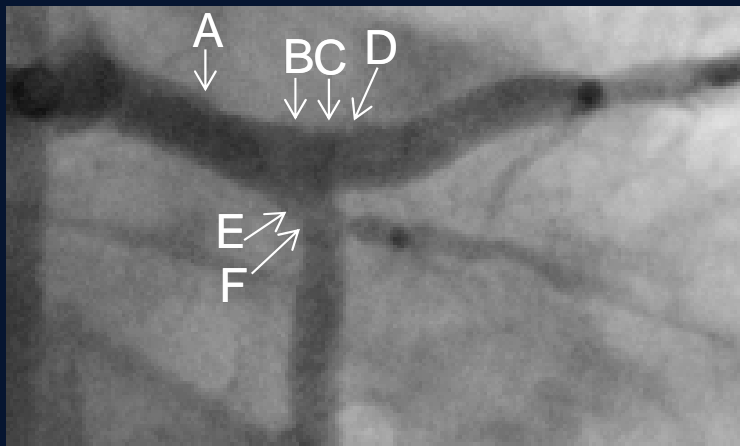
St Jude Medical, Volcano Corporation

Post Stent Evaluation

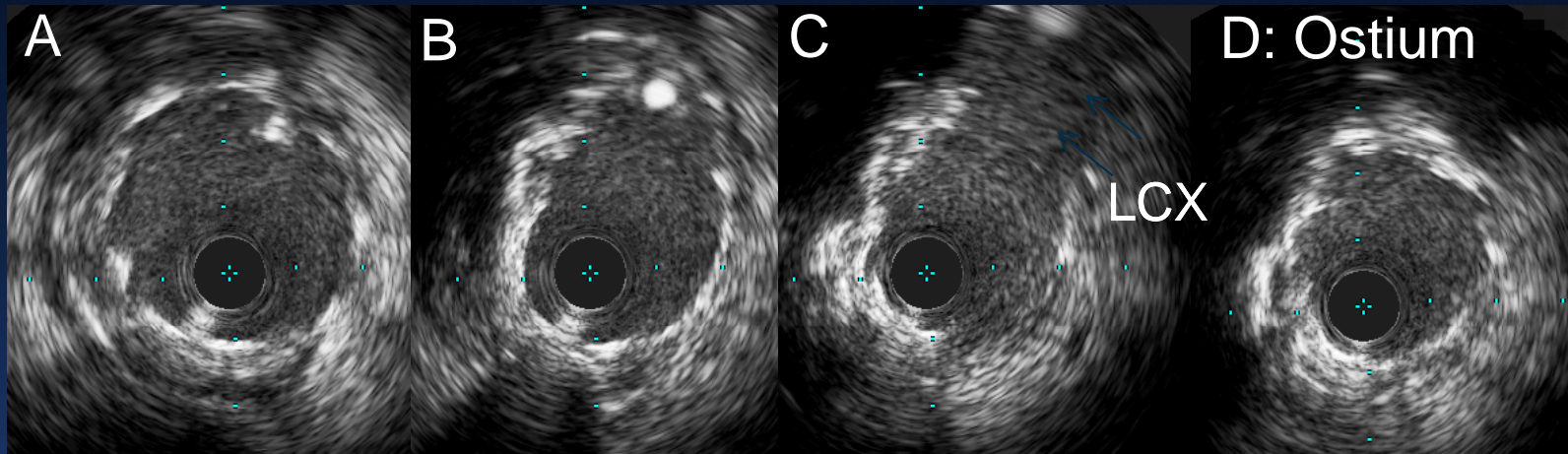


Optimal Stent Expansion



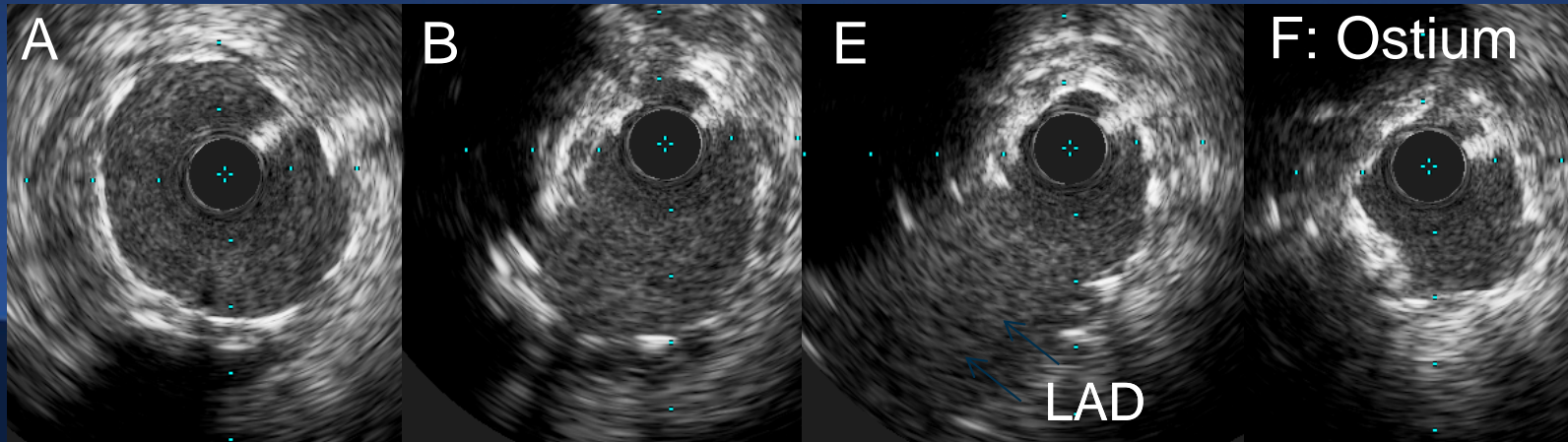


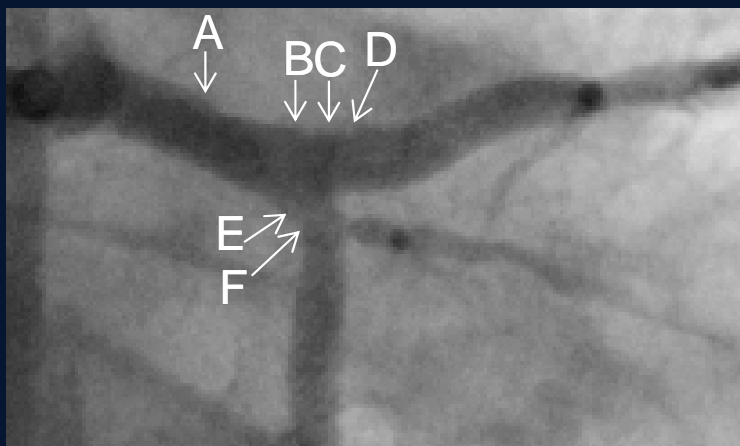
← Left Main → Bifurcation ← LAD →



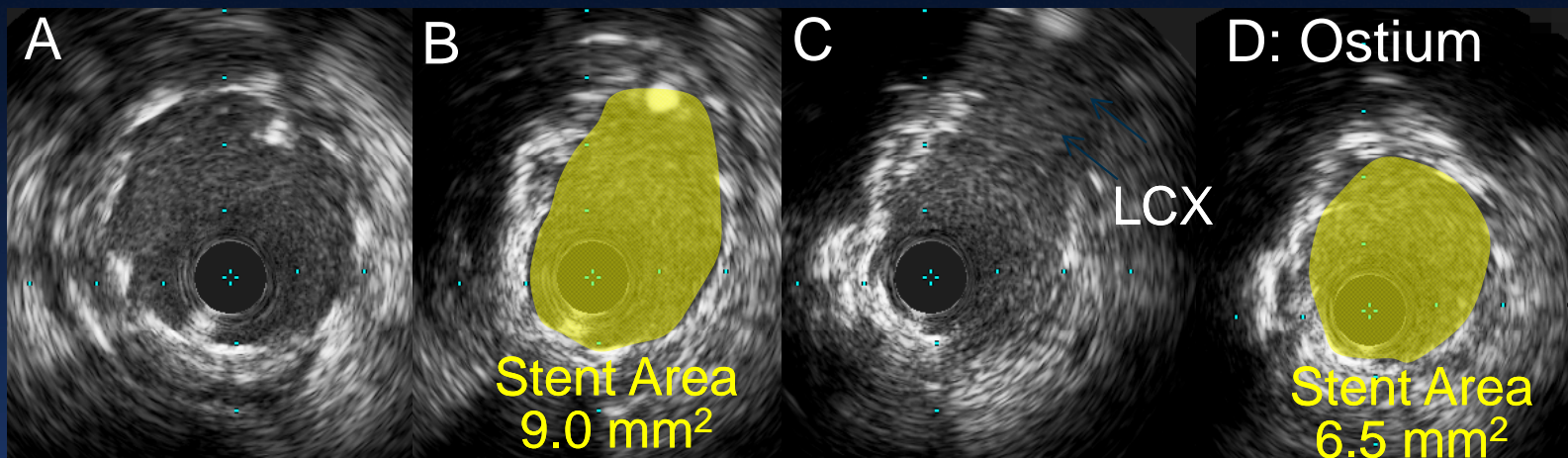
Proximal Distal

← Left Main → Bifurcation ← LCX →

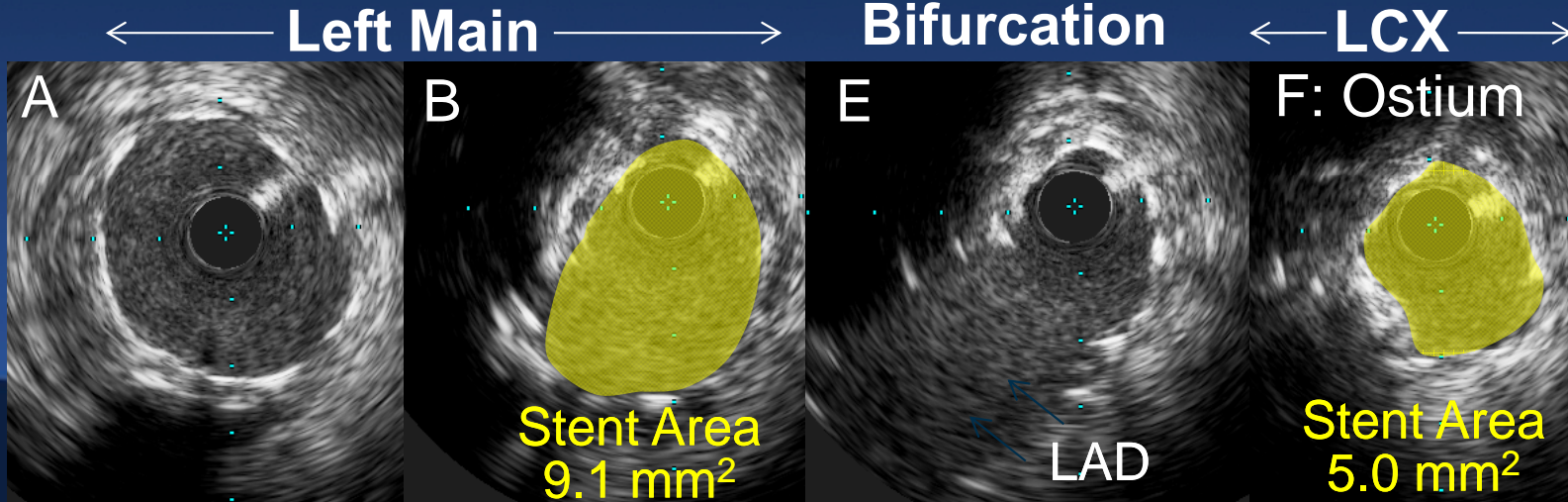




← Left Main → Bifurcation ← LAD →

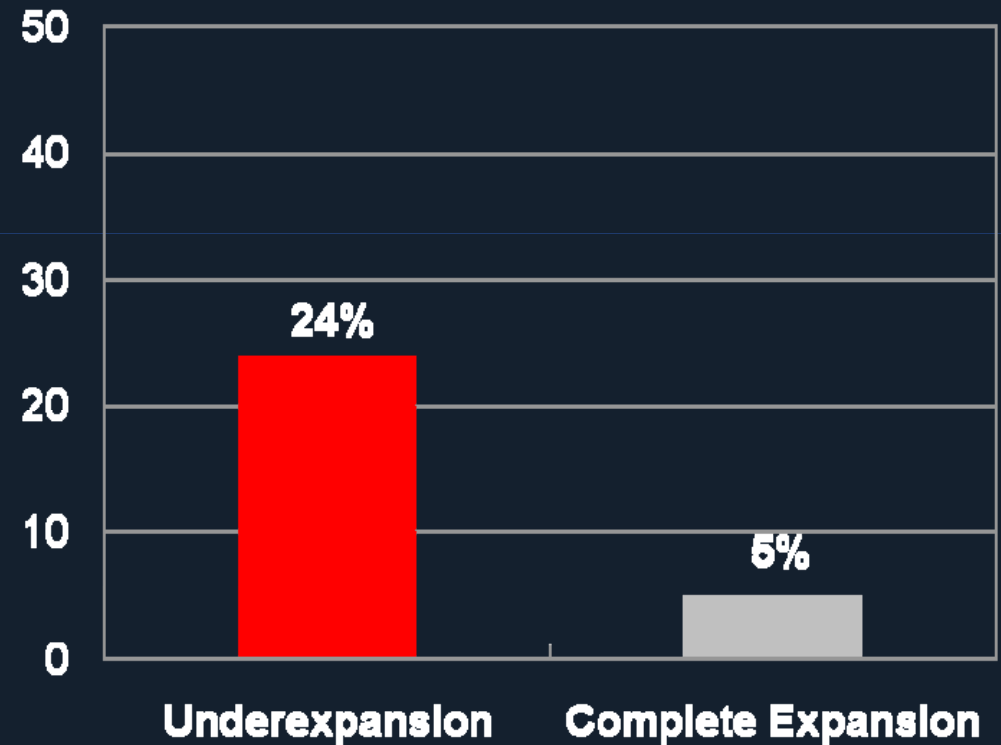
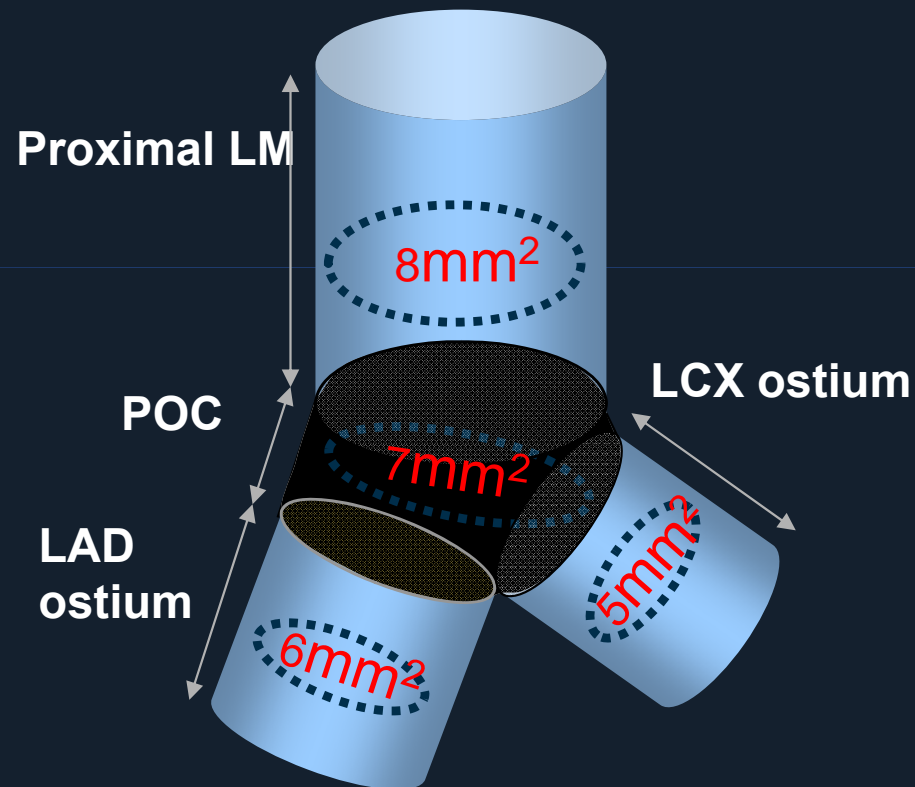


Proximal ← Left Main → Bifurcation ← LCX → Distal



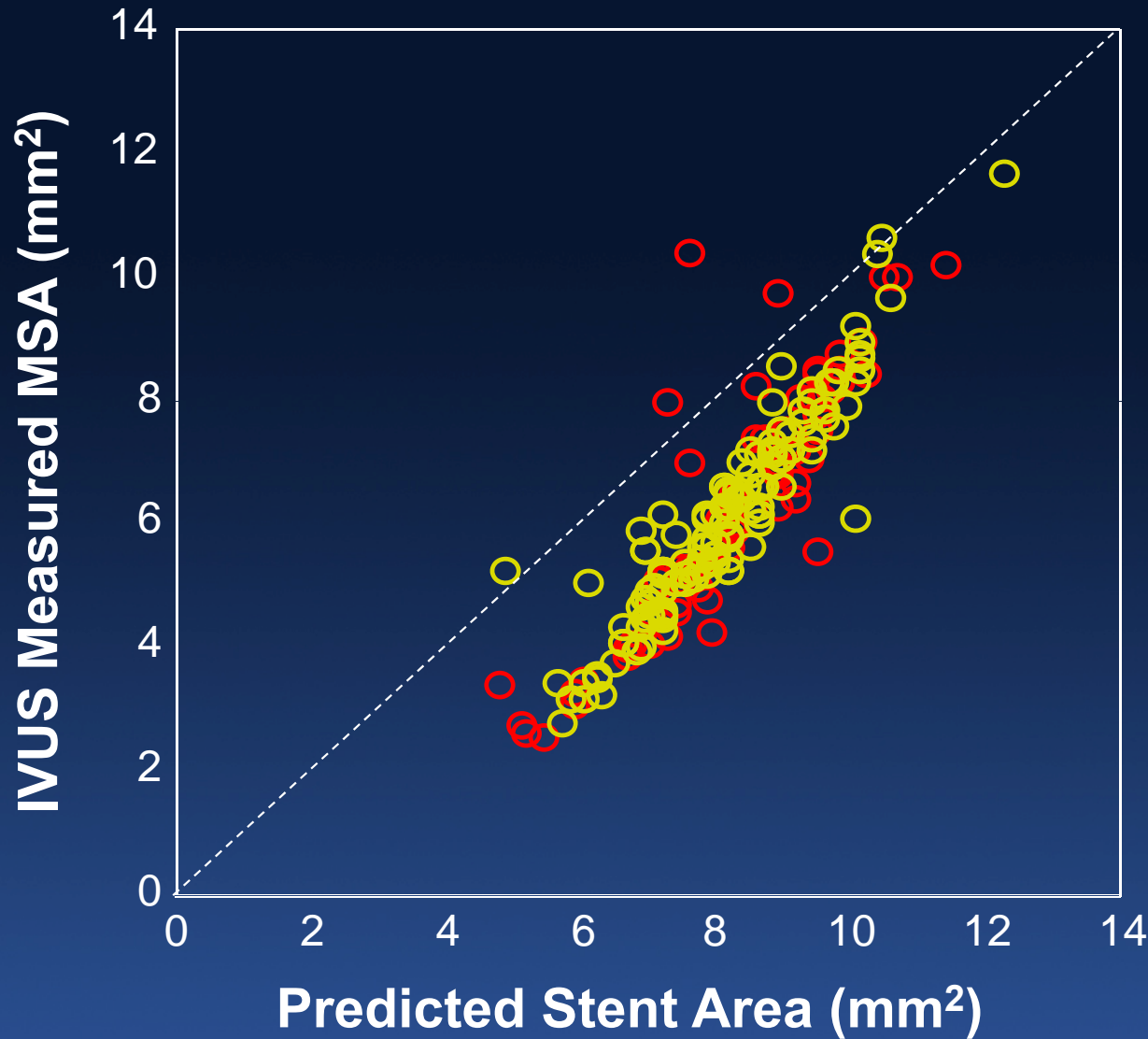
Optimal Stent Cross Sectional Area After LM Stenting

ISR Rate



Kang et al. Circ Cardiovasc Interv 2011 2011;4:1168-74

Compliance Charts and the Actual Expansion



- CYPHER (n=133)
- TAXUS (n=67)

66%

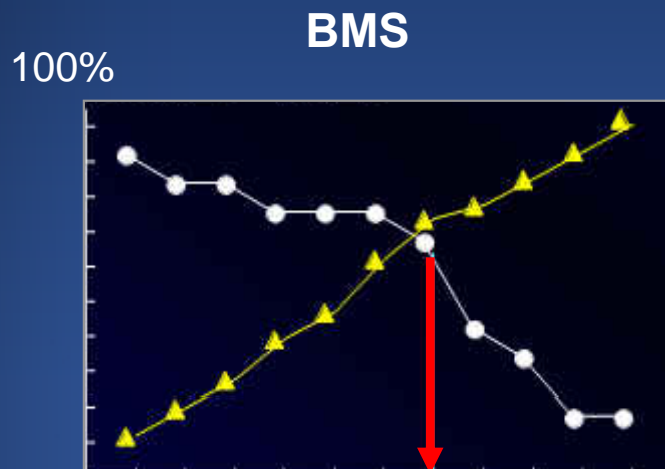
3mm Stent = 7mm²

66% Expansion = 4.6mm²

Underexpansion Predicts DES Restenosis

	Population	DES	Endpoint	MSA Cut-off
SIRIUS¹	72	SES	8 mo, MLA<4.0mm ²	5.0mm²
Hong²	550	SES	6 mo, Angio-ISR	5.5mm²
TAXUS-Meta³	1098	PES	9 mo, Angio-ISR	5.7mm²

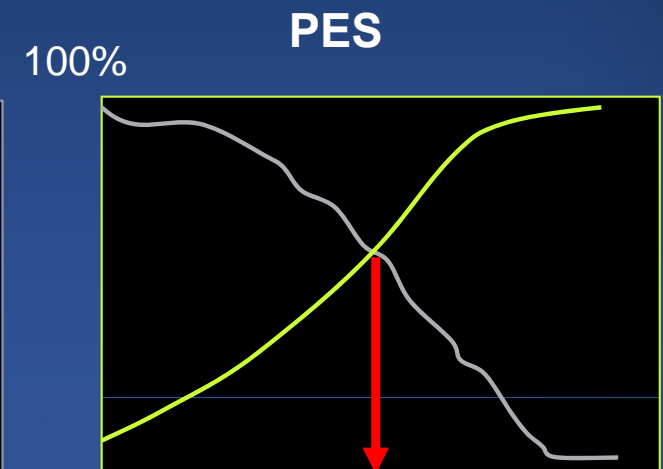
¹J Am Coll Cardiol 2004;43:1959-63 ² Eur Heart J 2006;27:1305-10 ³ JACC Interv 2009;2:1269-75



MSA 6.5mm²
Predictive value 56%



MSA 5.0mm²
Predictive value 90%



MSA 5.7mm²

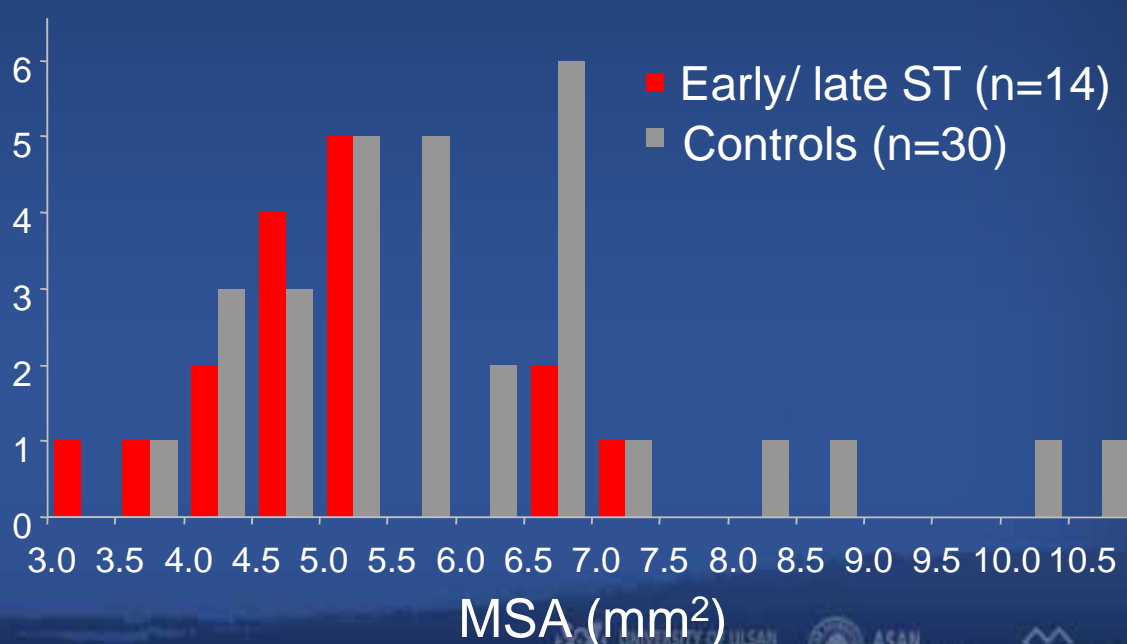
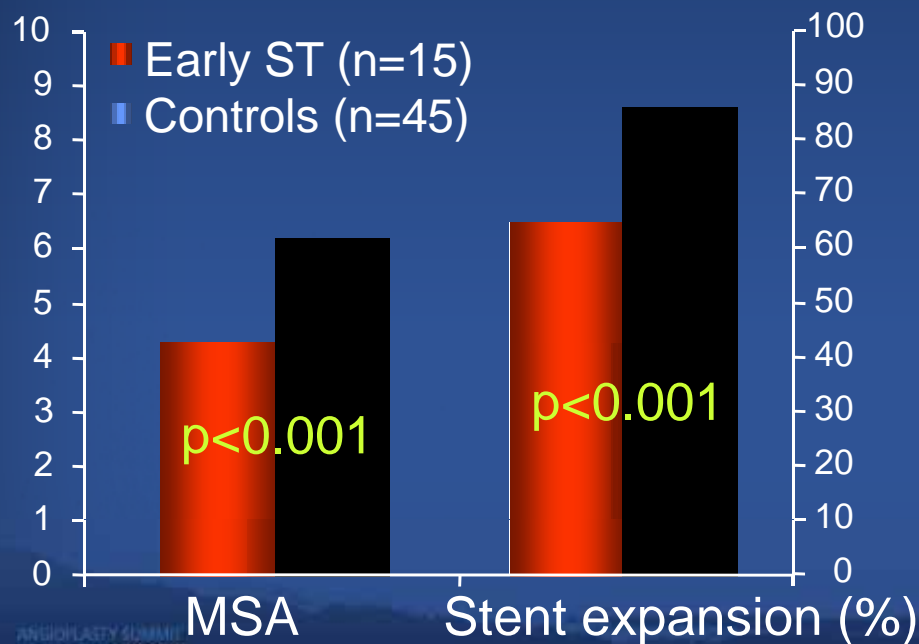
Underexpansion Predicts DES Thrombosis

	Population	DES	Endpoint	Rate of Underexpansion
Fujii ¹	15 ST vs. 45 controls	SES	ST <1 month	<5.0mm ² in 80% vs. 29%
Okabe ²	13 ST vs. 27 controls	DES	ST <1 year	<5.0mm ² in 79% vs. 40%
Liu ³	20 ST vs. 50 controls	DES	ST <1 year	<5.0mm ² in 85% vs. 26%

¹ J Am Coll Cardiol 2005;45:995-8

² Am J Cardiol 2007;100:615-20

³ JACC interv 2009;2:428-34



ADAPT-DES

Assessment of Dual AntiPlatelet Therapy with Drug-Eluting Stents

8582 pts prospectively enrolled
No clinical or anatomic exclusion criteria
11 sites in US and Germany

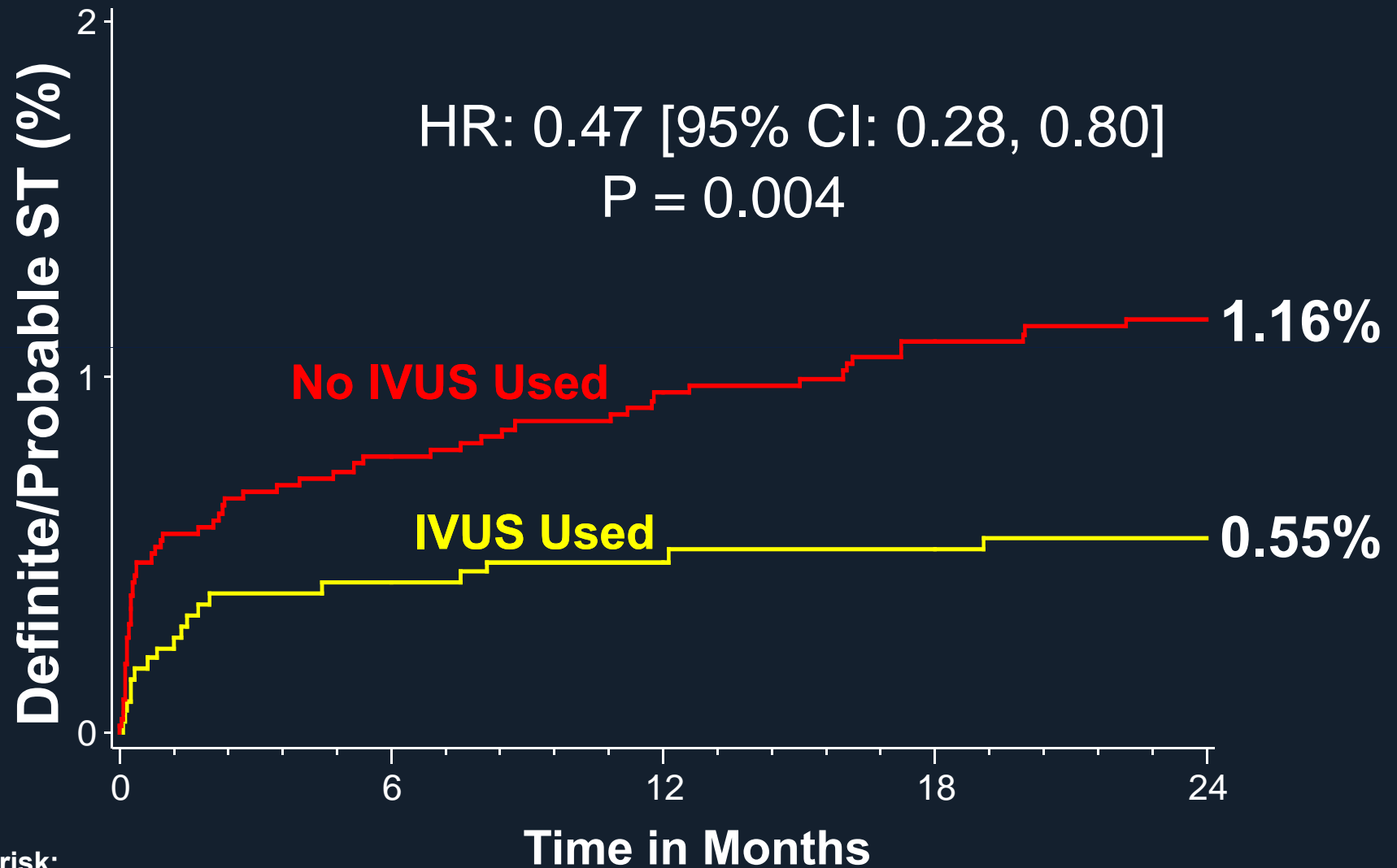
PCI with ≥ 1 non-investigational DES
Successful and uncomplicated

IVUS Use: 3361 pts

No IVUS: 5221 pts

Clinical FU at 30 days, 1 year, 2 years

Relationship Between IVUS Use and Definite/Probable Stent Thrombosis Within 2 Years

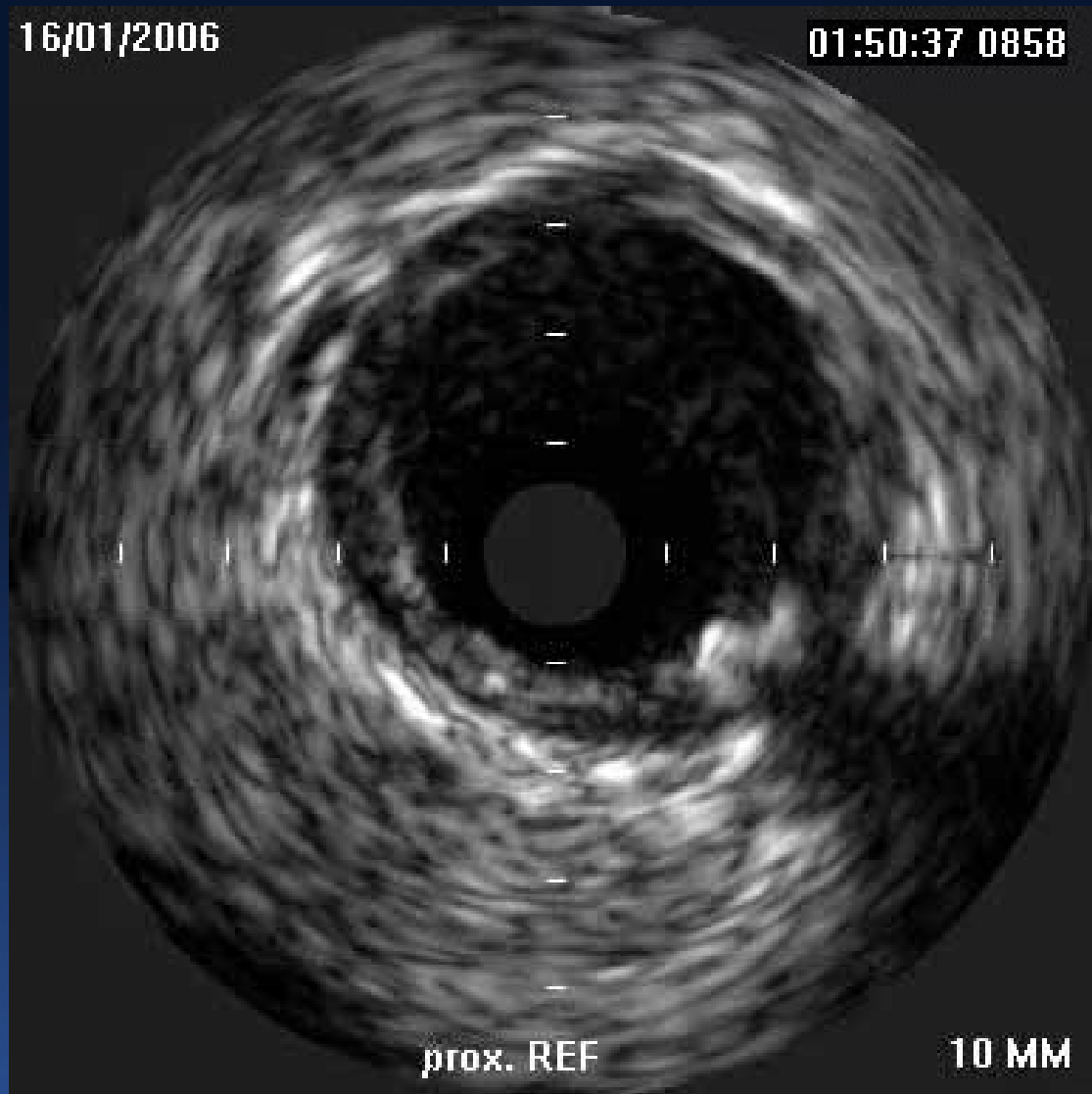


Number at risk:

IVUS Used	3361	3260	3182	3065	1791
IVUS Not Used	5221	5019	4886	4713	2279

16/01/2006

01:50:37 0858

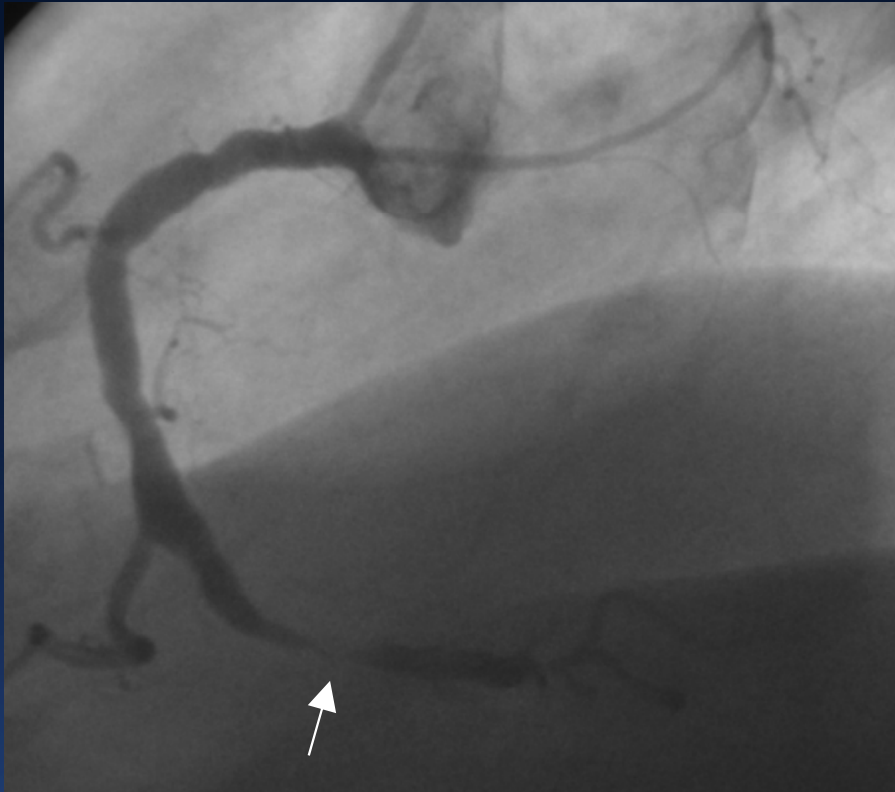


prox. REF

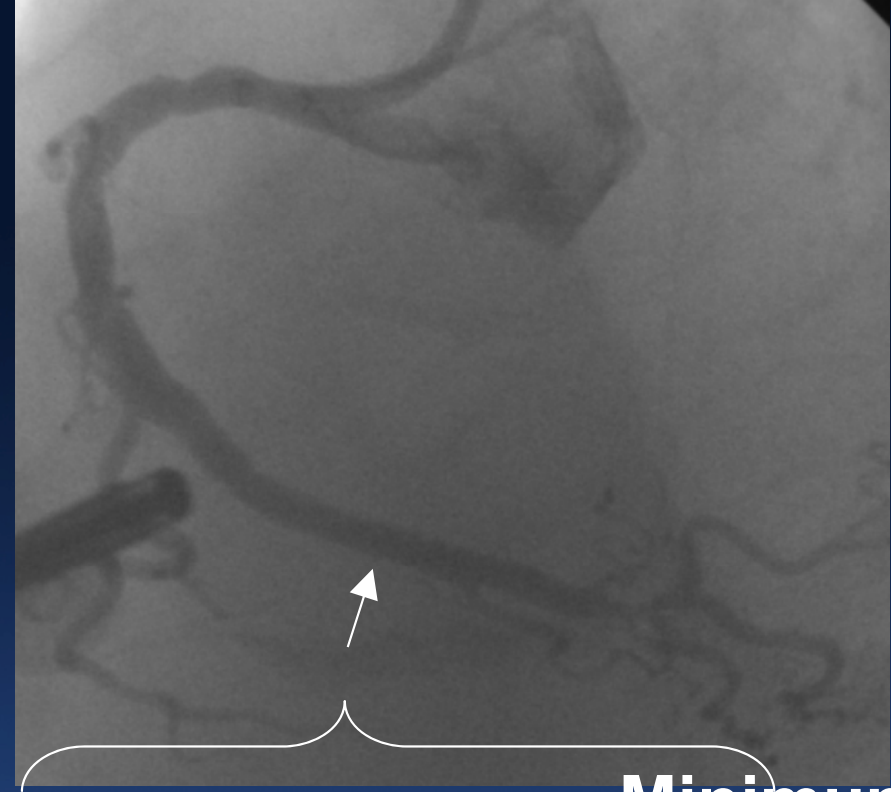
10 MM

Thrombus Protrusion

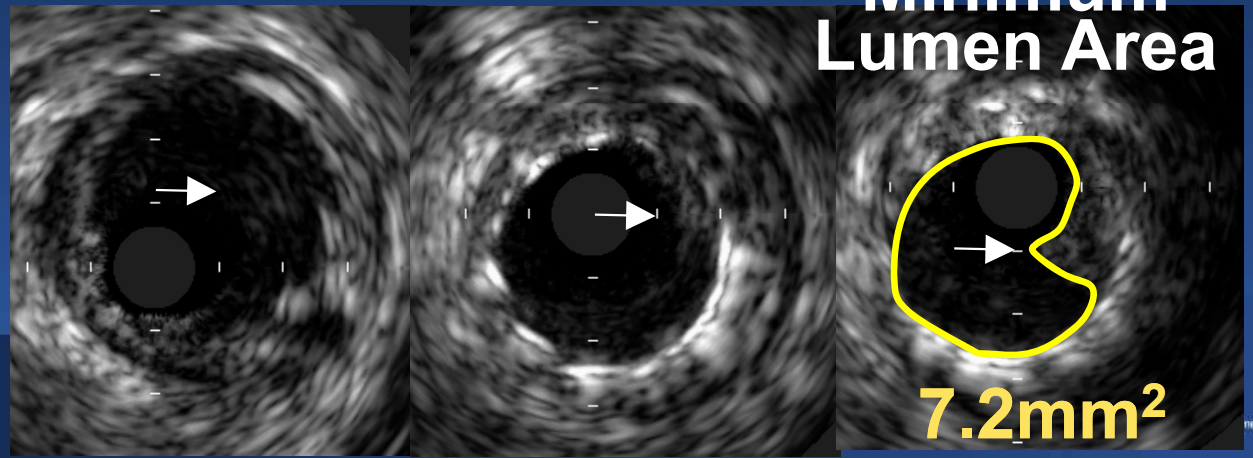
Pre-Intervention



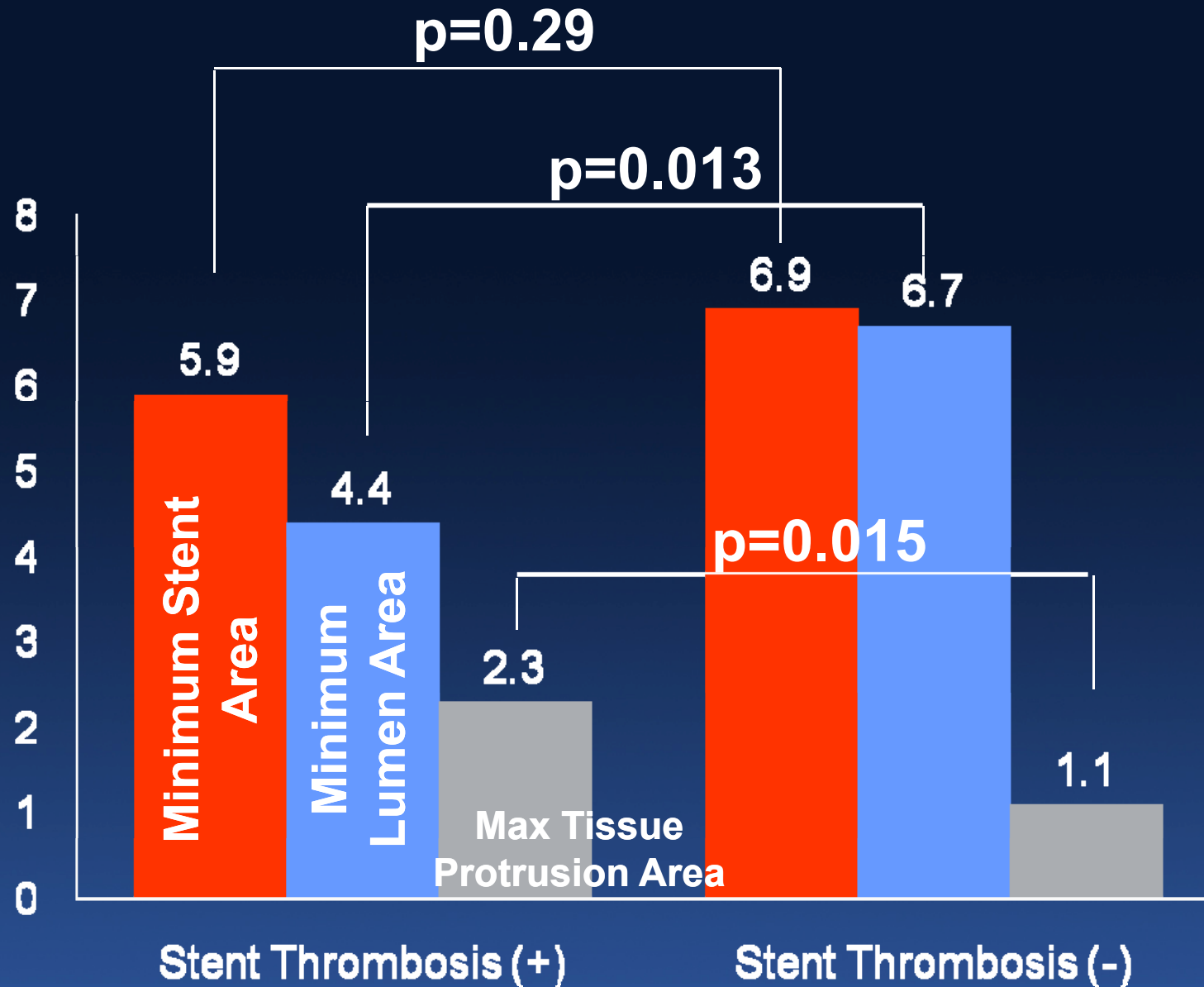
Post-Stent



Minimum Lumen Area



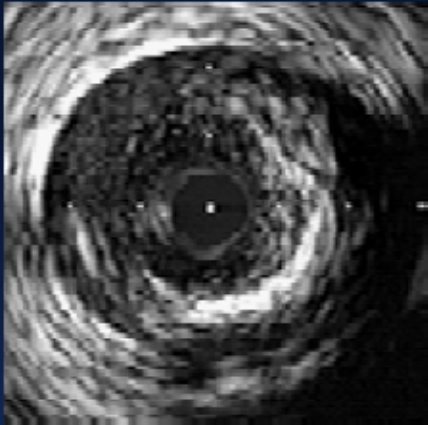
HORIZONS-AMI Early Stent Thrombosis



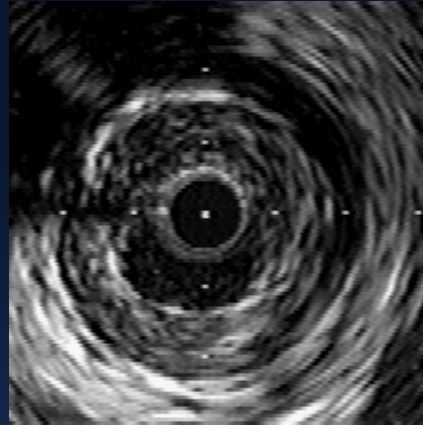


“Haziness” Following Stenting

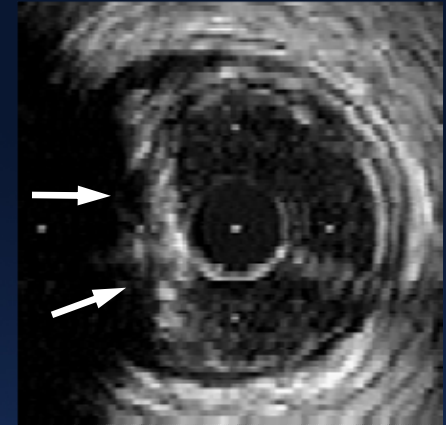
1. Edge Dissection



2. Residual Plaque Burden



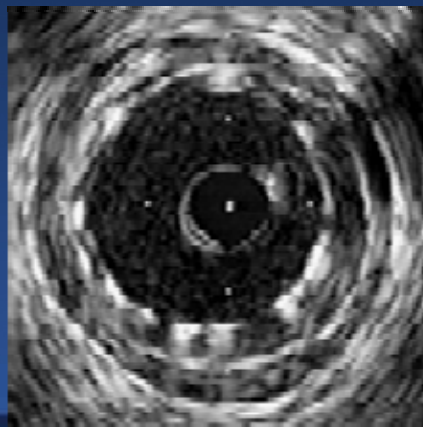
3. Calcified Plaque



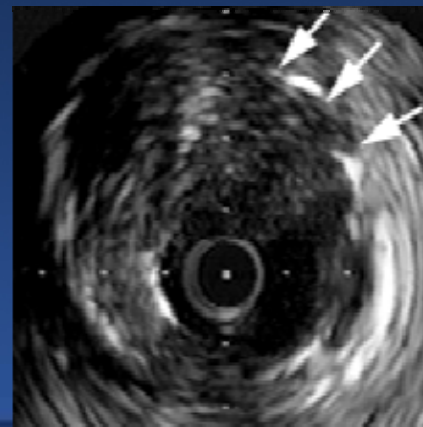
4. Incomplete Expansion



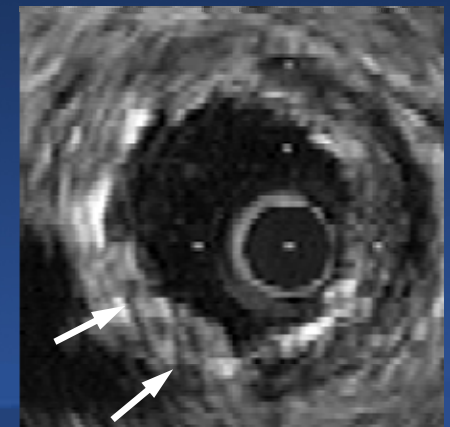
5. Incomplete Apposition



6. Thrombus

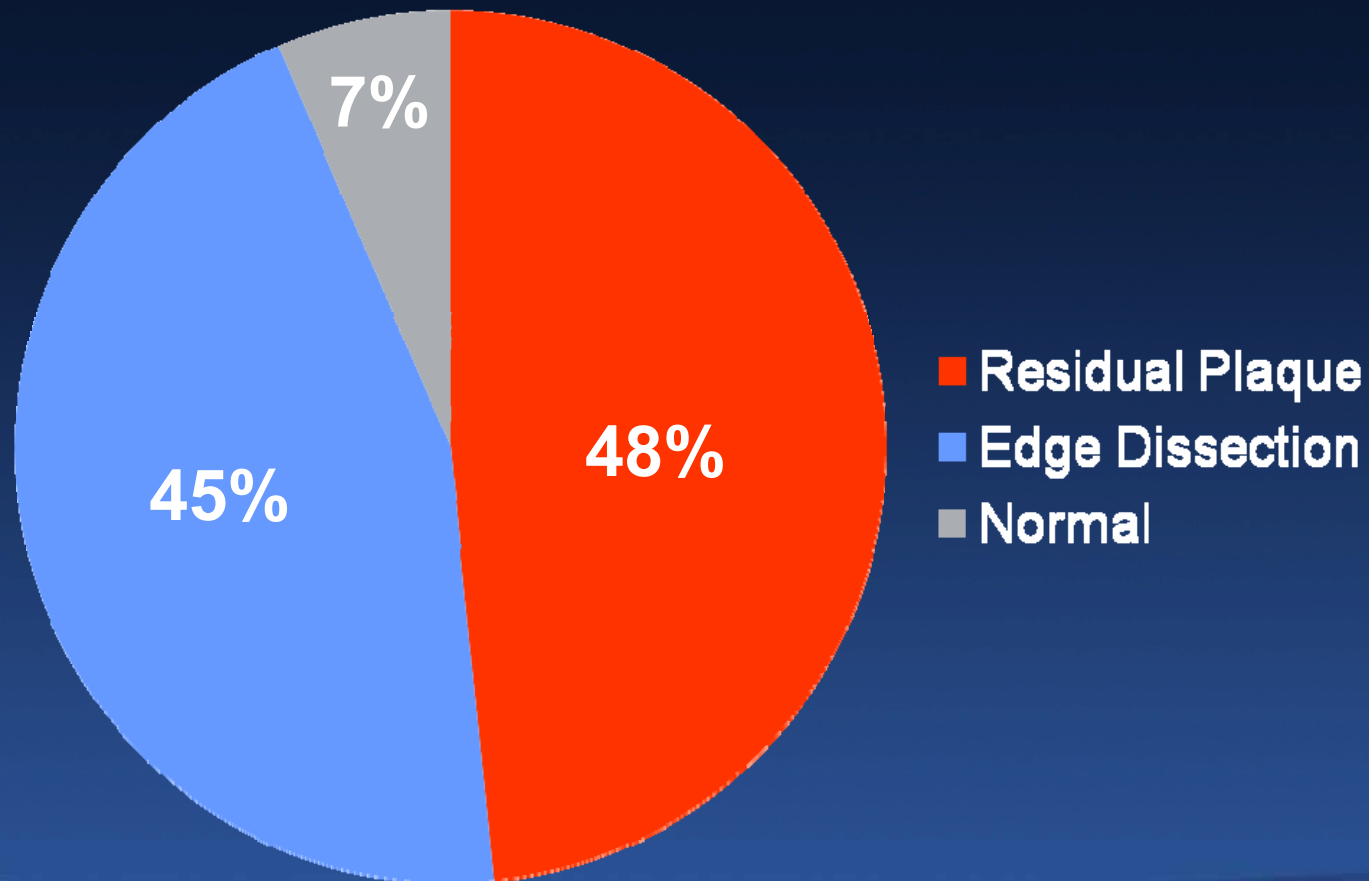


7. Plaque Protrusion



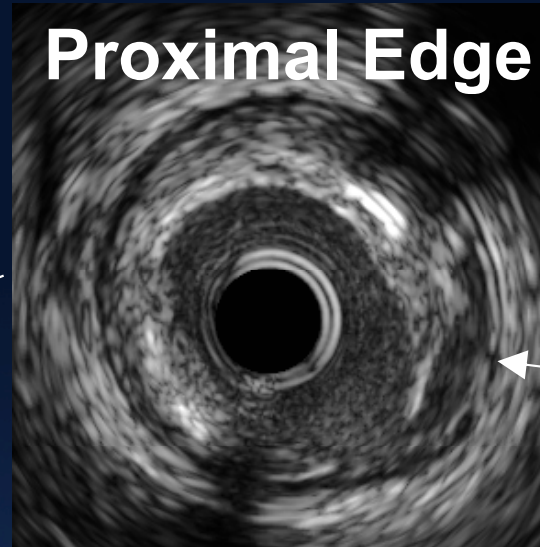
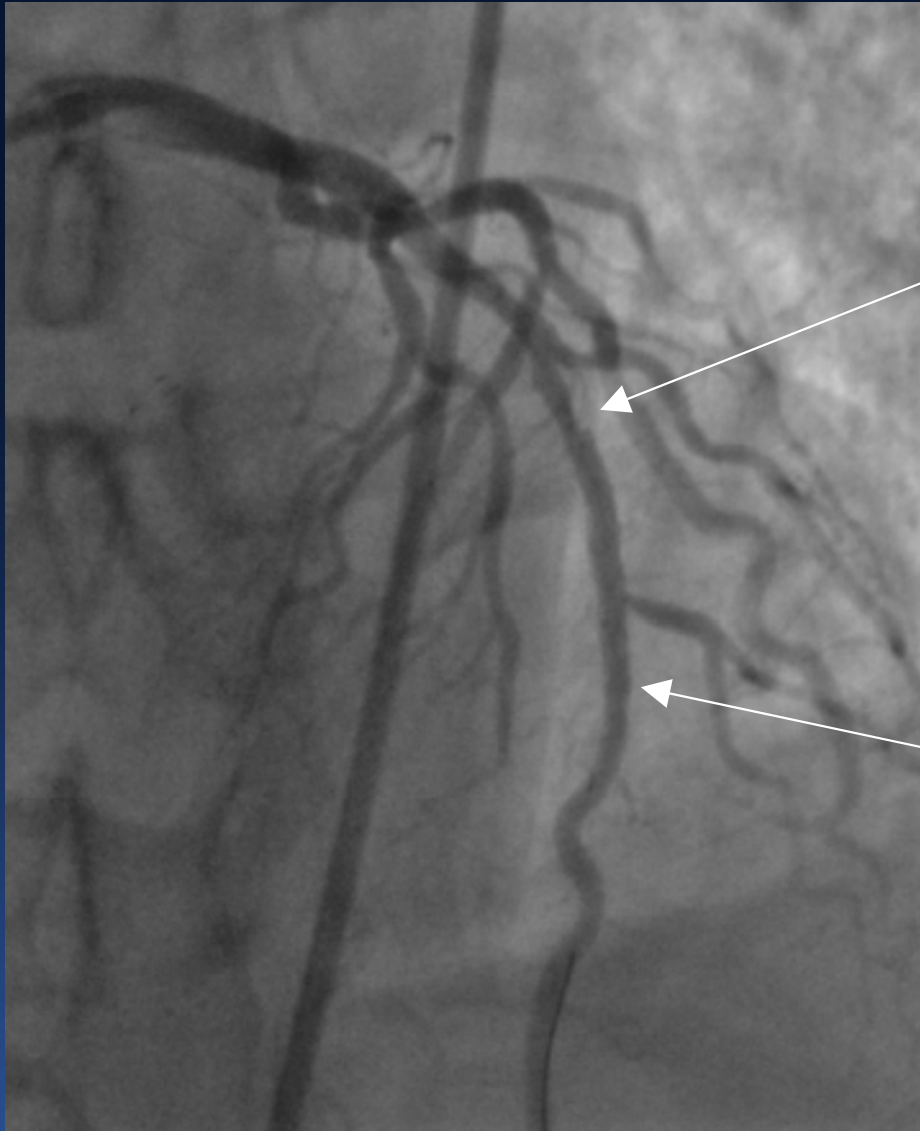
IVUS Assessment for Angiographic “Haziness”

Angiographical Haziness : 31/201 segments (15%)

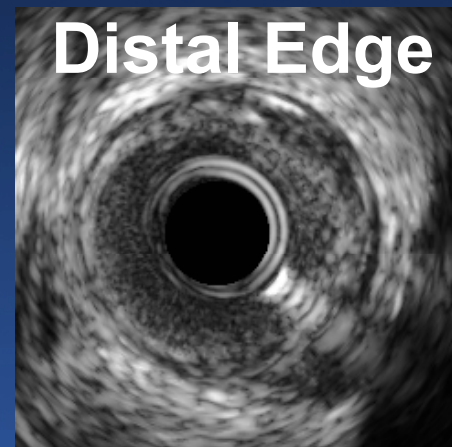


Ziada et al. Am J Cardiol 1997

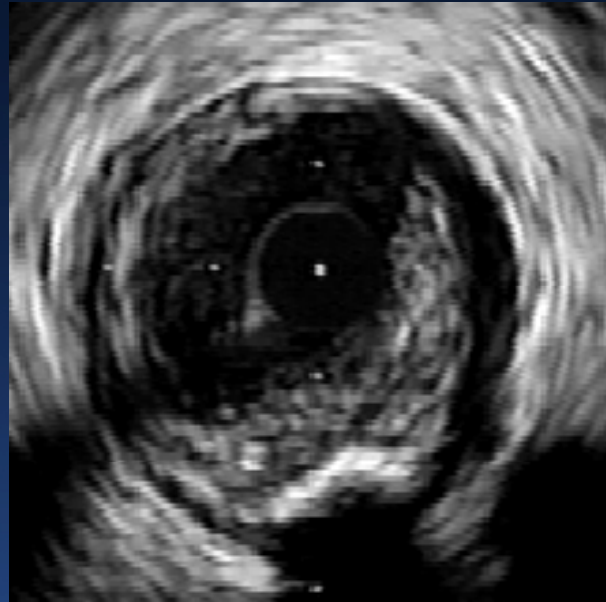
Stent Edge Dissection



dissection



Please expect after wire out.



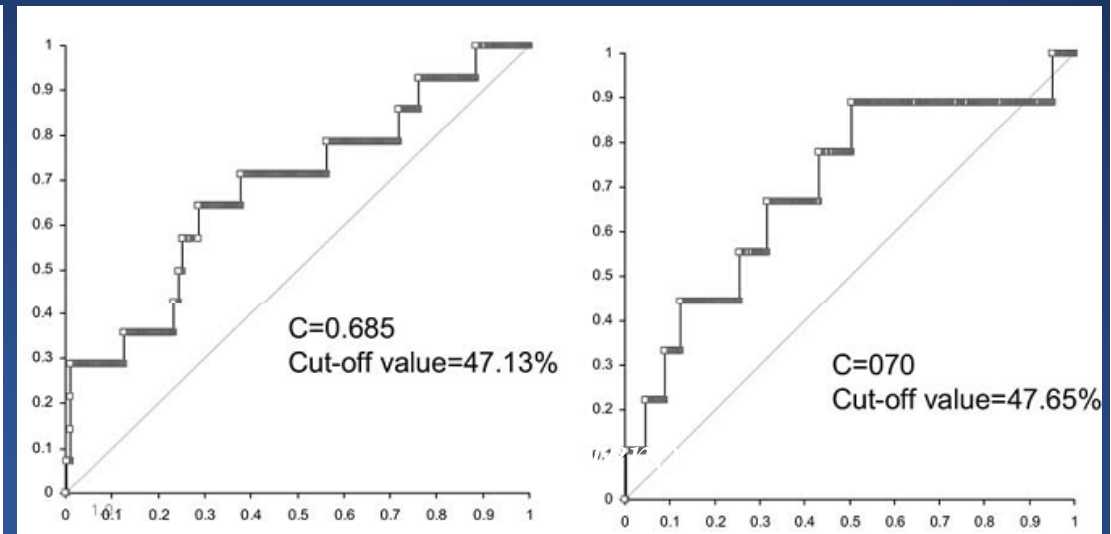
Flow limiting

Need additional Stent

Residual Plaque Predicts DES Restenosis

	Population	DES	F/U time	Predictor
SIRIUS¹	6 edge restenosis vs. 162 controls	SES	8 mo	Ref segment PB 60% vs. 41% (p<0.01)
TAXUS²	276 edge stenosis	PES	9 mo	Ref segment PB 47%

	Edge restenosis		p
	Yes	No	
Ref MLA, mm ²	4.7 ± 2.3	6.4 ± 2.3	0.05
Ref EEM, mm ²	10.7 ± 3.8	14.0 ± 4.8	0.16
Max PB, %	61 ± 9	41 ± 12	0.03
Edge dissec	0	2 (1%)	1.00



Plaque Burden 47% ≈ 50%

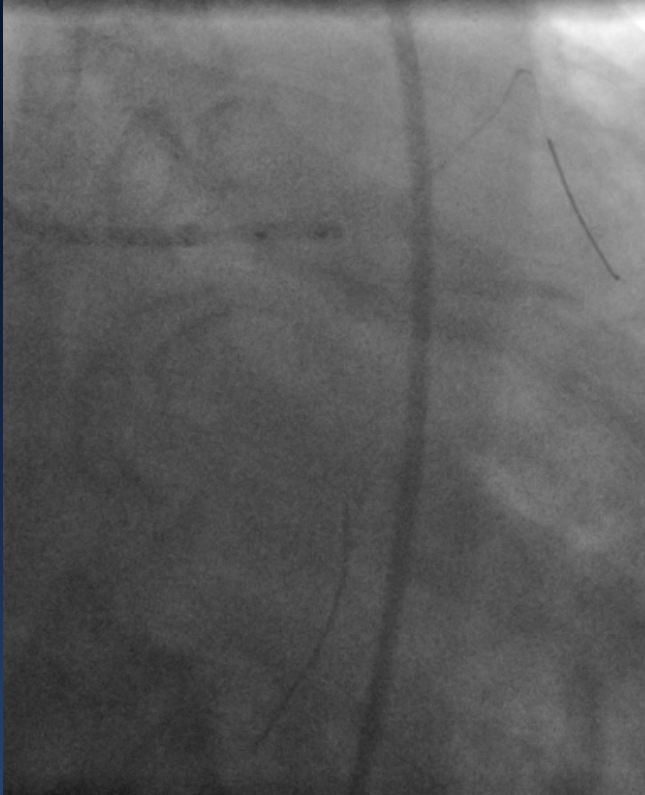
¹Am J Cardiol 2005;96:1251-3

²Liu et al. Am J Cardiol 2009;103:501-6

Pre-Intervention



Ballooning



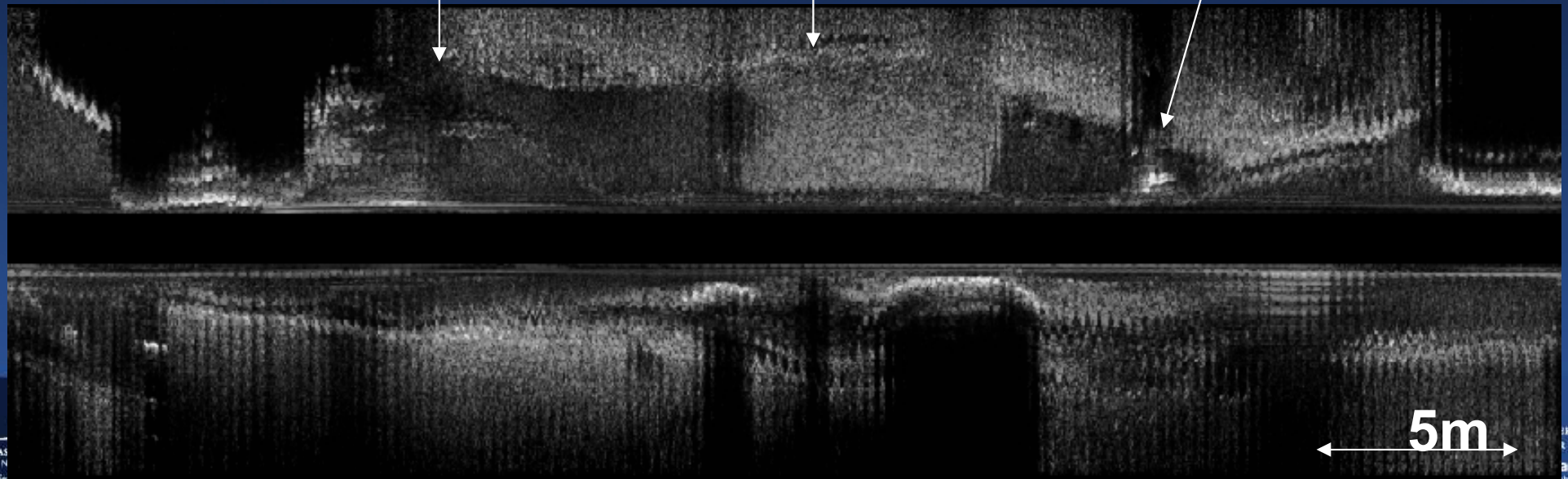
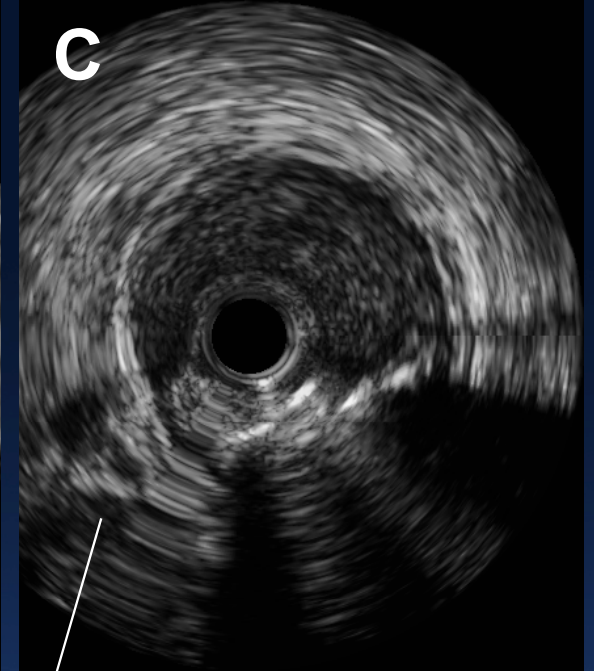
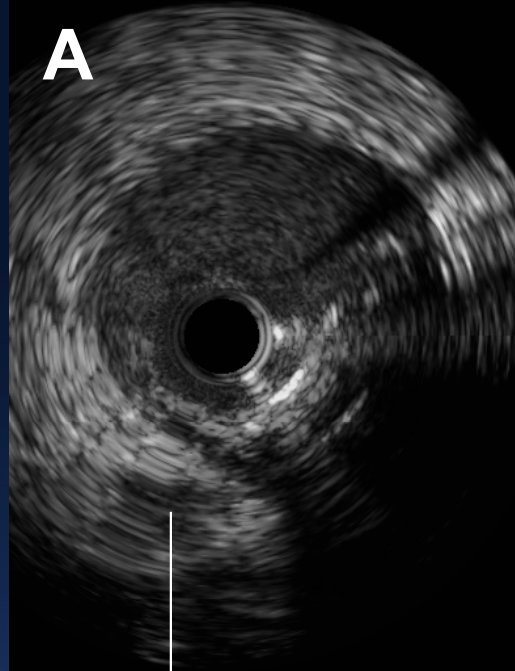
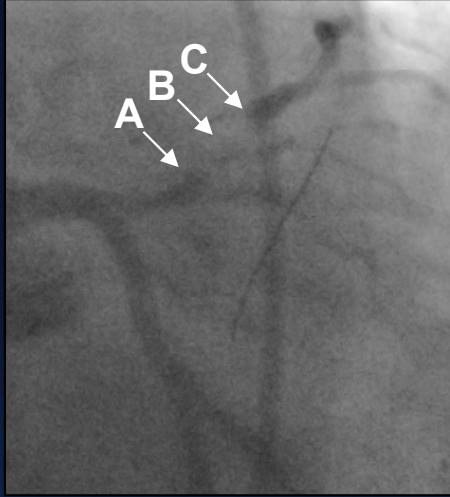
Post-Balloon



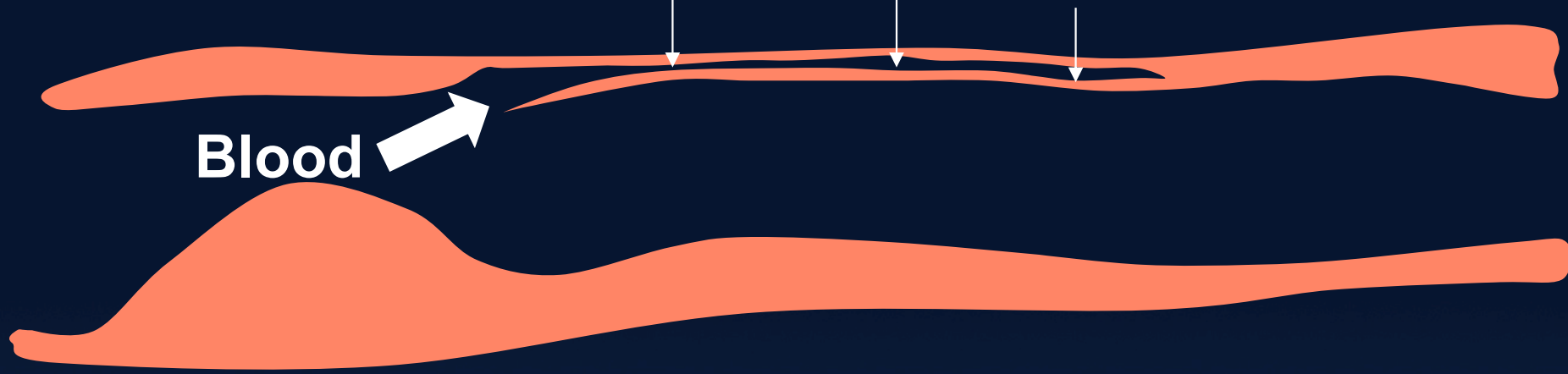
Intramural Hematoma

Entry site of hematoma

Distal End of
hematoma space



Longitudinal Medial Dissection



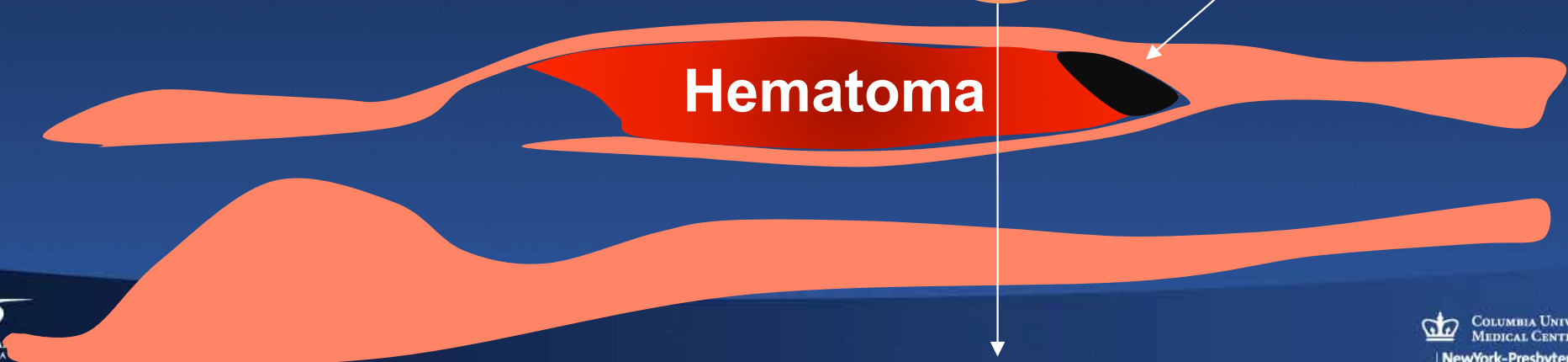
Development of Intramural Hematoma



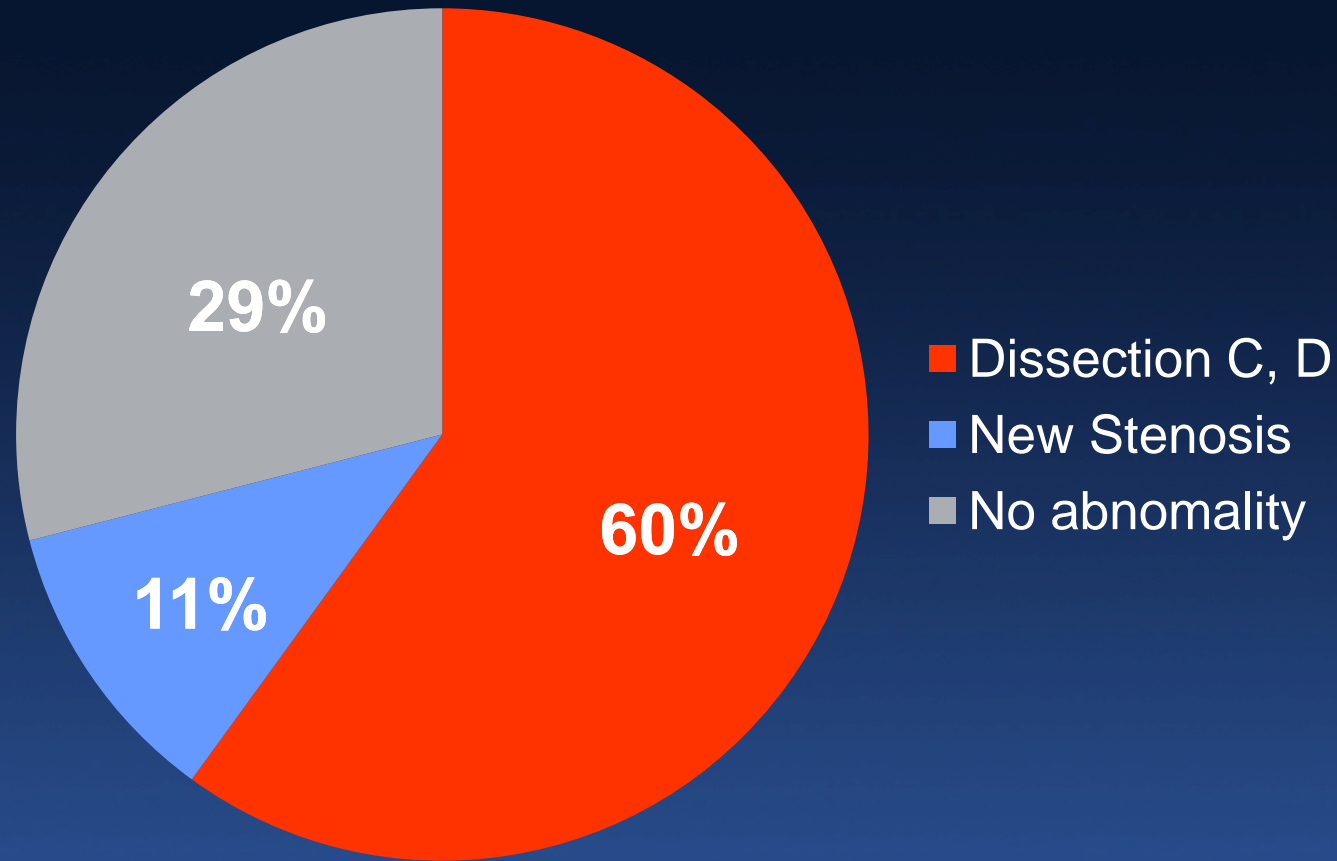
Cross sectional image



Retention of Contrast, Saline, or Serum



Angiographical Finding of Hematoma

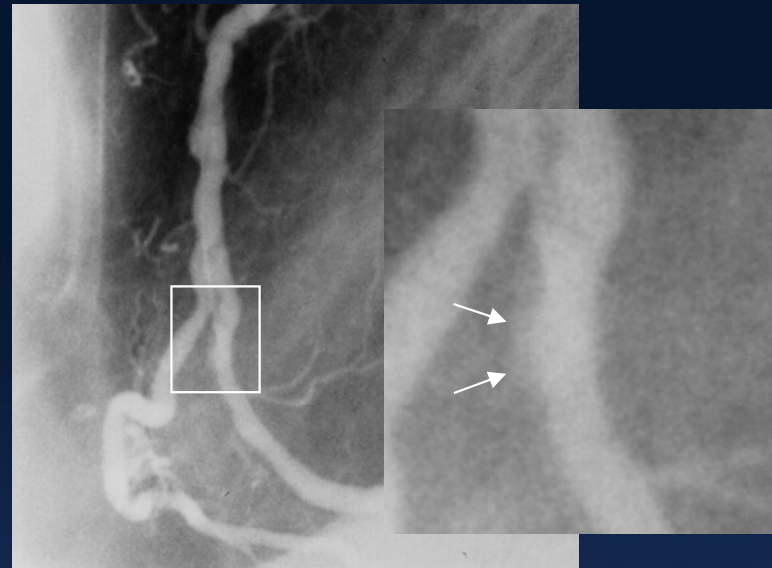


Perforation - angiographically unclear -

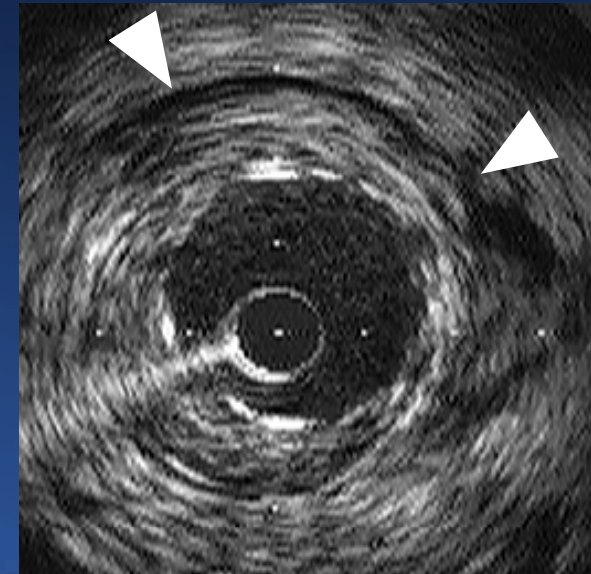
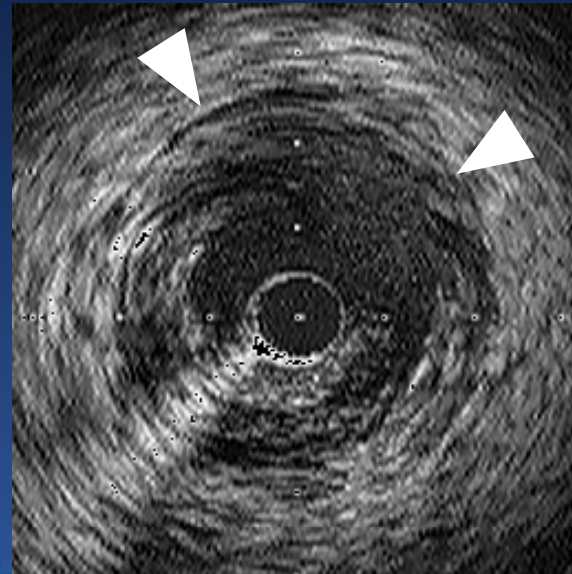
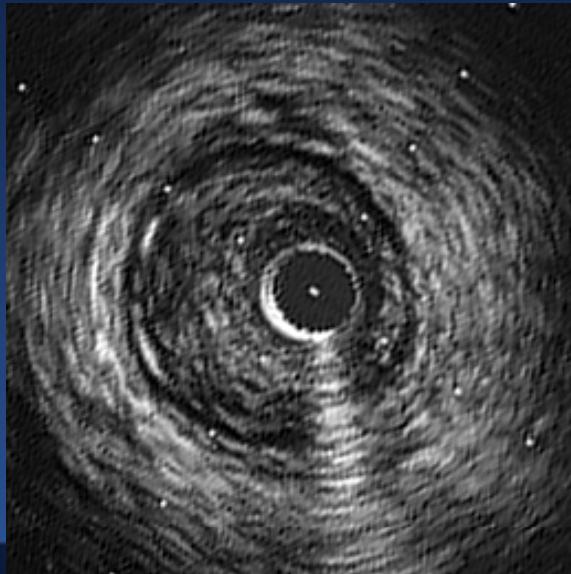
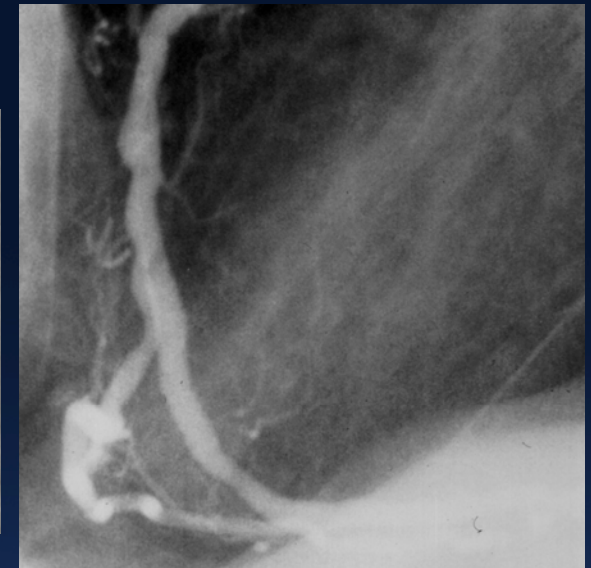
Pre



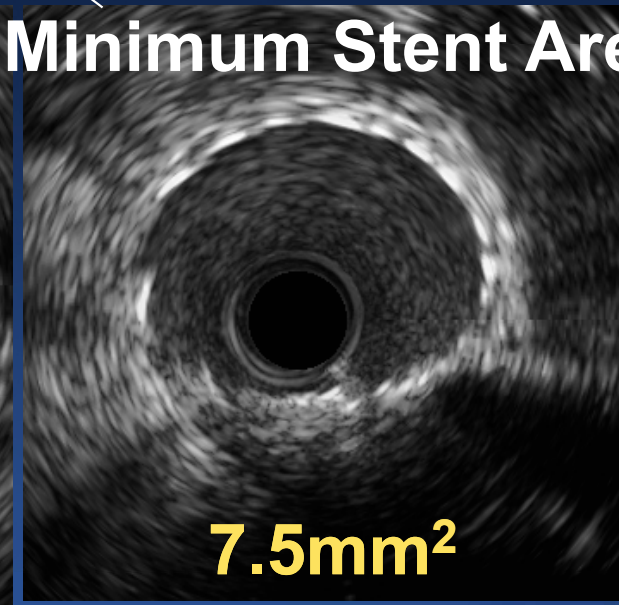
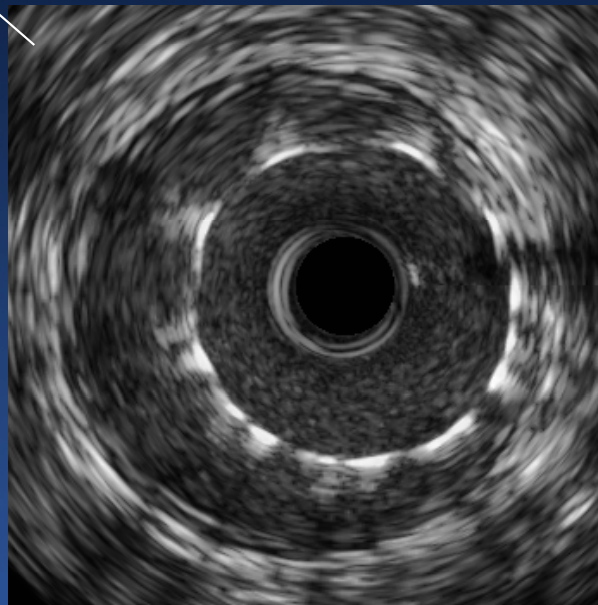
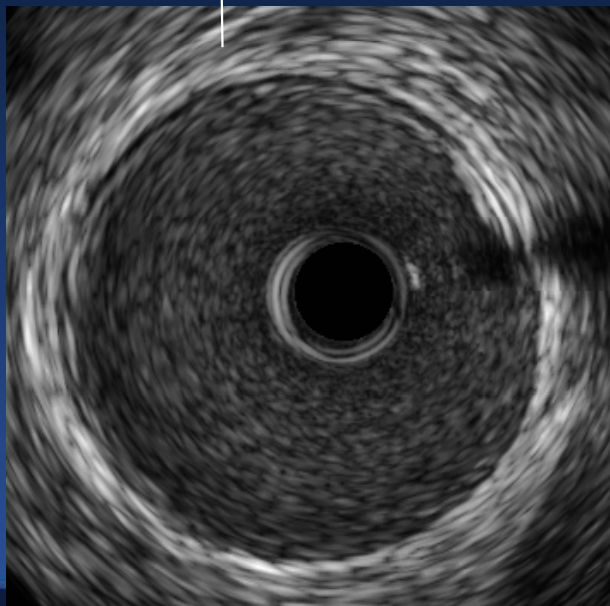
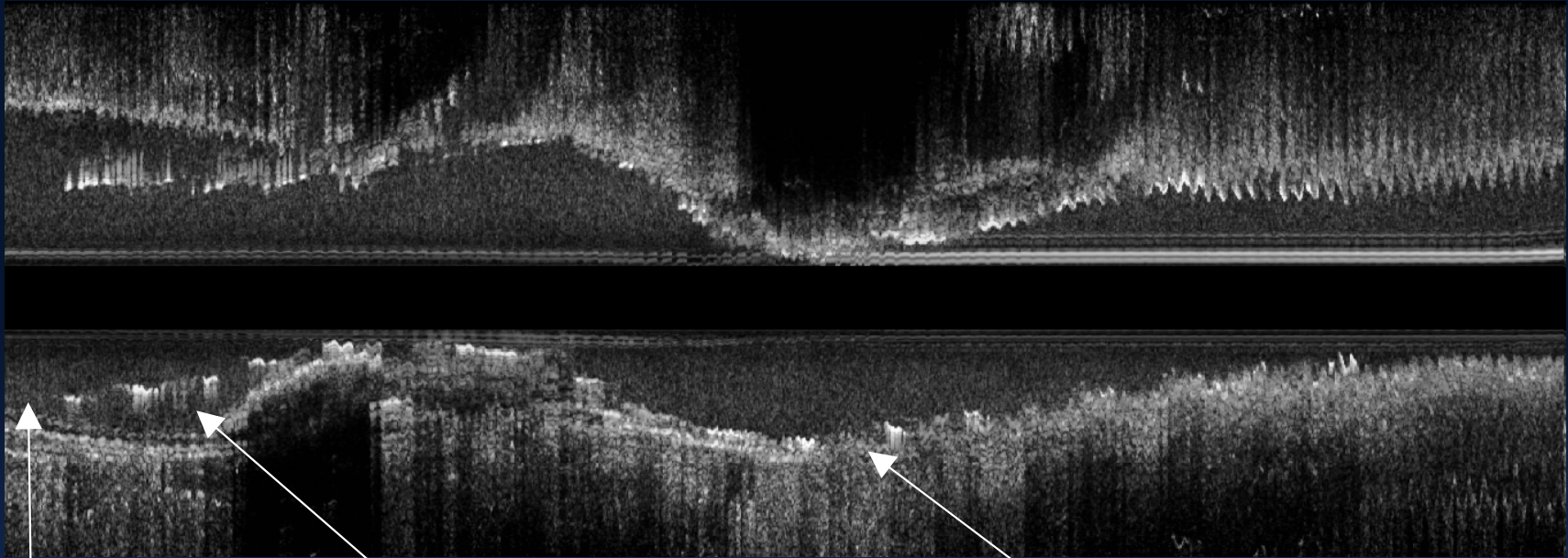
Post-Balloon



Post-Stent



Acute Stent Malapposition



Minimum Stent Area

7.5mm²

Malapposition

Acute Stent Malapposition (ASM)

Little Evidence Linking ASM to MACE

Study	ASM frequency	Clinical outcomes
HORIZON-AMI¹	34% of PES 39% of BMS	39% resolved by negative remodeling No difference in 13-month MACE
TAXUS IV,V,VI²	9.7% of PES 7.2% of BMS	No difference in 9-mo MACE between ASM vs. control (12% vs. 9%, p=0.45)
Hong et al.³	7.2% of DES	No MACE or TLR at 6 months
Kimura et al.⁴	18% of SES	25% of ASM resolved at 6 months No ISR or ST

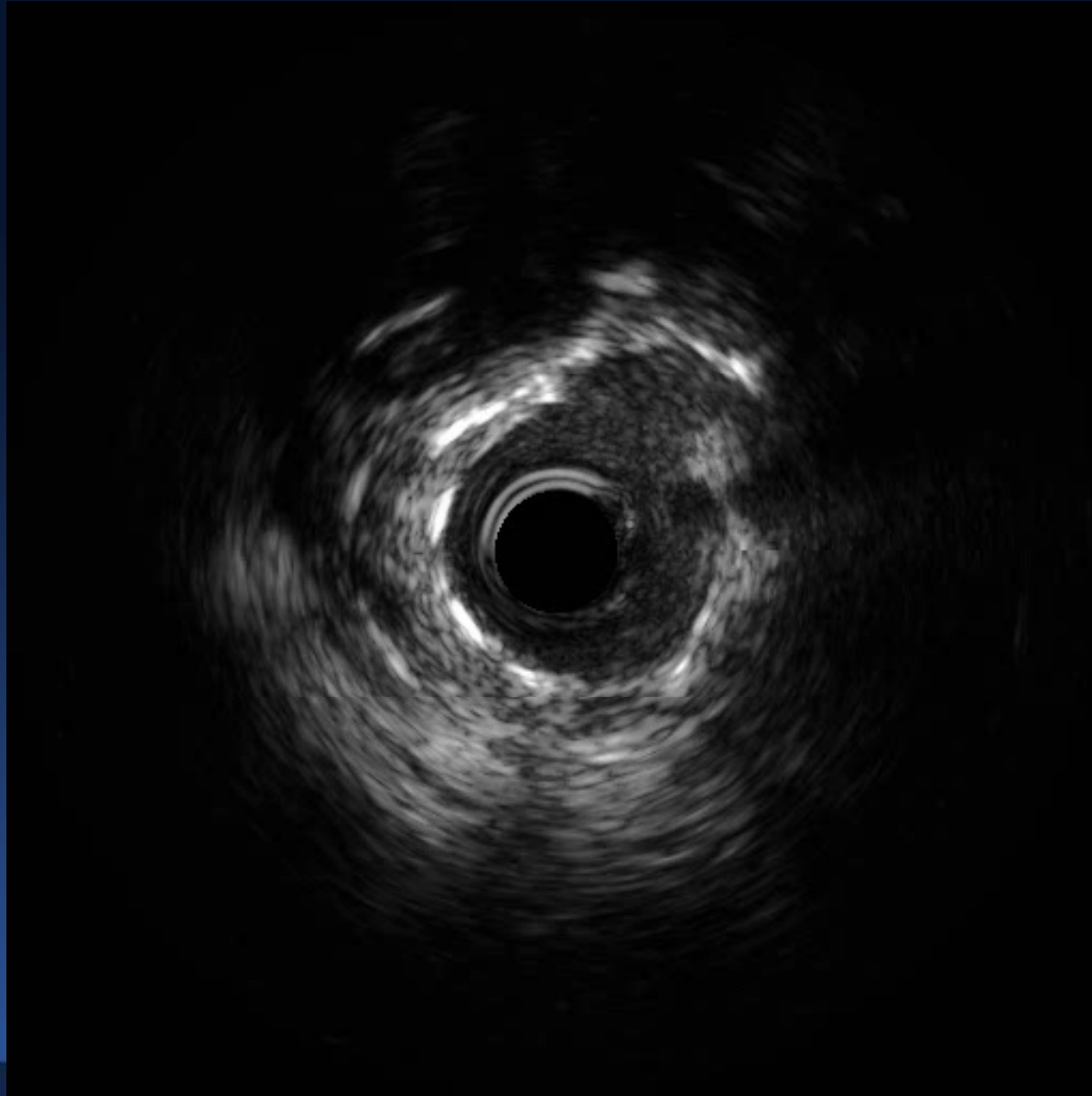
¹Guo et al. Circulation 2010;122:1077-84

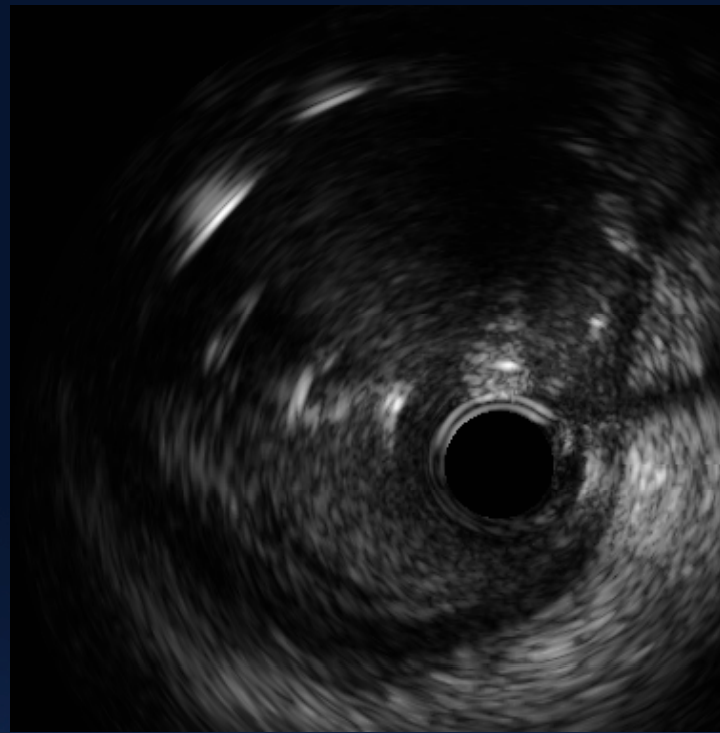
²Steinberg et al. JACC interv 2010;3:486-94

³Hong et al. Circulation 2006;113:414-9

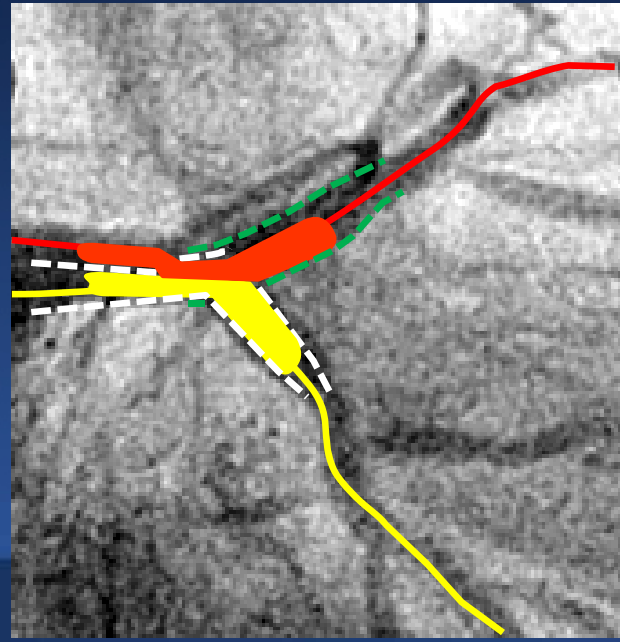
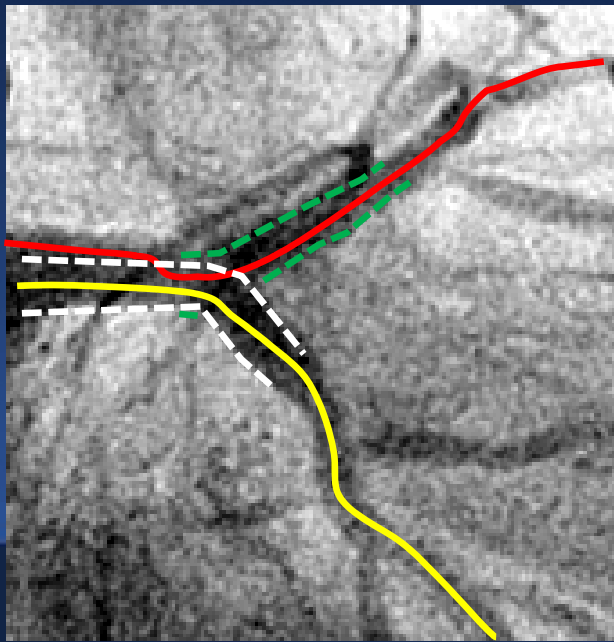
⁴Kimura et al. Am J Cardiol 2006;98:36-42

IVUS LAD to Left Main

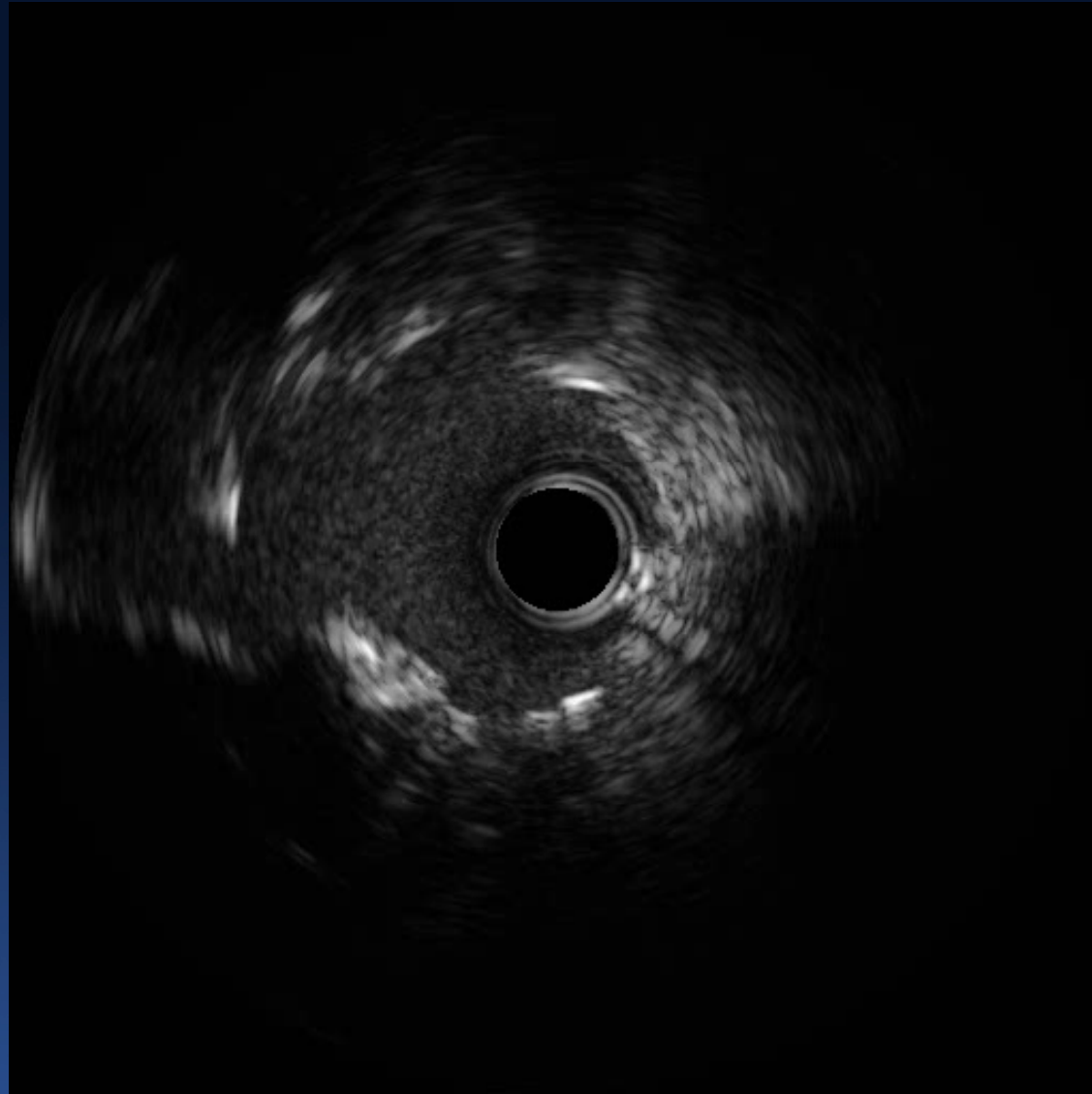




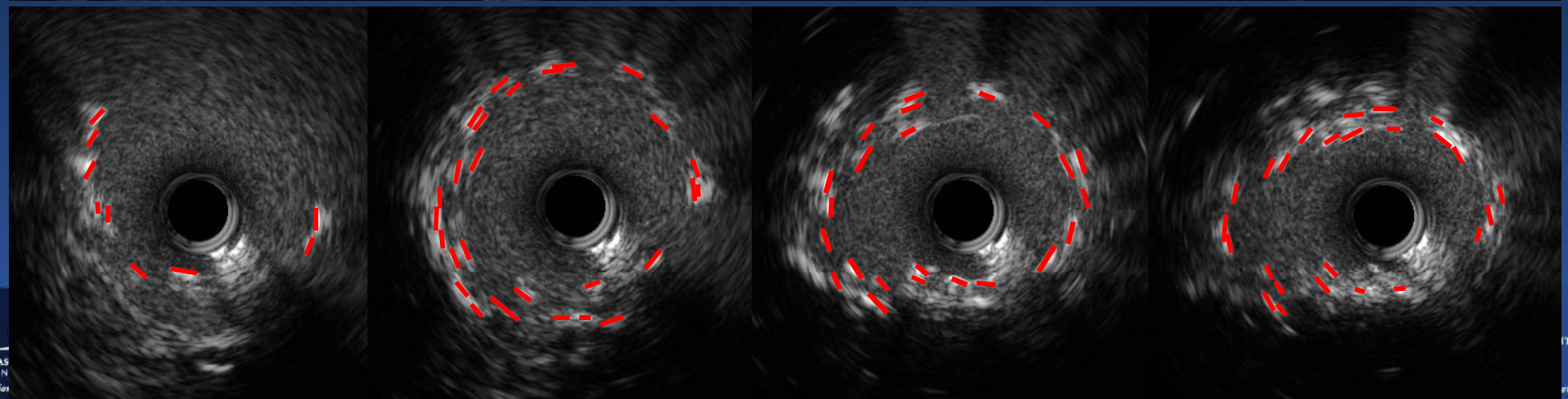
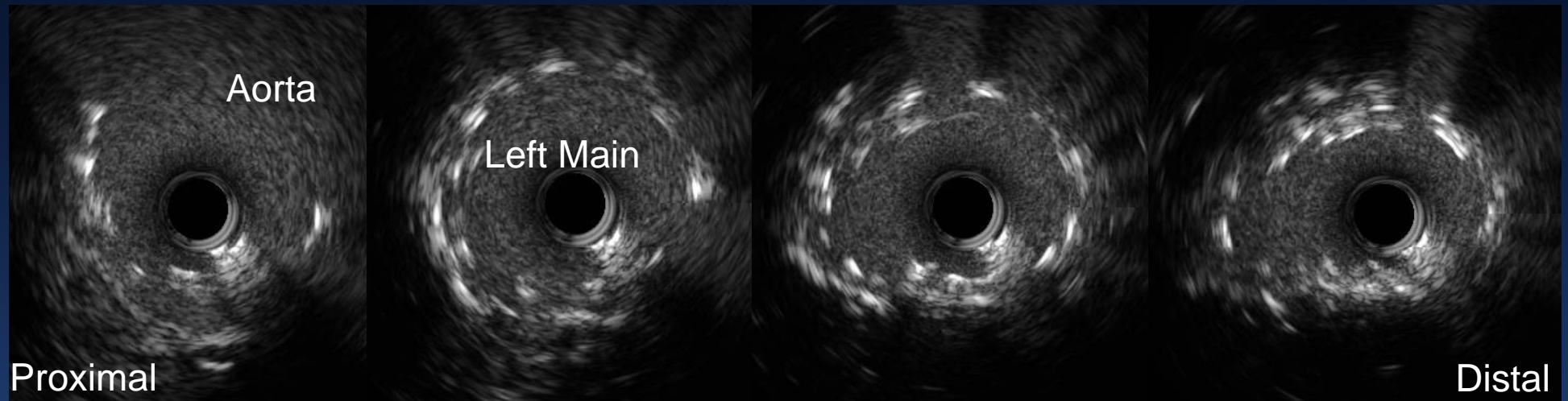
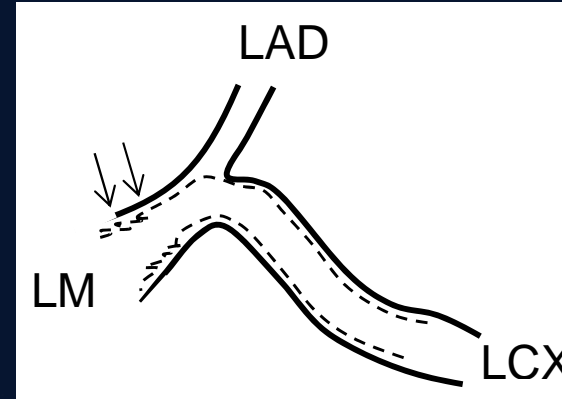
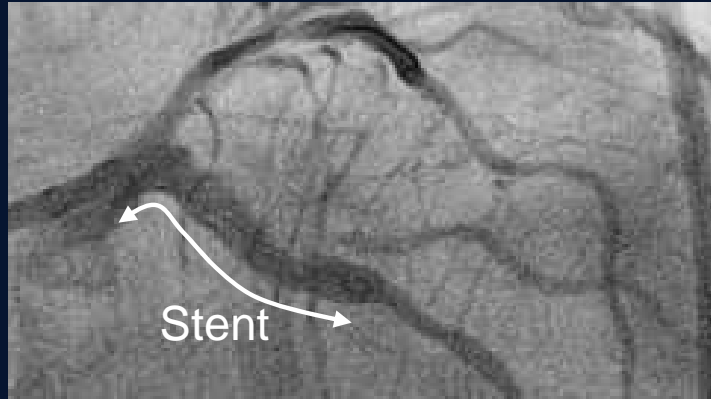
KBT



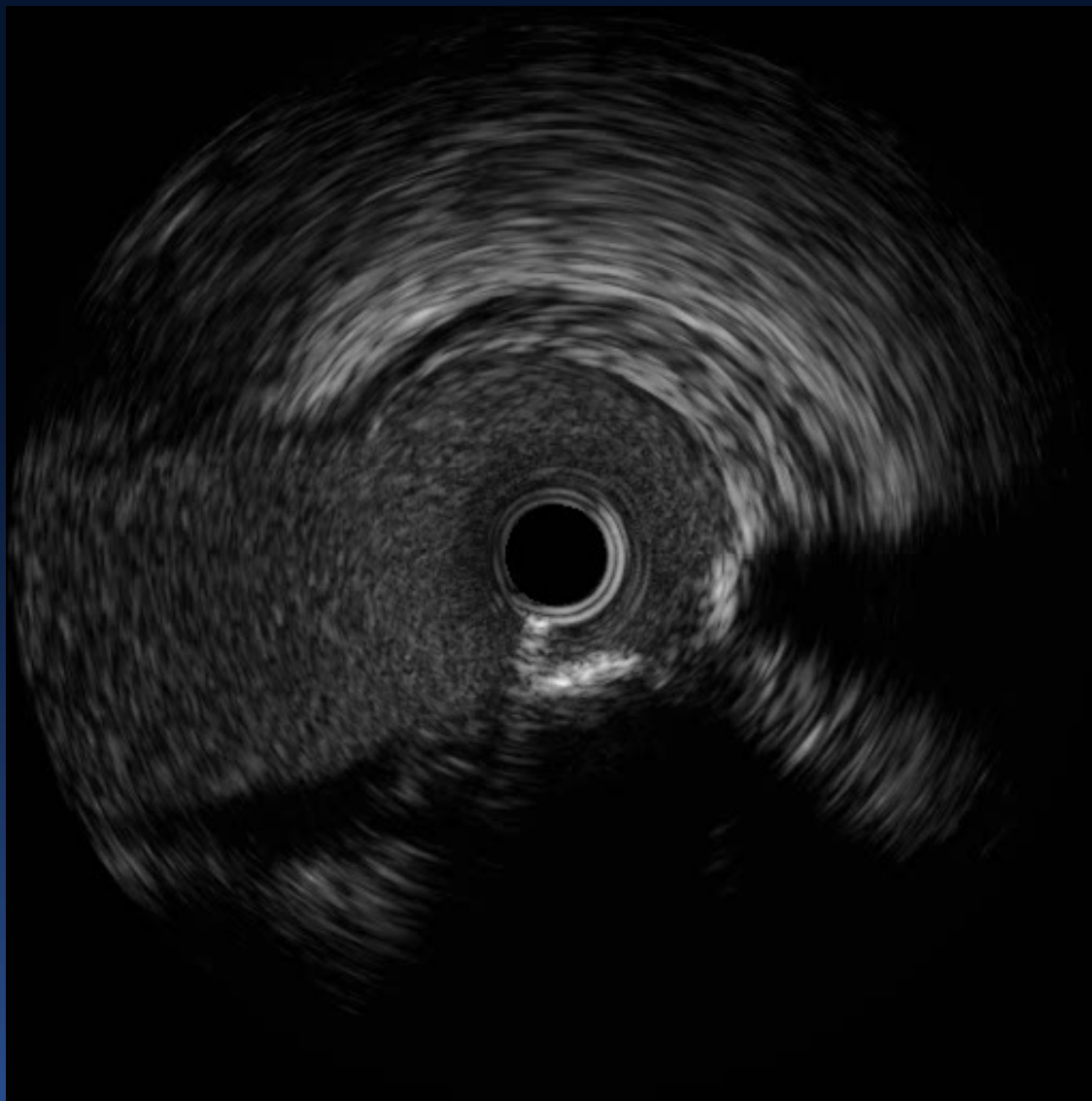




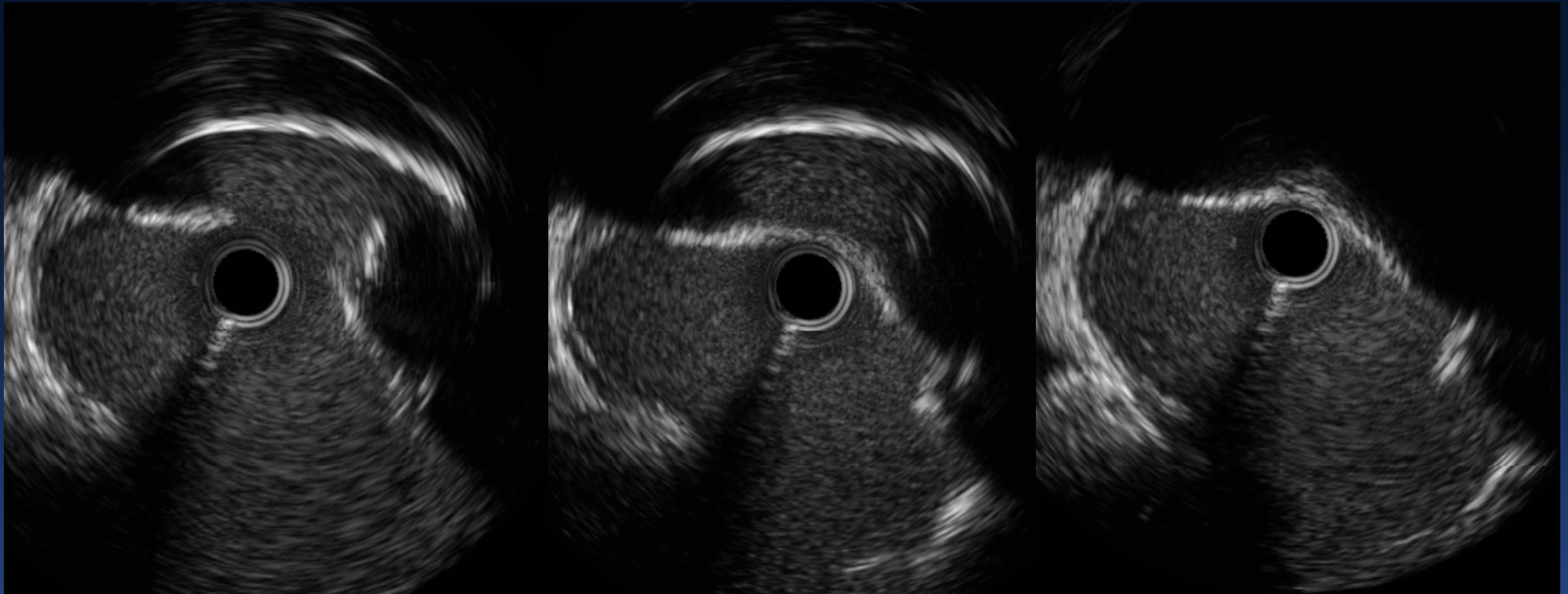
Stent Deformation







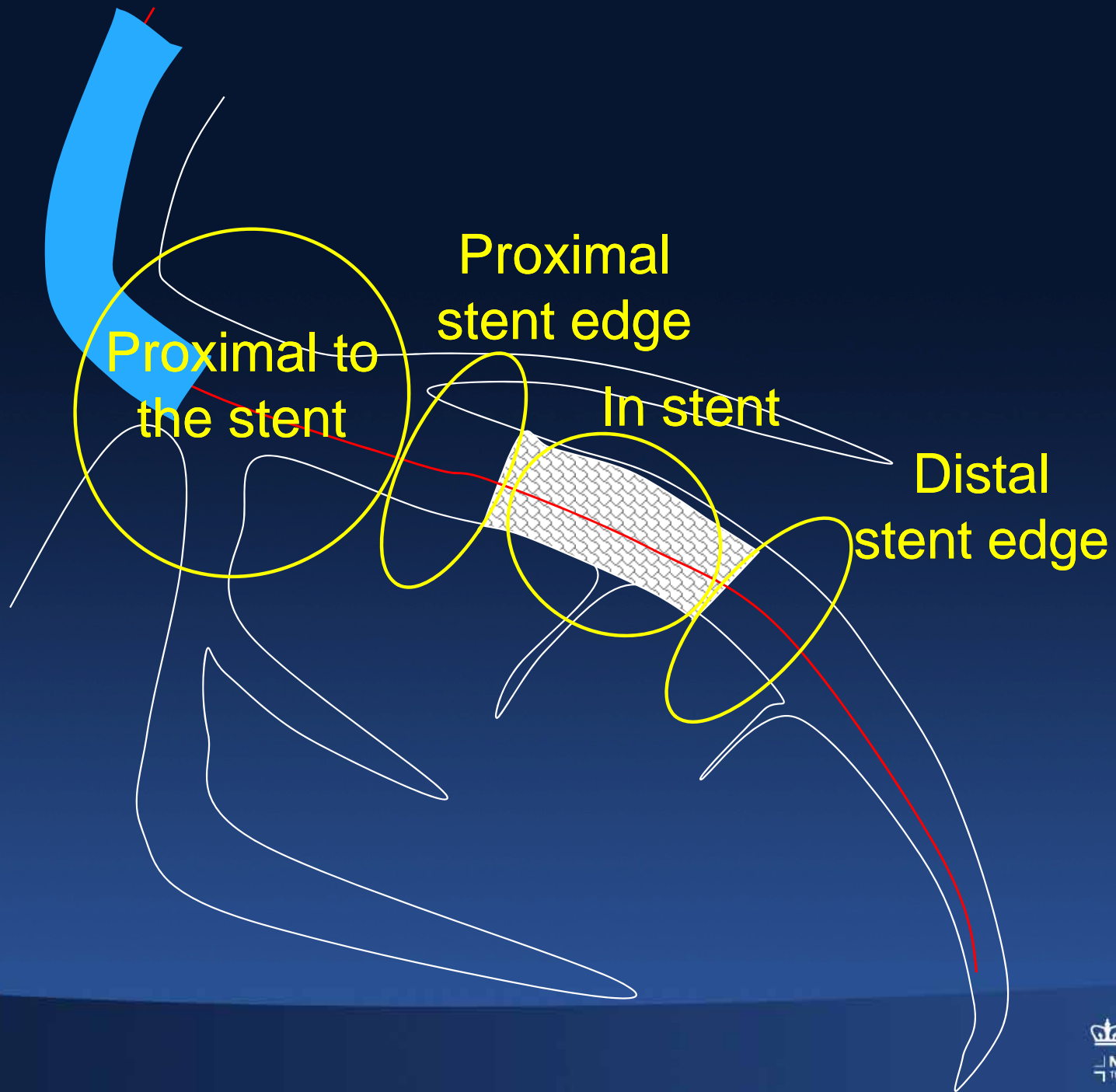
Chronic Left main Dissection or Ruptured Plaque



Proximal

Distal

Post Stent Evaluation



Post Stent Evaluation

- Enough Lumen?
- Optimal Stent Expansion
- Significant Tissue Protrusion

- At least 5.5mm²
- >90% of distal reference lumen area

Proximal or Distal Residual Lesion

Plaque burden: 50%

Mechanical Issue?

- Edge dissection
- Malapposition
- Stent deformation

Anything else? Guiding catheter injury, Wire pass