How to Treat Tandem Lesion Under Physiology-Guidance

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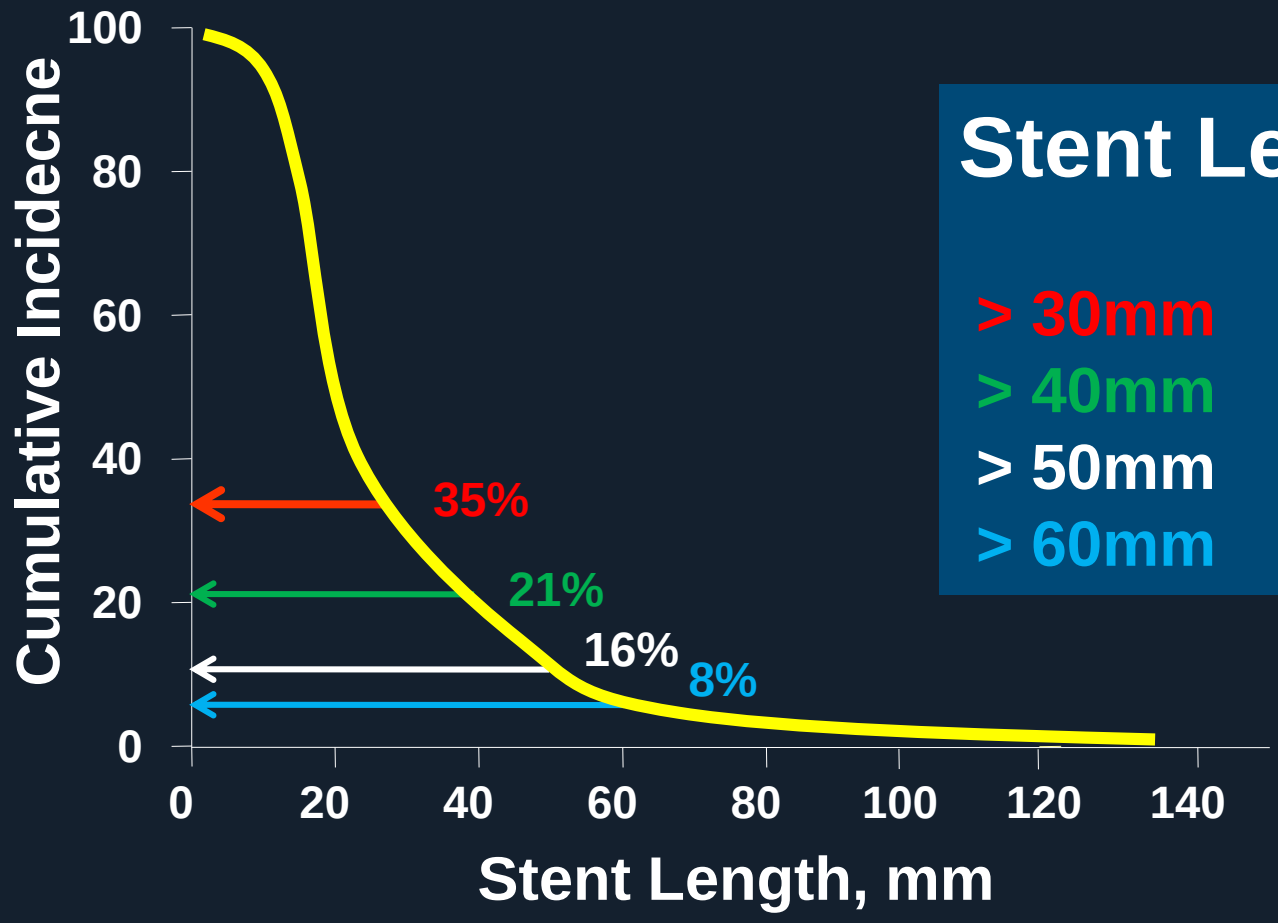
Incidence of Long Stenting



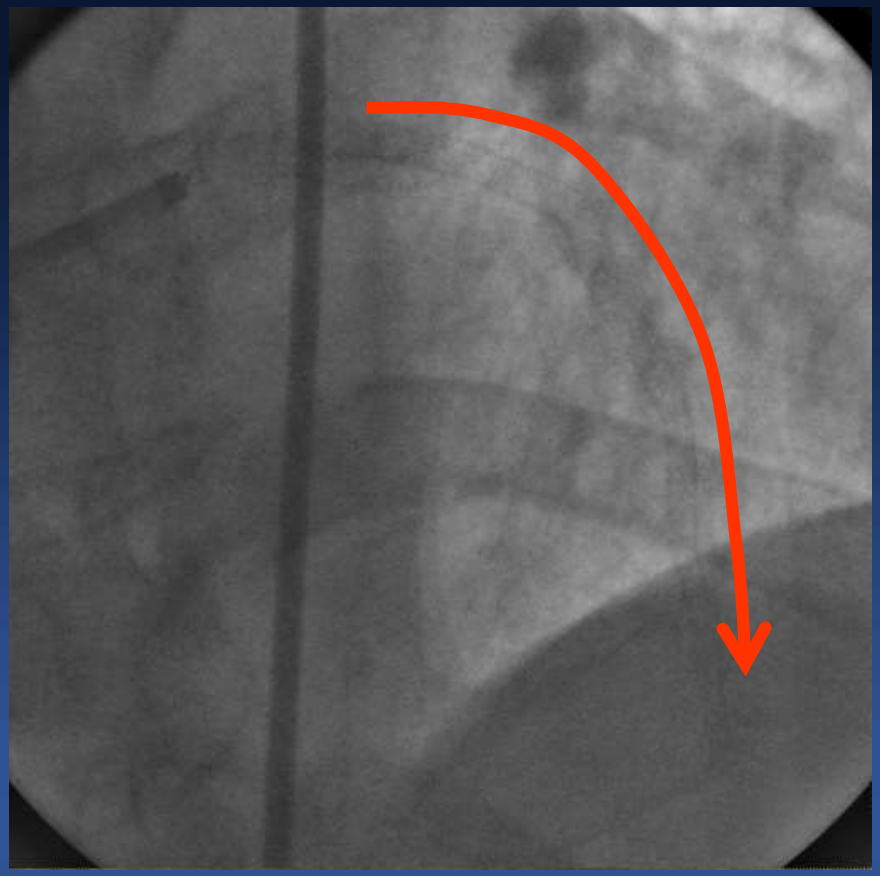
Stent Length

> 30mm	35%
> 40mm	21%
> 50mm	16%
> 60mm	8%

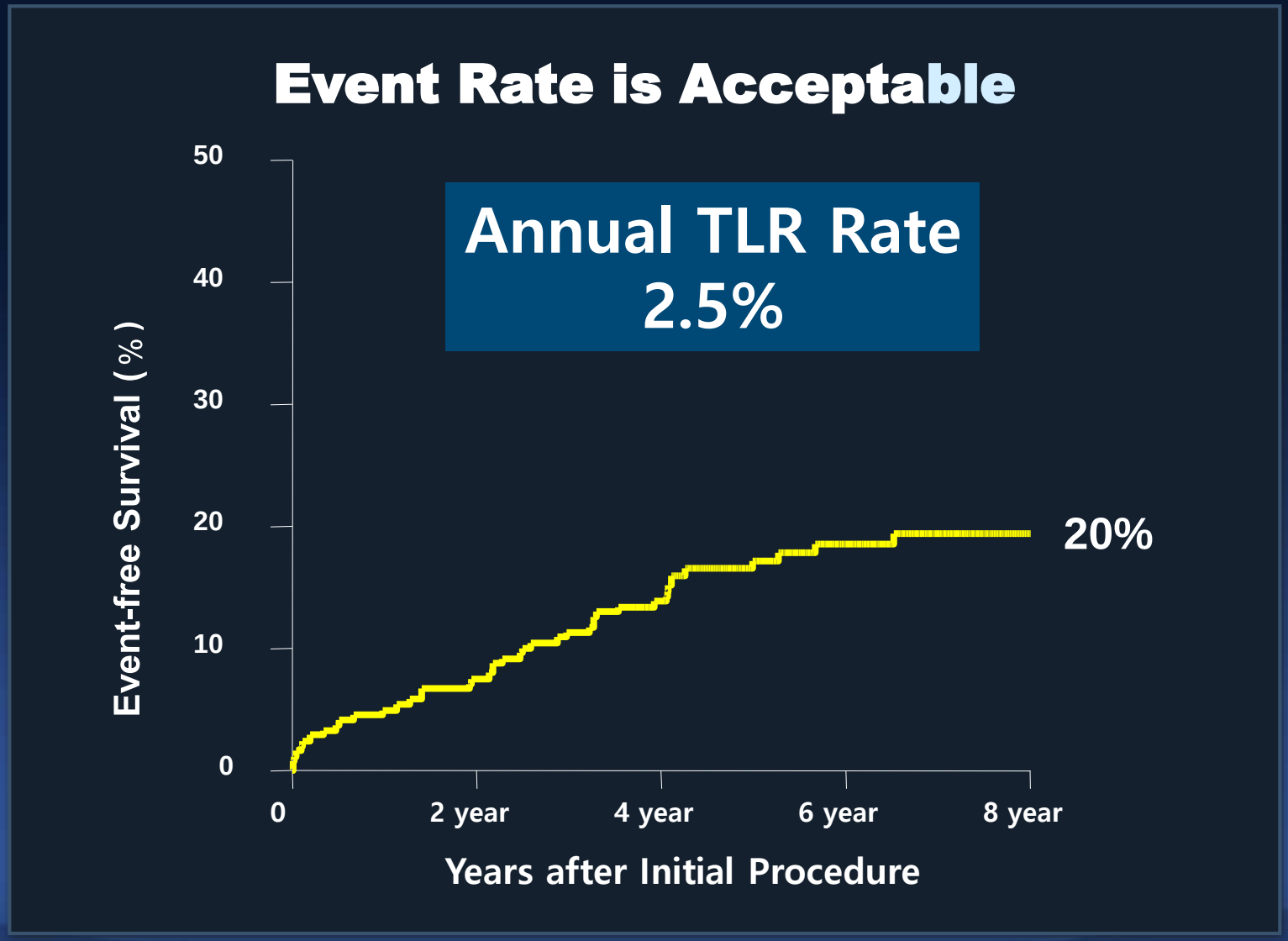
Data from IRIS DES registry

“Full Metal Jacket”

Multiple or overlapping stent implantation

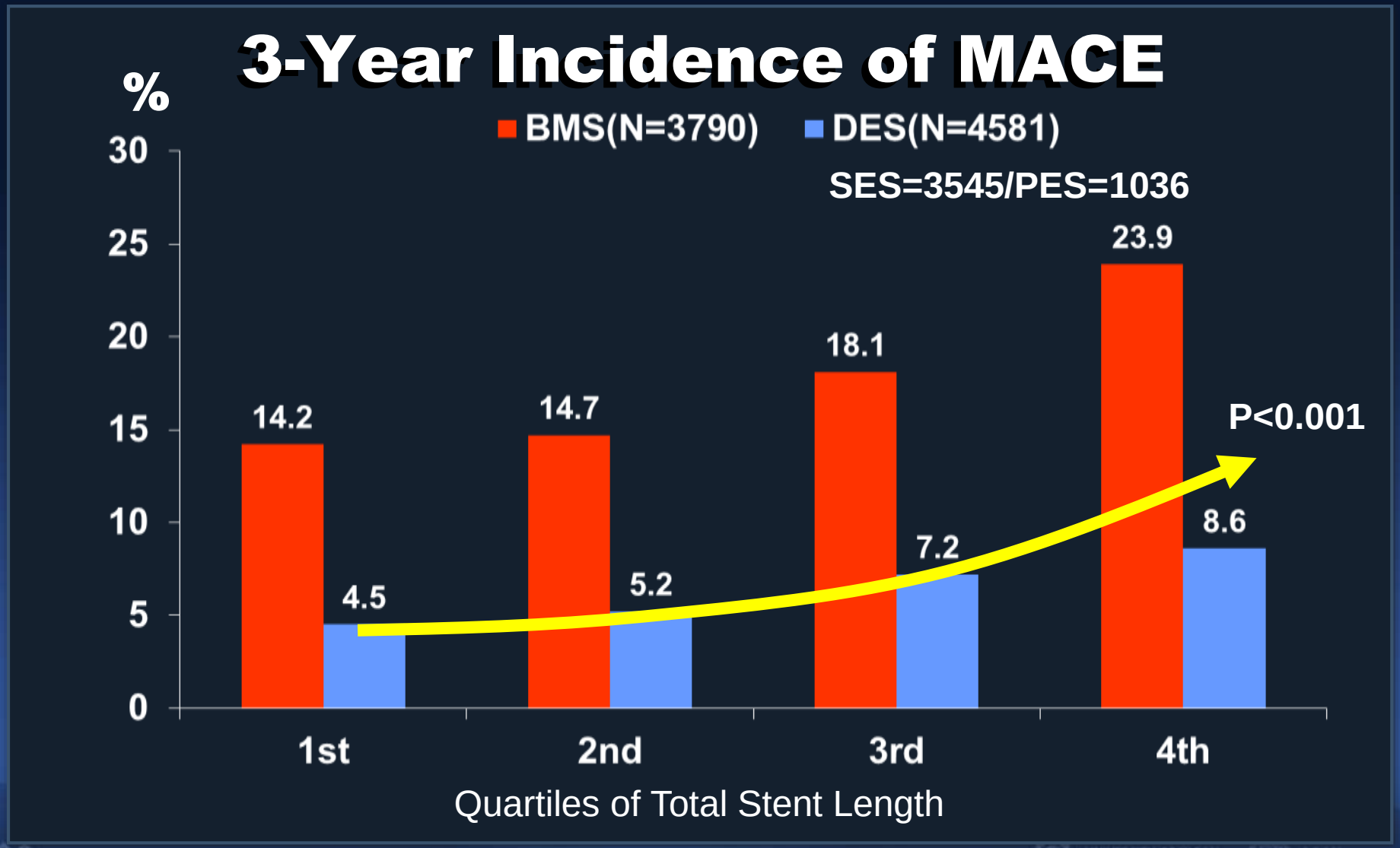


8 Year Follow-up of FMJ



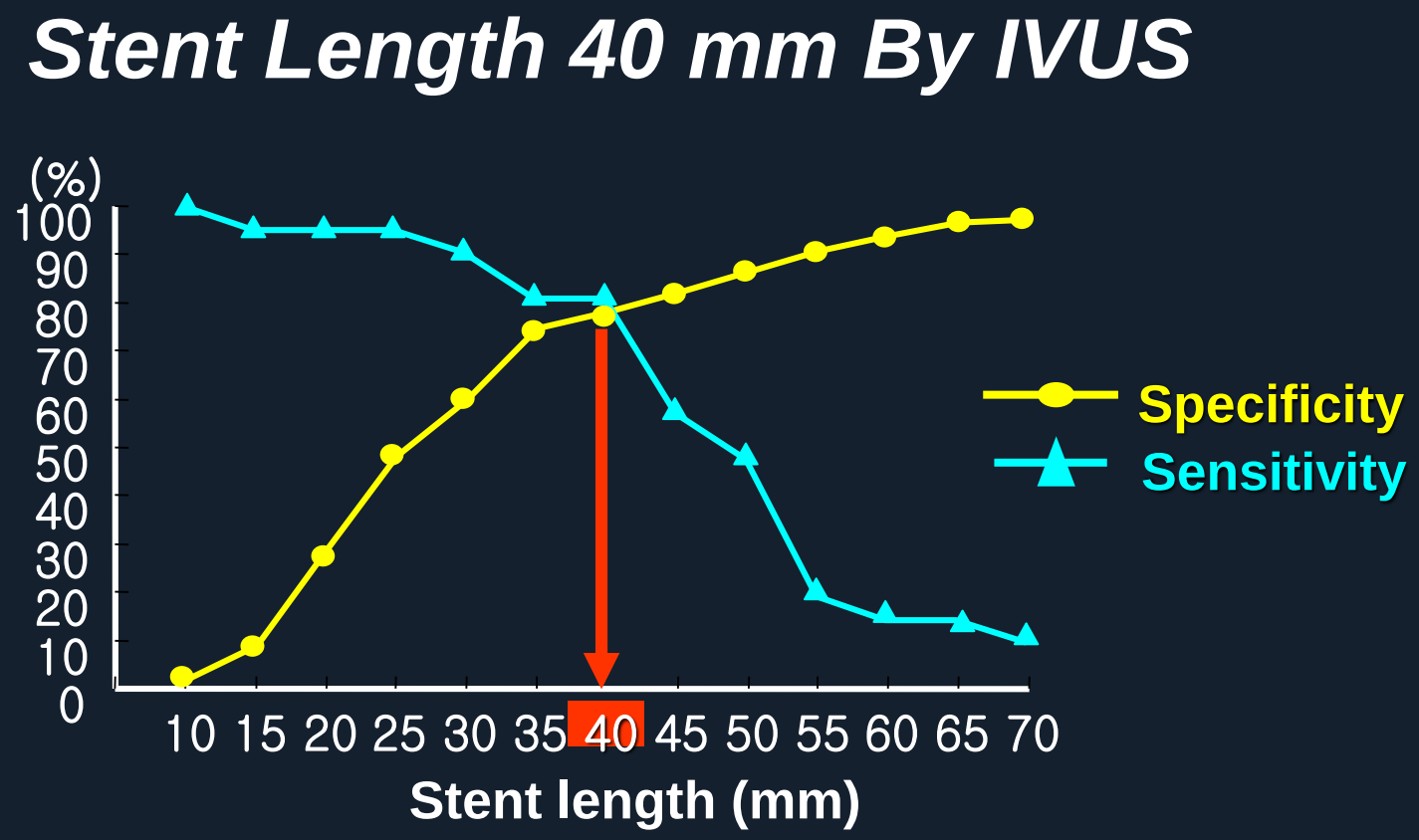
Lee CW, Park SJ, et al, CCI. 2014 Sep 1;84(3):361-5.

Stent Length and Outcomes



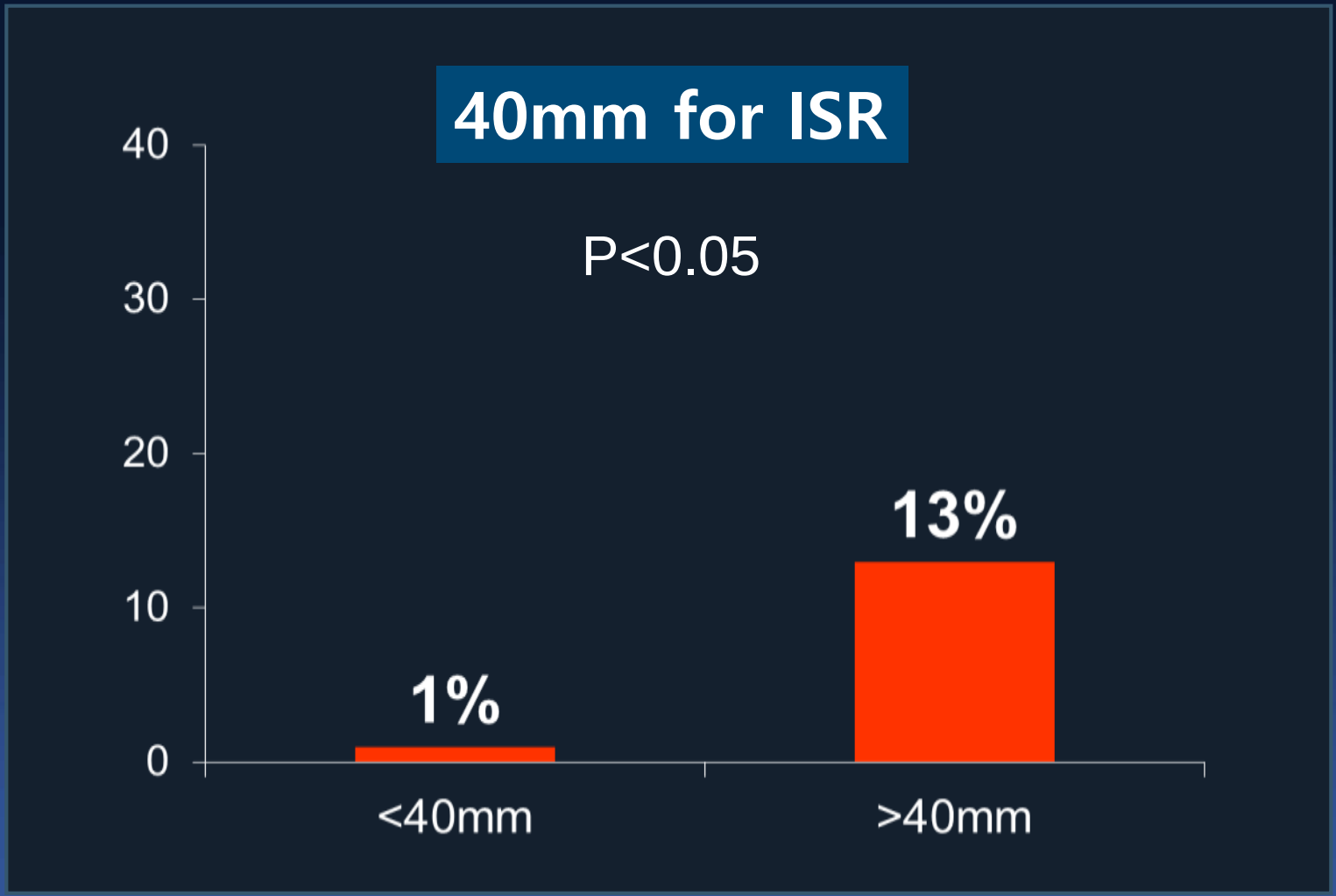
*Data from ASAN PCI registry (Year 1997-2006)

How Long?



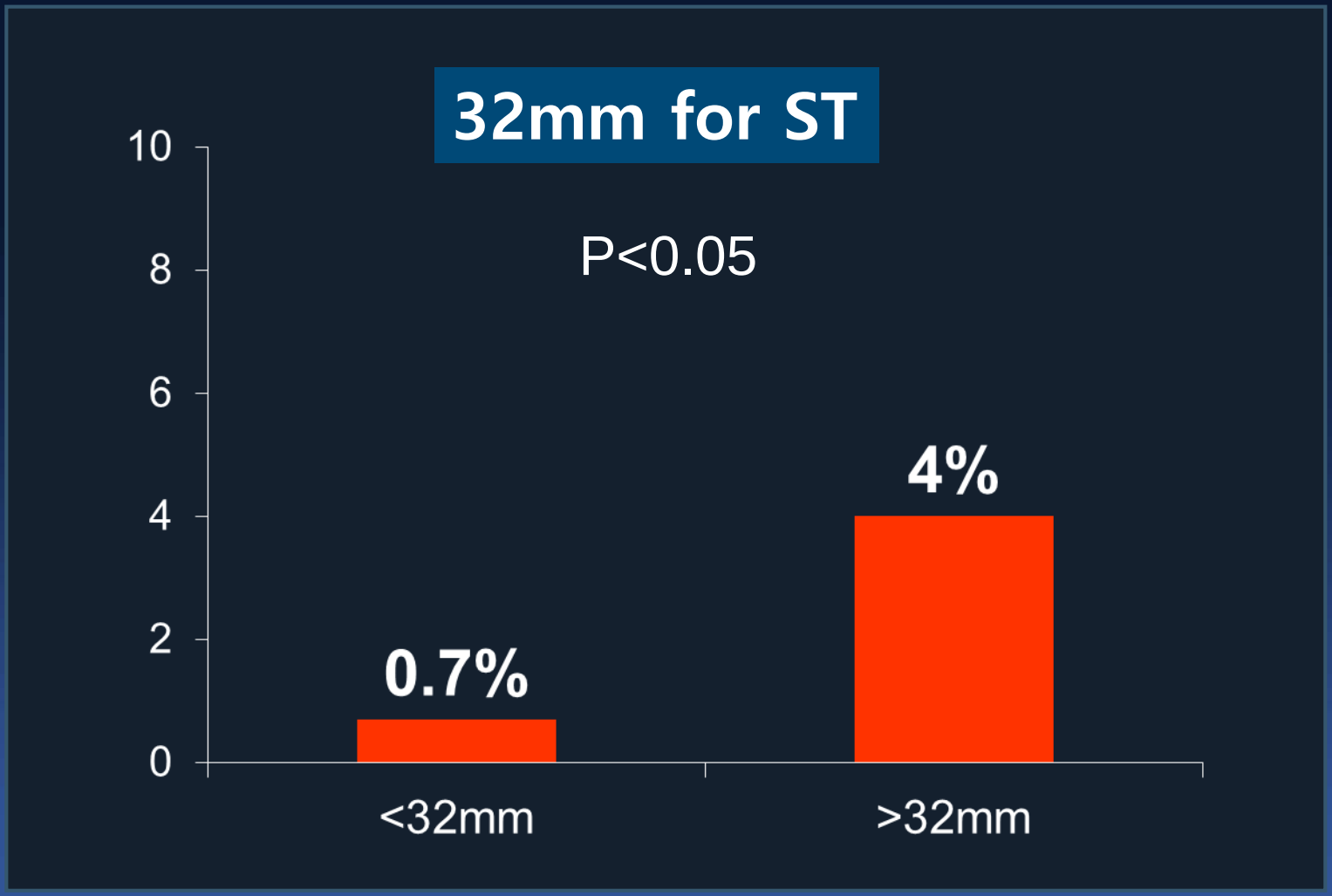
Hong MK, Park SJ, et al. Eur Heart J 2006 Jun;27(11):1305-10

How Long? In-Stent Restenosis



Hong MK, Park SJ, et al. Eur Heart J 2006 Jun;27(11):1305-10

How Long? Stent Thrombosis

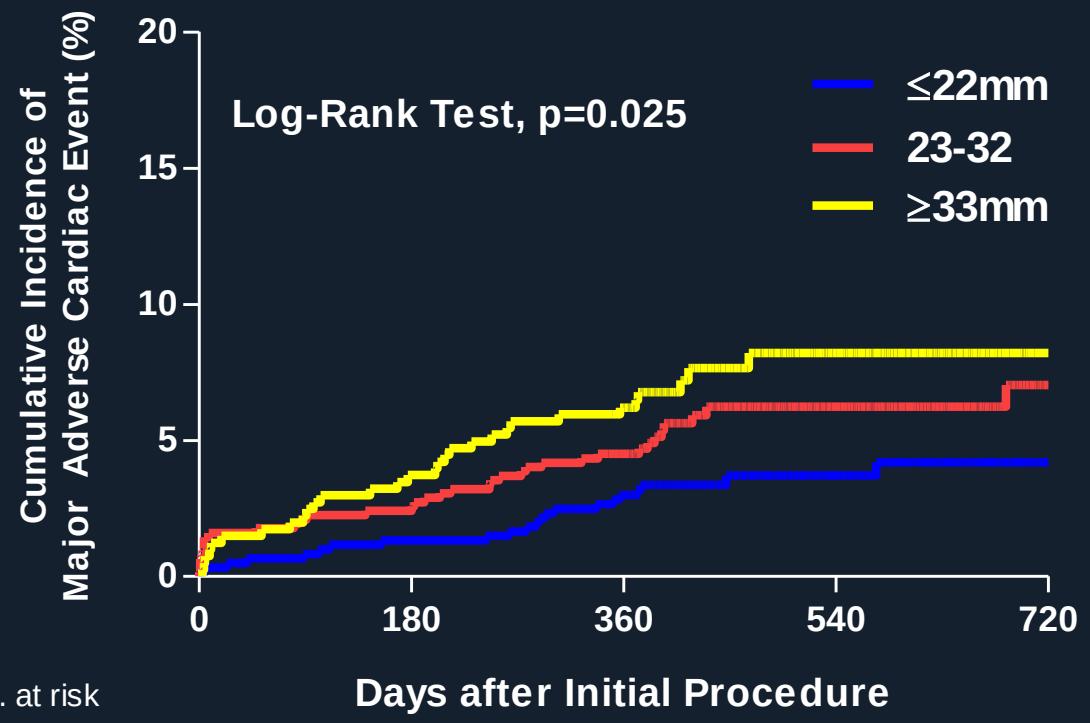


Suh J, Park SJ, et al. JACC Cardiovascular interventions 2010;3:383-9

One Longest Stent (38-40mm) is Effective and Safe

IVUS Utilization Modify the Stent Length Effect On Clinical Outcomes

Without IVUS

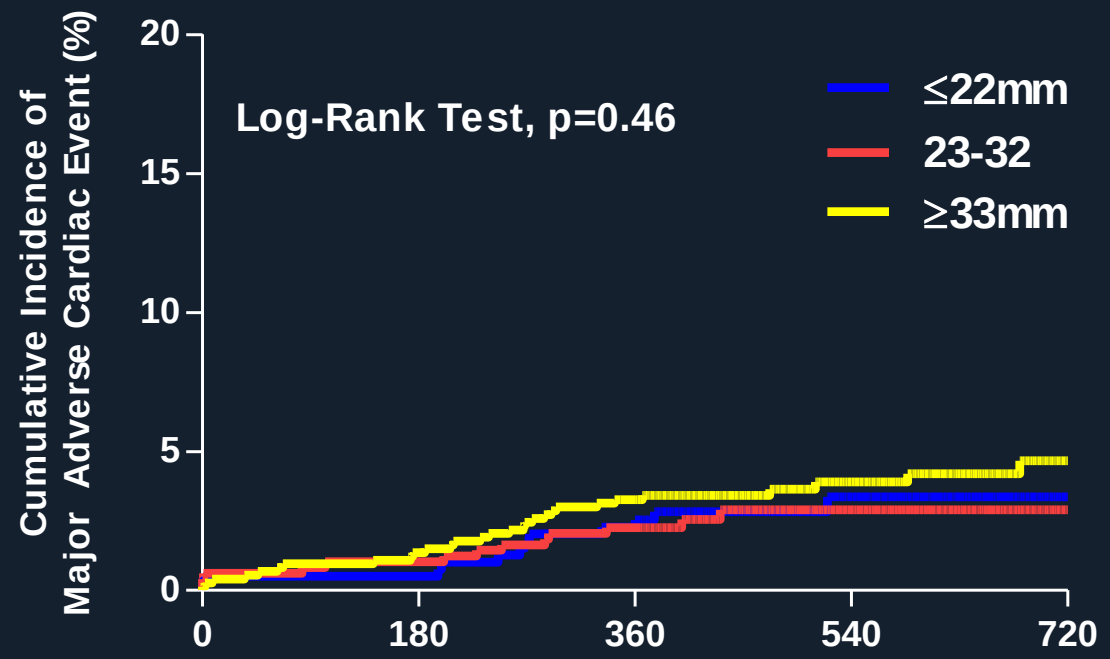


No. at risk					
≤22mm	603	595	582	214	100
23-32mm	622	607	592	219	81
≥33mm	403	388	376	125	38

Ahn JM, Park SJ et al. Am J Cardiol 2013;111:829-35

IVUS Utilization Modify the Stent Length Effect On Clinical Outcomes

With IVUS

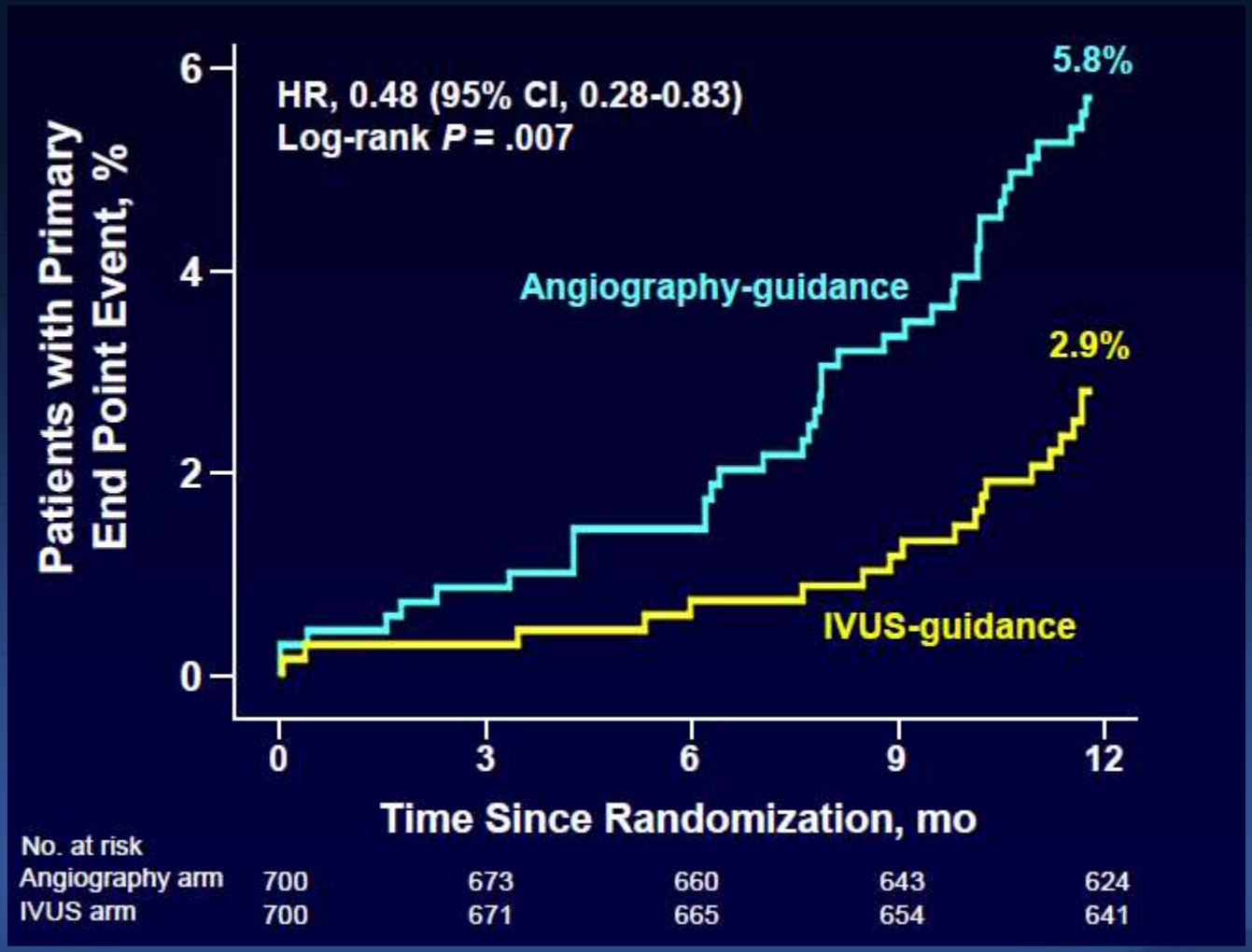


No. at risk					
≤22mm	395	393	386	169	55
23-32mm	487	482	476	221	72
≥33mm	734	724	709	355	116

Ahn JM, Park SJ et al. Am J Cardiol 2013;111:829-35

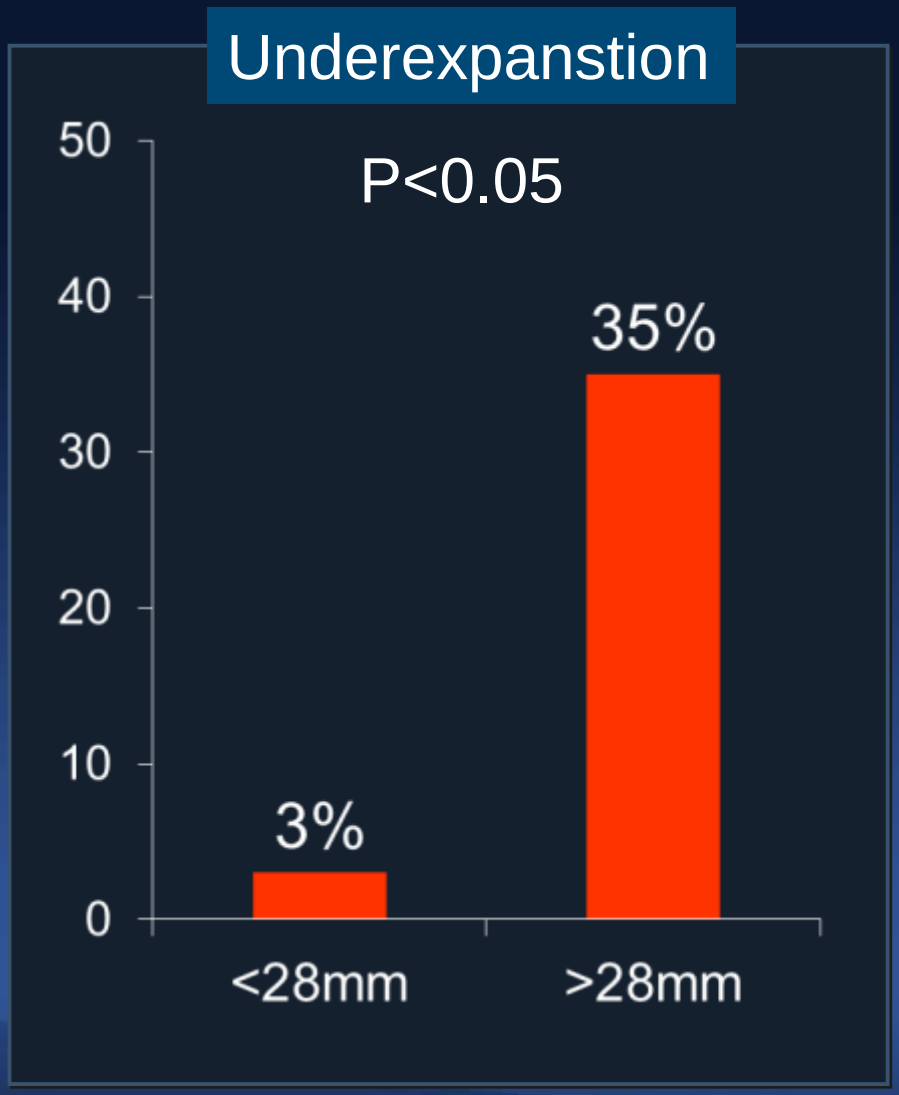
IVUS-XPL Trial

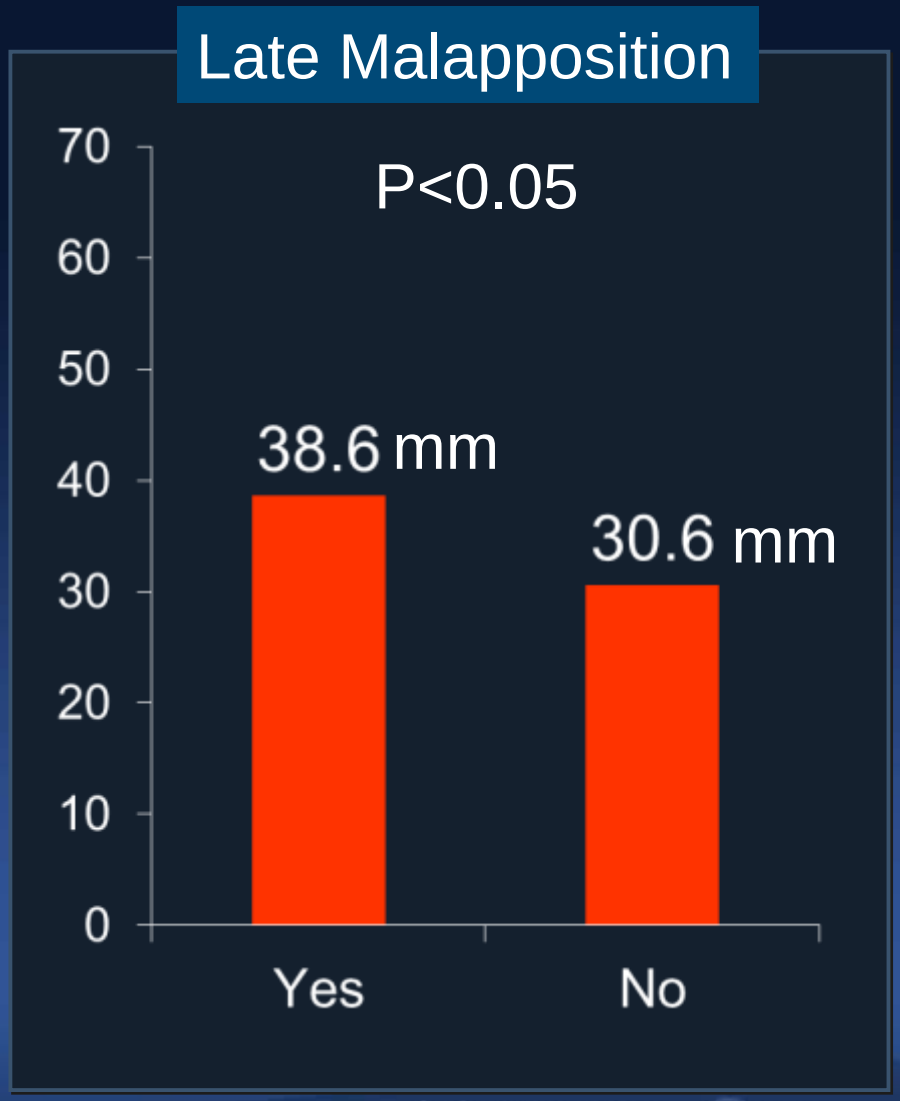
(Implanted stent ≥28 mm in length)



Hong SJ, Hong MK et al. JAMA. 2015;314(20):2155-2163

Stent Length and Optimal Stenting



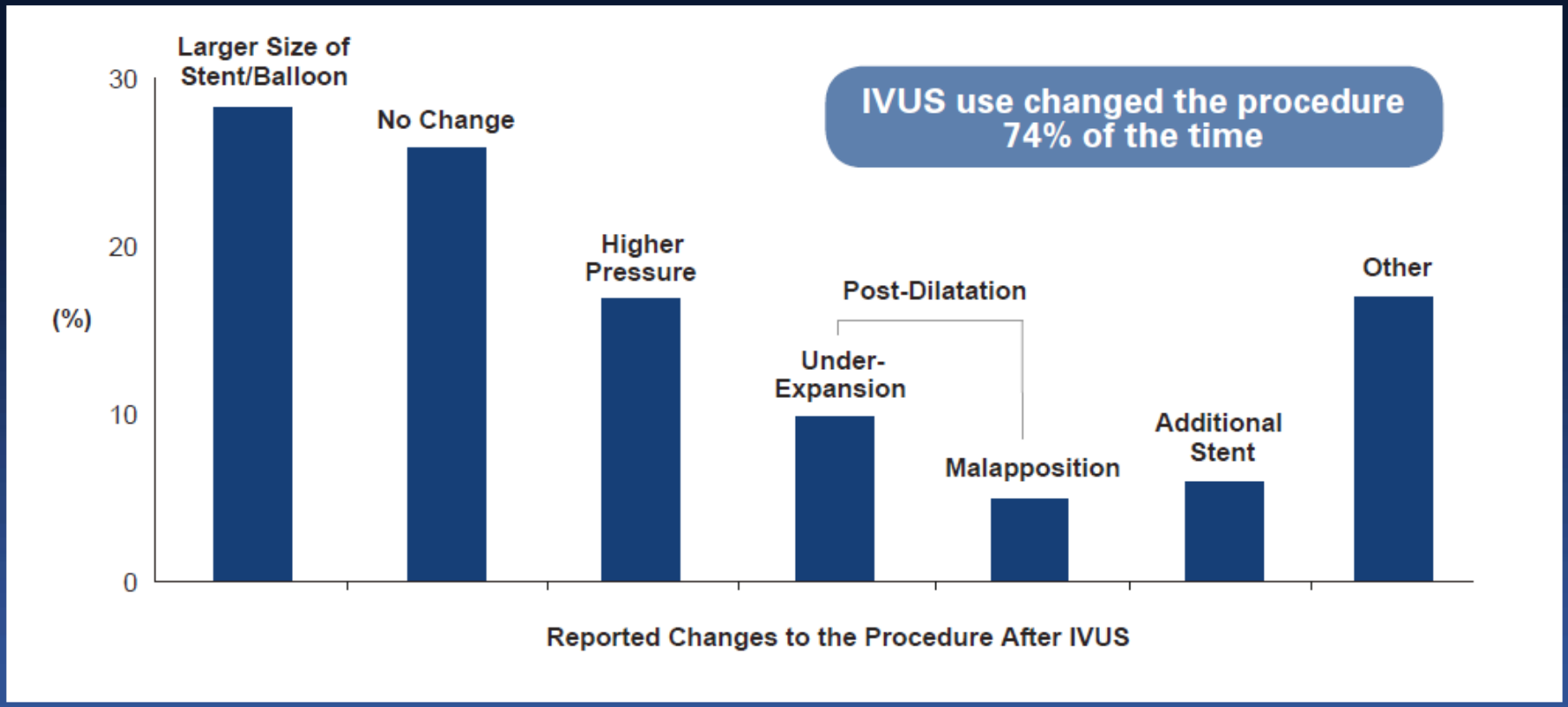


Kang SJ, et al Circ Cardiovasc Interv 2011;4:9-14

Hong MK, et al Circulation 2006;113:414-419

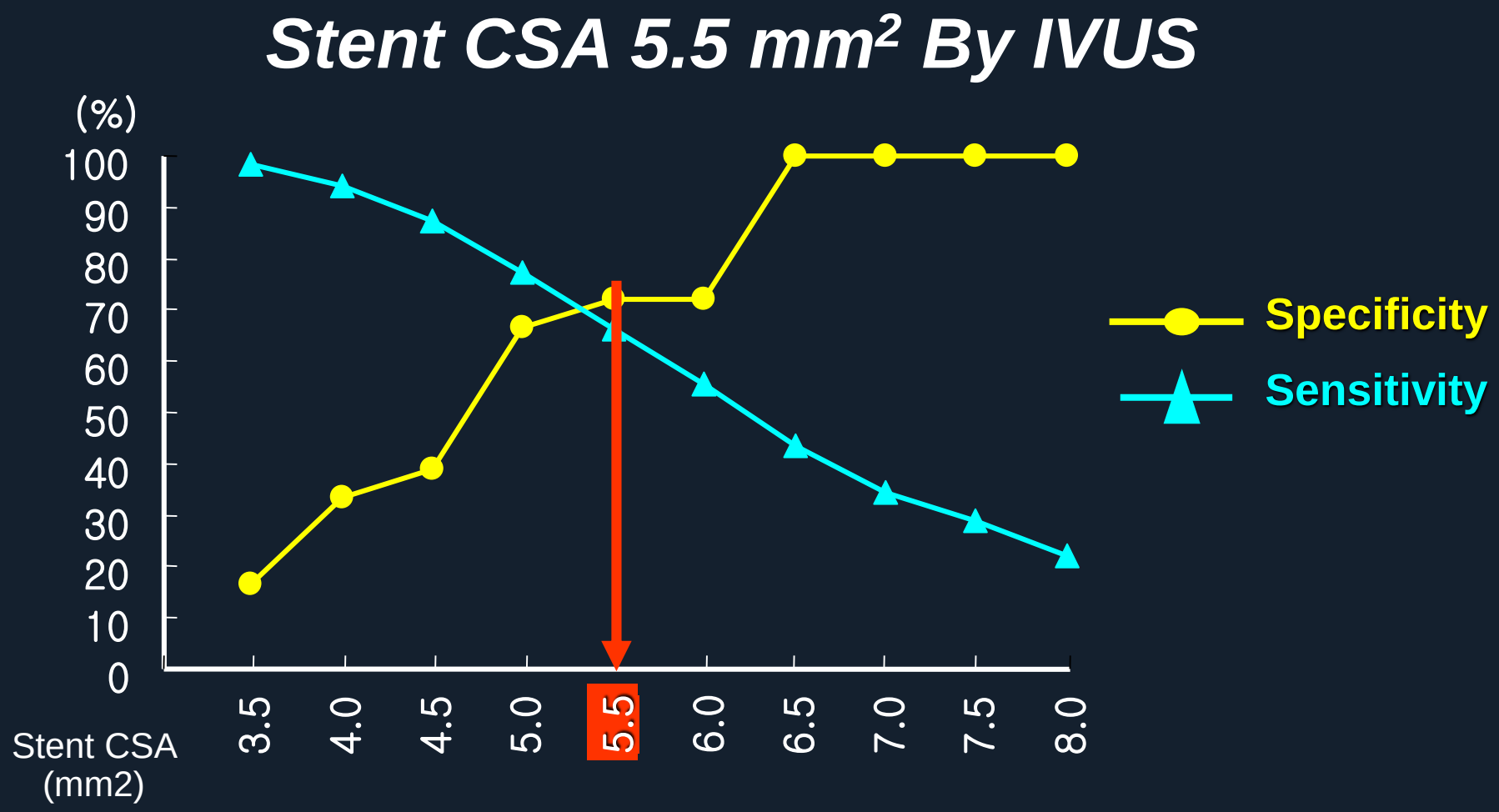
IVUS Changed the Procedure

ADAPT-DES Sub-Study



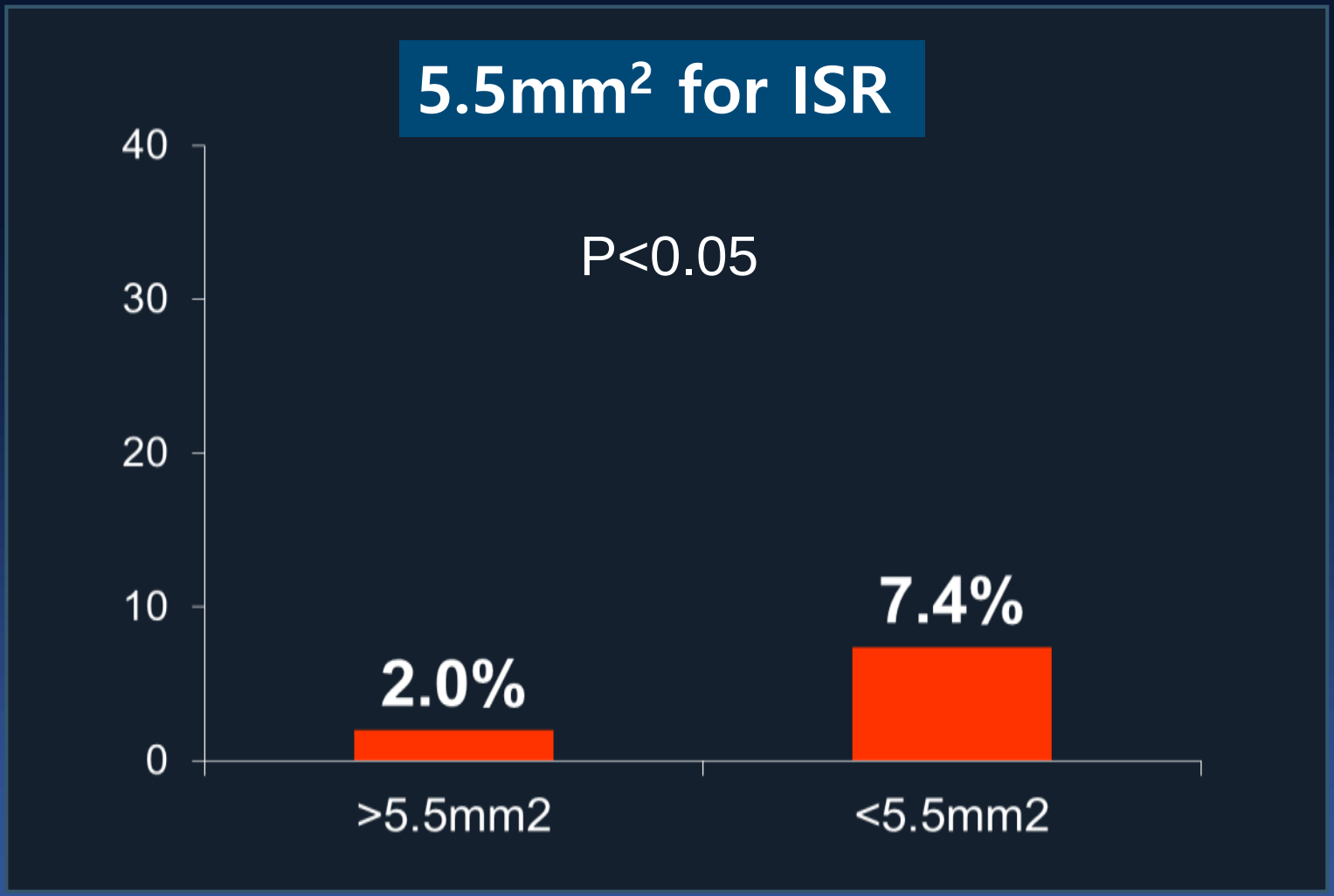
Witzenbichler B et al. Circulation. 2014 Jan 28;129(4):463-70

How Big?



Hong MK, Eur Heart J, 2006:27:1305 (AMC Cypher Registry)

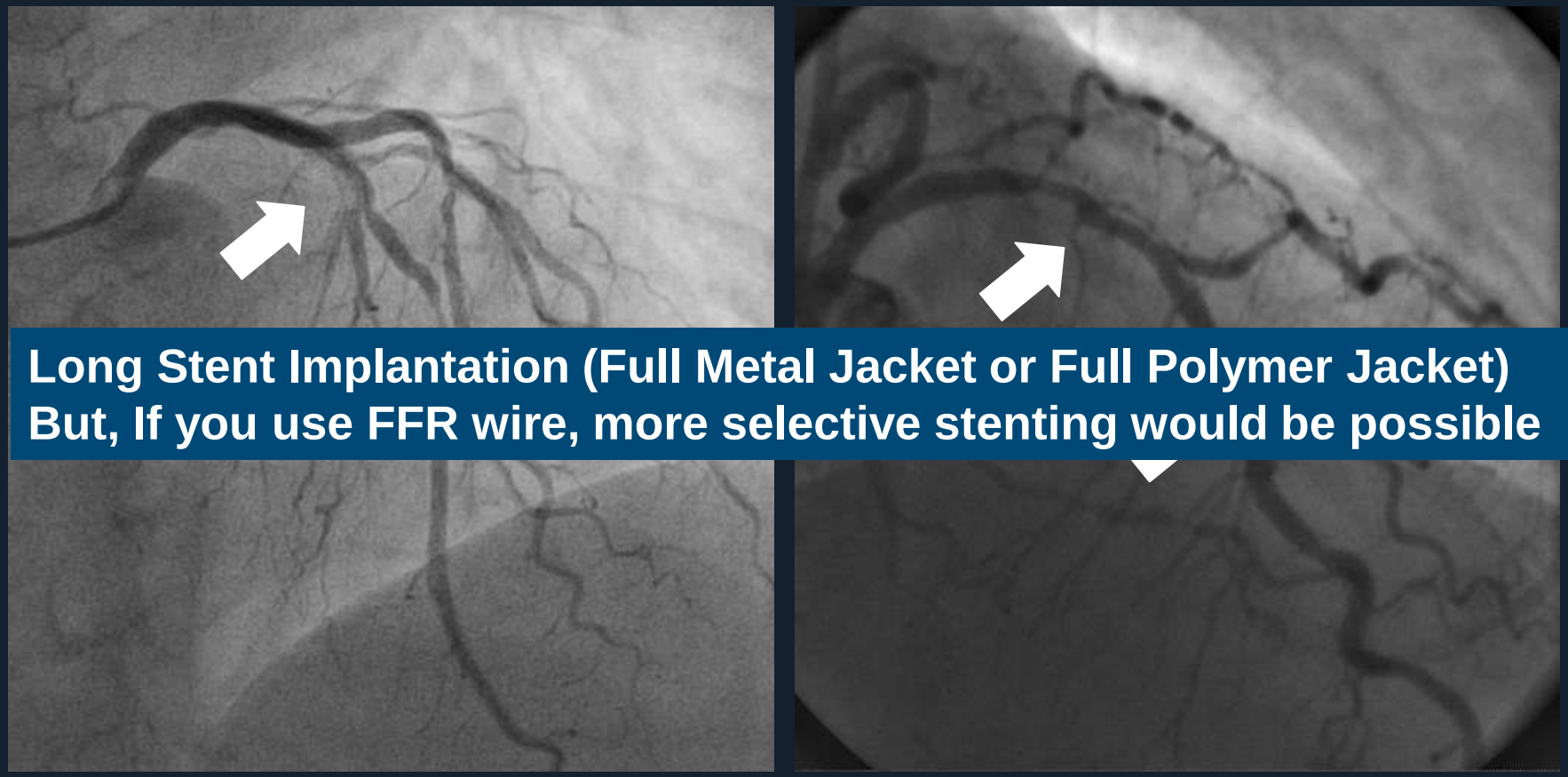
How Big? In-Stent Restenosis



Hong MK, Park SJ, et al. Eur Heart J 2006 Jun;27(11):1305-10

Tandem Lesions

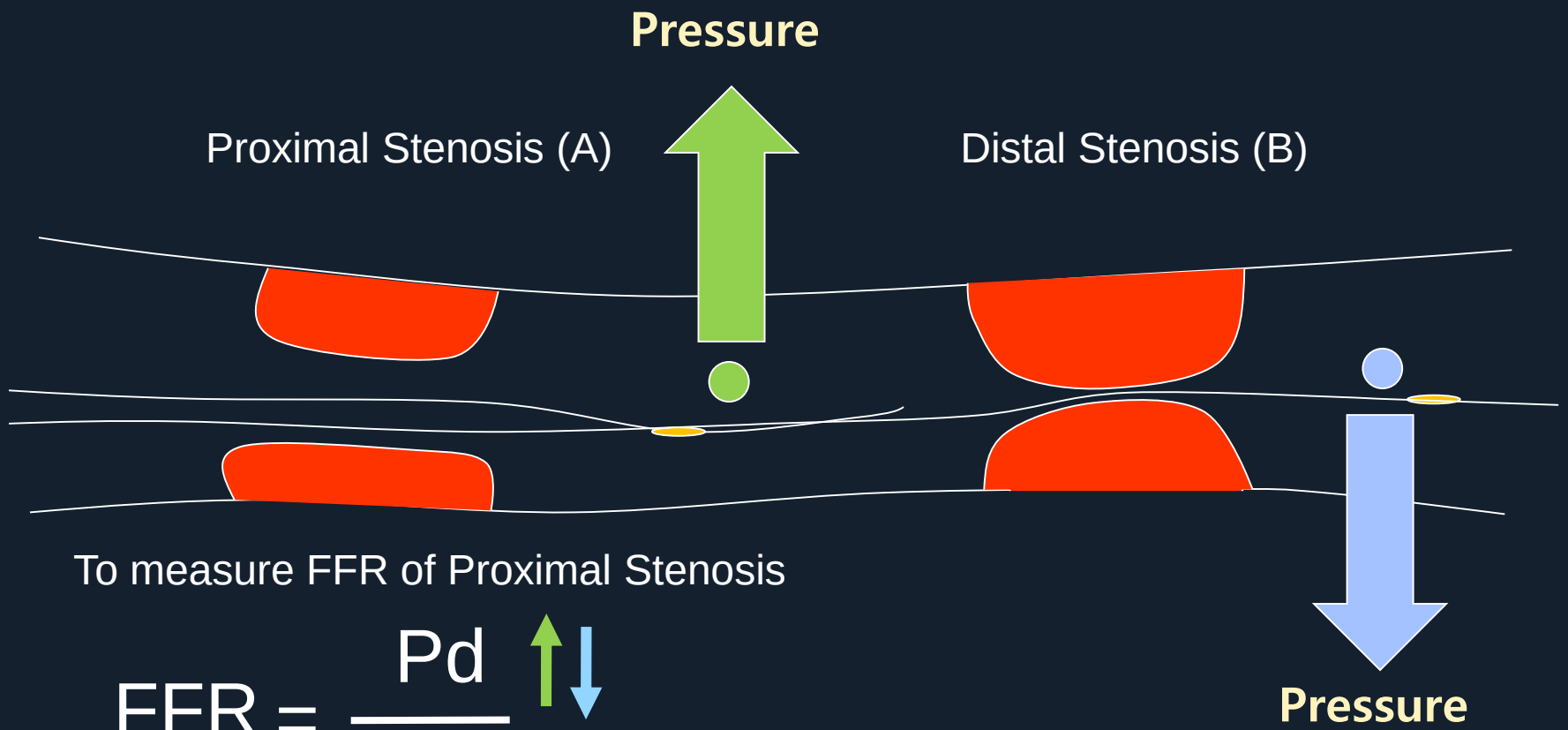
Multiple stenoses in series along one coronary artery



Long Stent Implantation (Full Metal Jacket or Full Polymer Jacket)
But, If you use FFR wire, more selective stenting would be possible

Park SJ, Ahn JM, et al Am J Cardiol. 2012 Dec 1;110(11):1578-84

Hemodynamic Interaction in Tandem Lesion

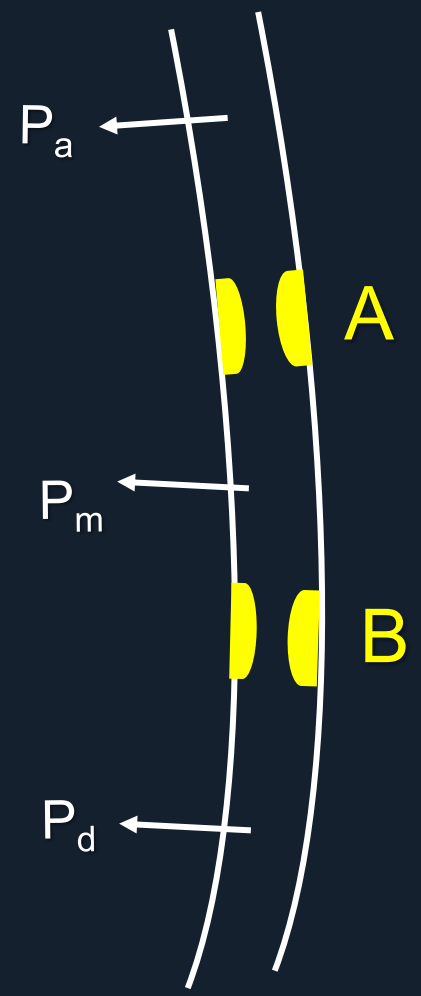


To measure FFR of Proximal Stenosis

$$FFR = \frac{Pd}{Pa}$$

FFR value of proximal stenosis should be underestimated

The Separate Functional Significance of Tandem Stenoses



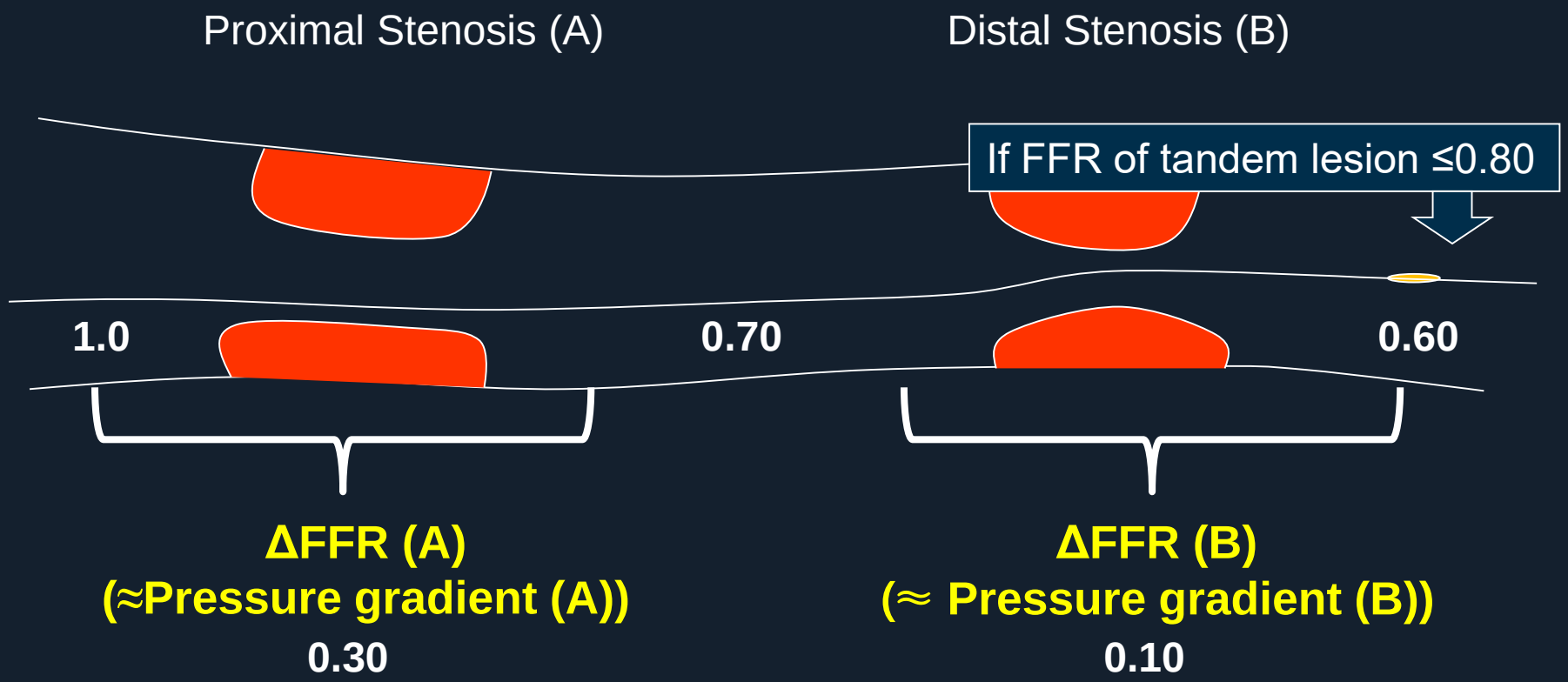
$$FFR(A)_{pred} = \frac{P_d - (P_m/P_a)\,P_w}{P_a - P_m + P_d - P_w}$$

$$FFR(B)_{pred} = \frac{(P_a - P_w)\,(P_m - P_d)}{P_a\,(P_m - P_w)}$$

P_w = Coronary occlusive pressure

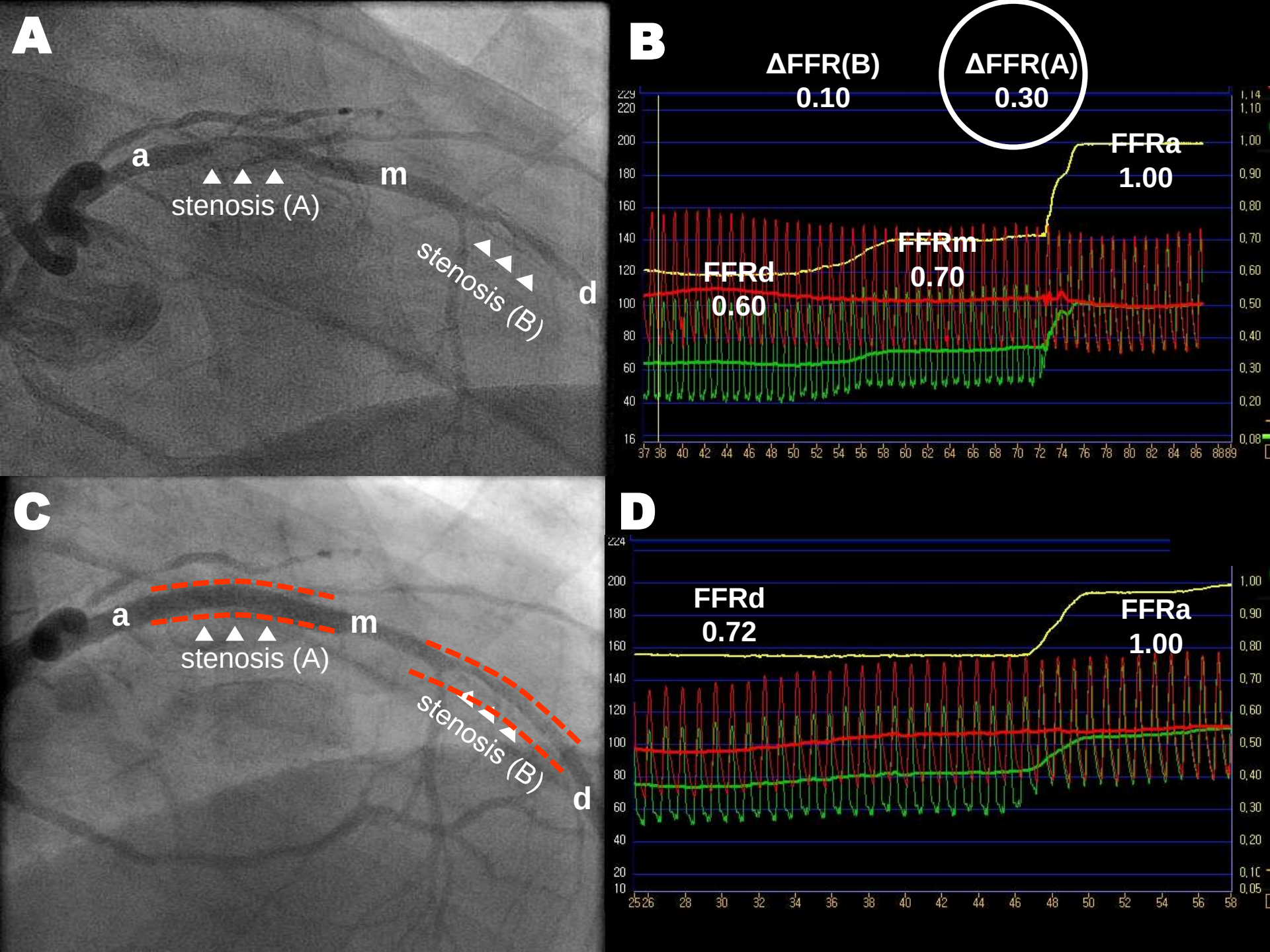
Nico H.J. Pijls and Bernard De Bruyne et al. Circulation 2000;102:2371-2377

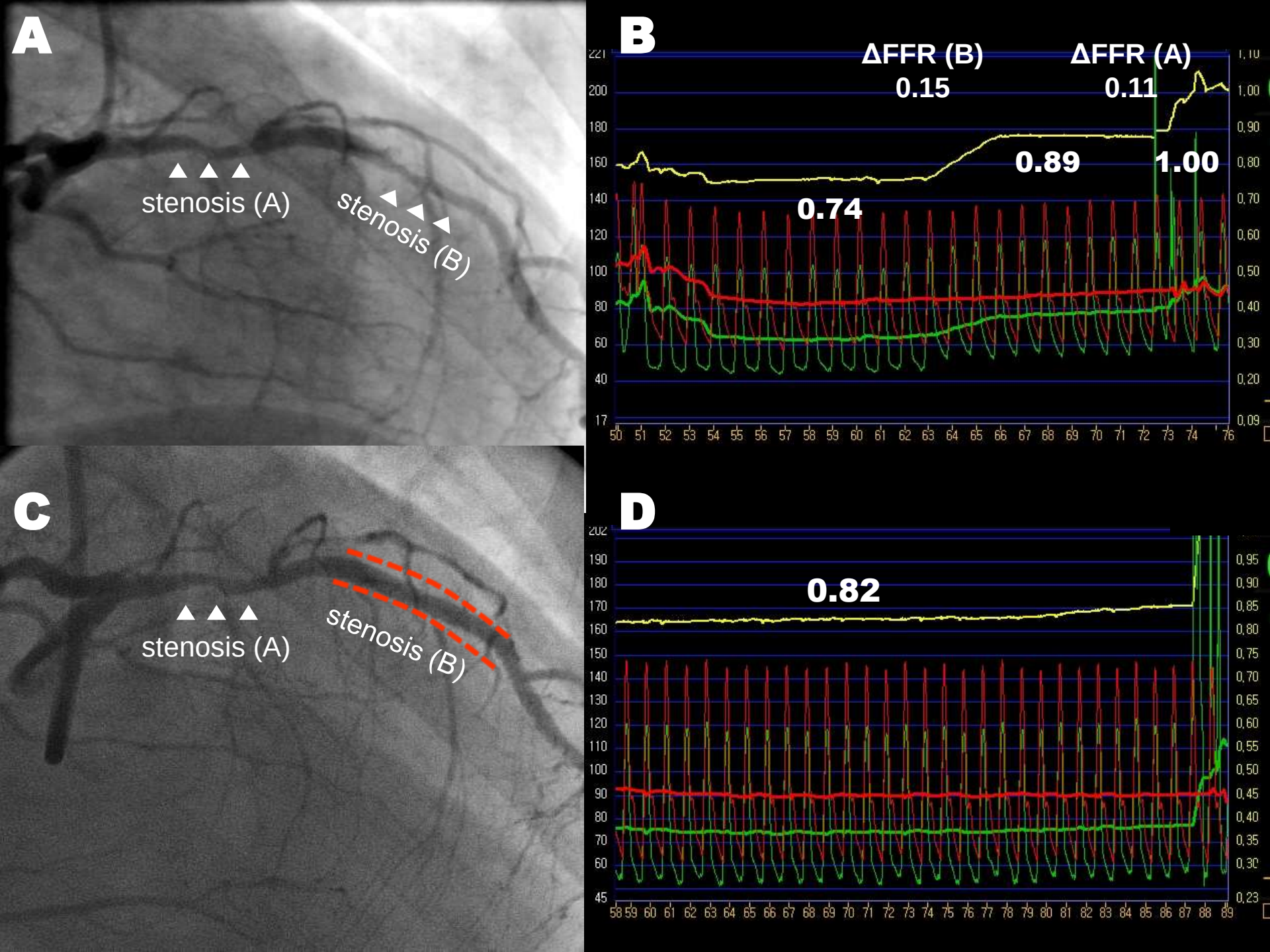
Practical Approach: Rule of Big Δ FFR



1. ΔFFR corresponds to relative functional severity
2. Perform revascularization first for lesions with more functional severity
3. This approach increase the chance of deferring PCI for the remaining lesions.

Park SJ, Ahn JM, et al Am J Cardiol. 2012 Dec 1;110(11):1578-84.


A
a
m
d
stenosis (A)
stenosis (B)
B
ΔFFR(B)
0.10
ΔFFR(A)
0.30
FFRa
1.00
FFRm
0.70
FFRd
0.60
C
a
m
d
stenosis (A)
stenosis (B)
D
FFRd
0.72
FFRa
1.00


A
stenosis (A)
stenosis (B)
B
ΔFFR (B)
0.15
ΔFFR (A)
0.11
0.89
1.00
0.74
C
stenosis (A)
stenosis (B)
D
0.82

According to the Rule of "Big Delta"

52 patients with coronary tandem lesion with FFR ≤0.80

↓

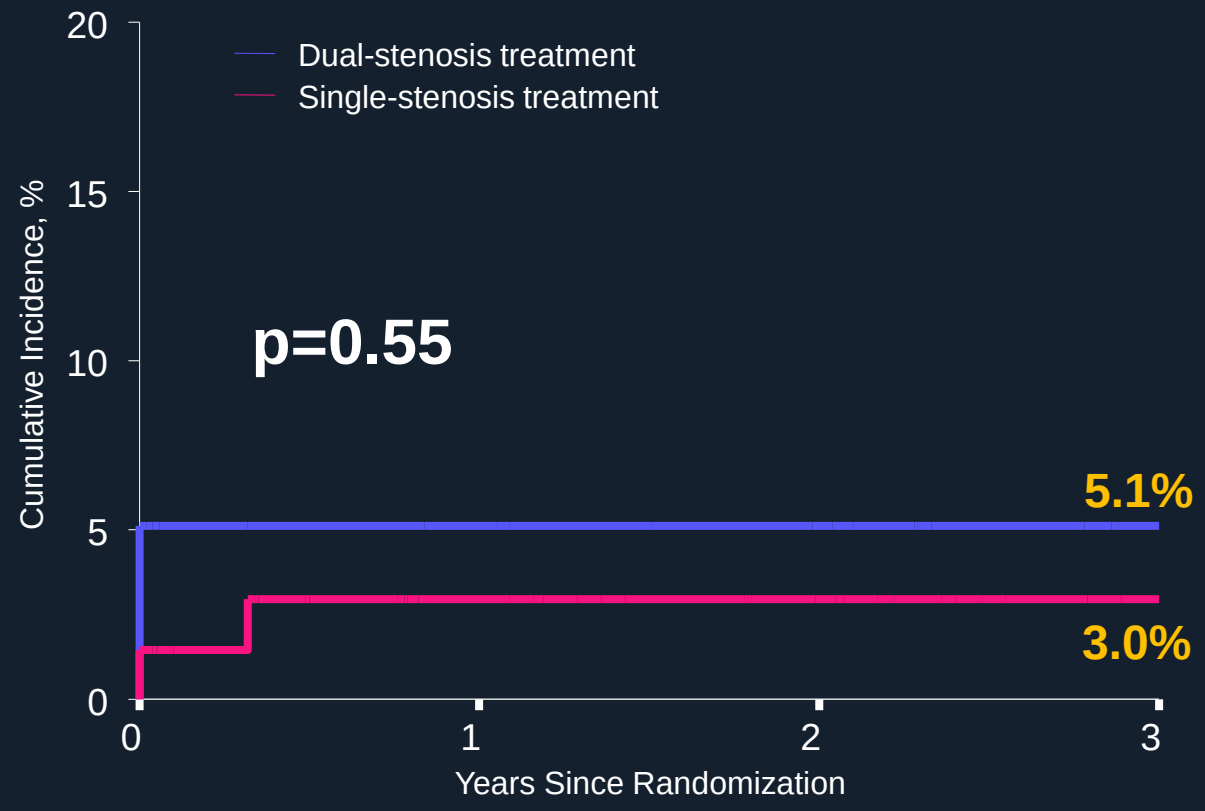
Prioritizing the treatment according to △FFR ("rule of big delta")

- 28 (53.8%) patients had only single-lesion Tx
- 28 (26.9%) lesions were deferred

Proximal stenosis treated only N=16	Both stenoses treated N=16	Distal stenosis treated only N=12	Both stenoses treated N=8

Park SJ, Ahn JM, et al Am J Cardiol. 2012 Dec 1;110(11):1578-84

Long-Term Outcomes



Patient at risk				
Dual-stenosis treatment	39	32	26	18
Single-stenosis treatment	69	56	45	32

DATA from IRIS FFR registry

Summary

- In every day practice, long stent implantation for long coronary lesion was frequently performed.
- For diffuse long coronary stenosis, single long DES (38-40mm) implantation appears safe and effective. BRS appeared to be feasible in these common lesions.
- IVUS use may attenuate the detrimental effect of the increase of implanted stent length, particularly during PCI with the long stent implantation.

Summary

- For functional lesion assessment of the coronary tandem lesions, ΔFFR is a useful index for determining the relative functional severity between the two stenoses.
- In this way, we can prioritize the treatment sequence and avoid unnecessary stent implantation with achieving favorable functional and clinical outcomes.