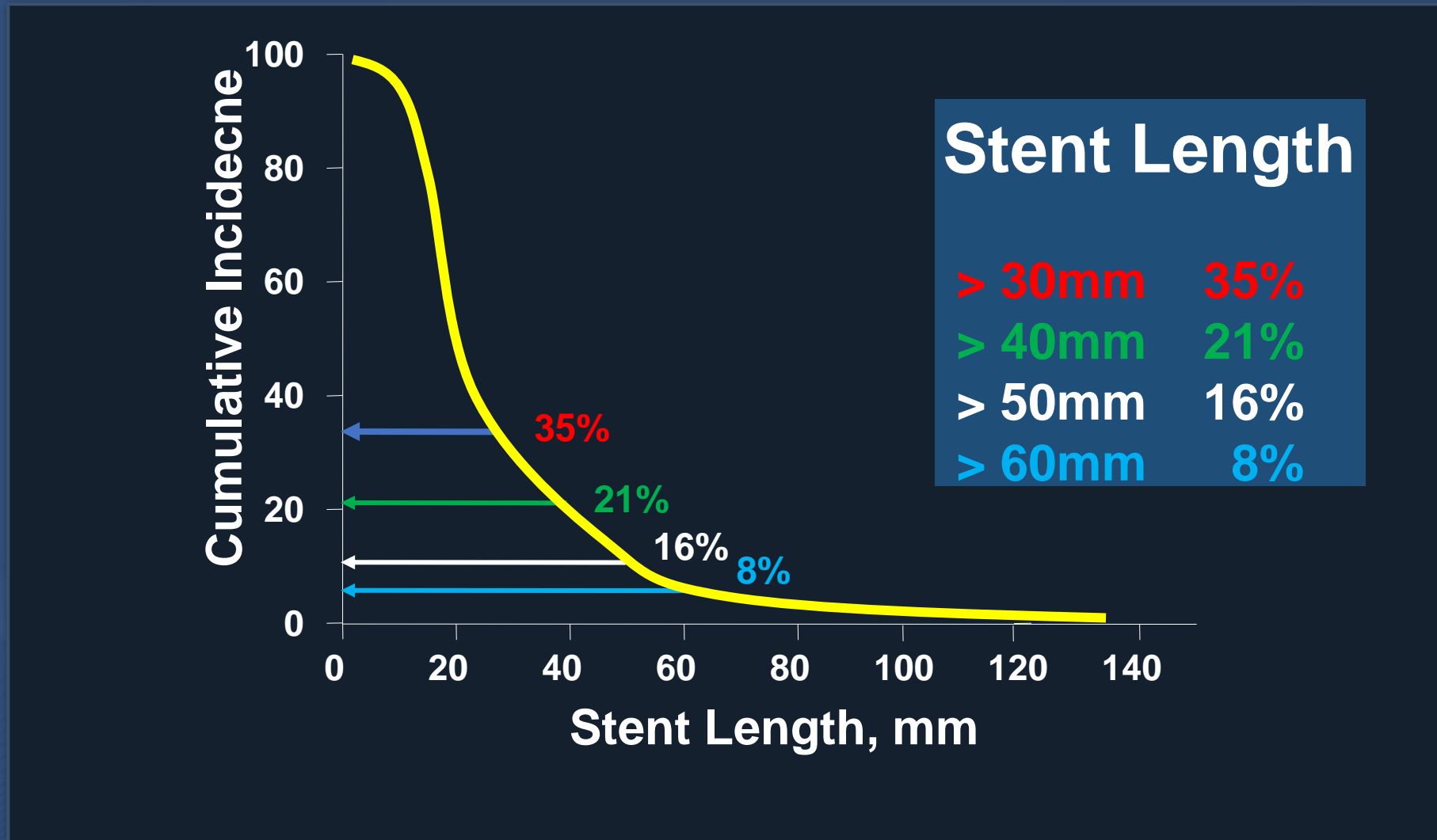


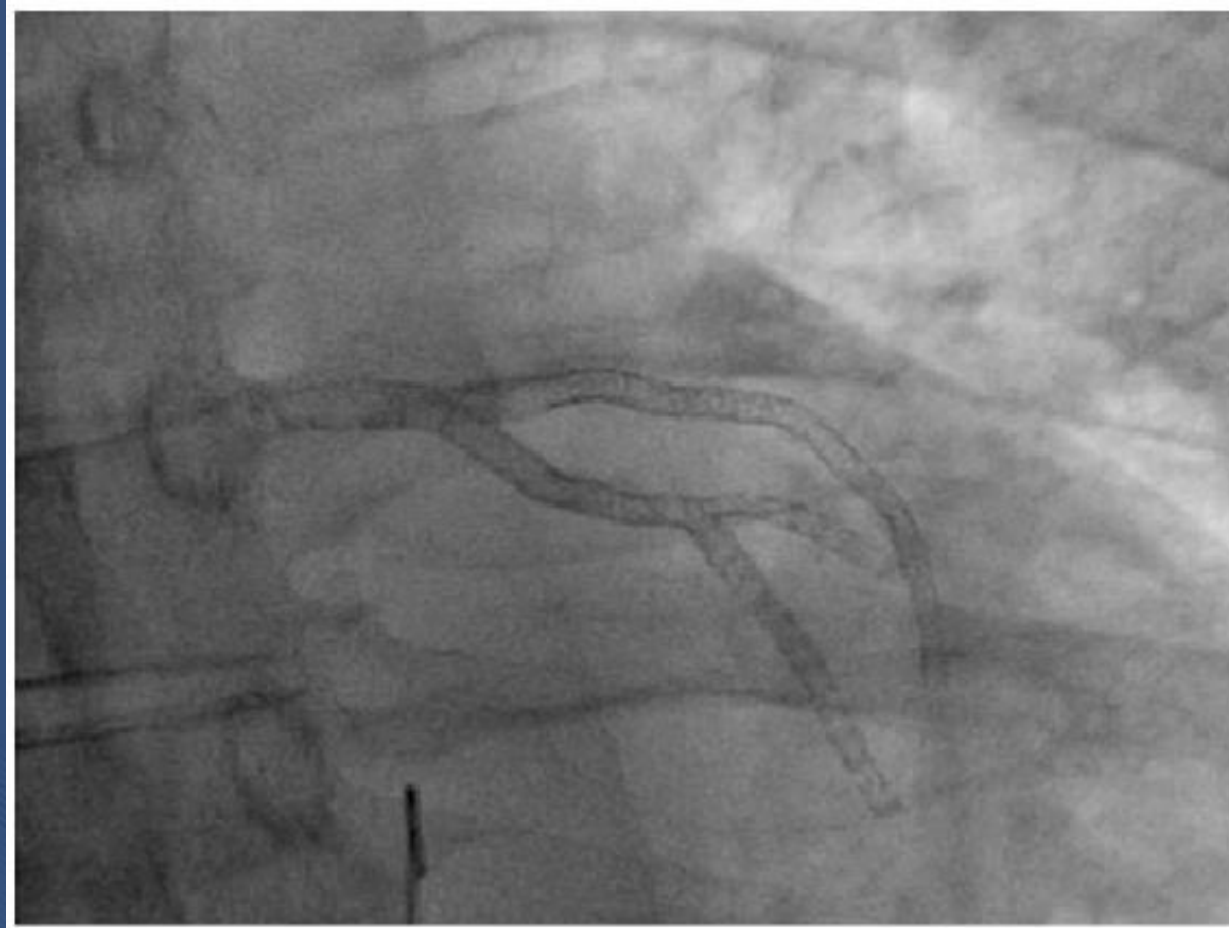
Tandem Lesion

Incidence of Long Stenting



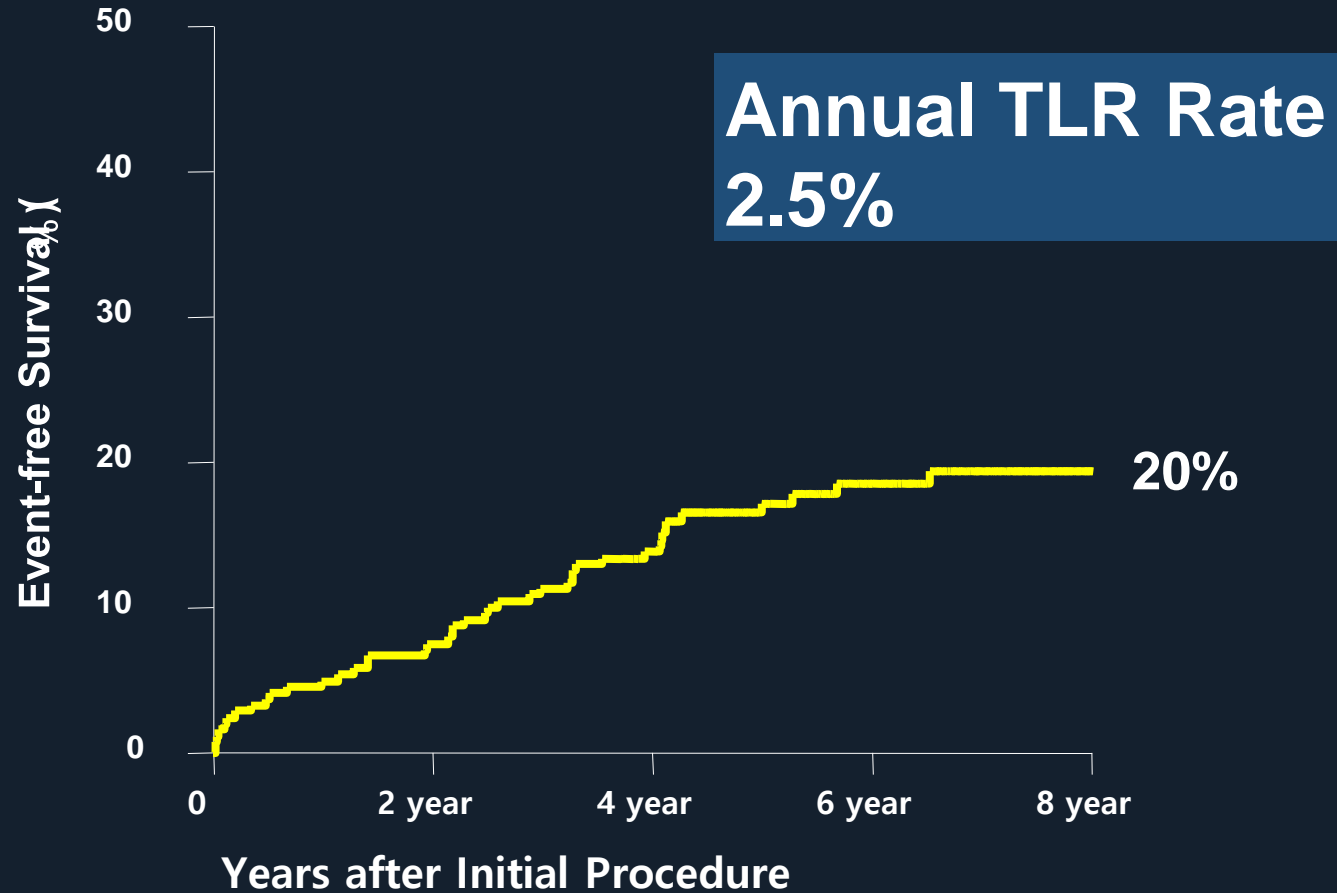
“Full Metal Jacket”

Multiple or overlapping stent implantation

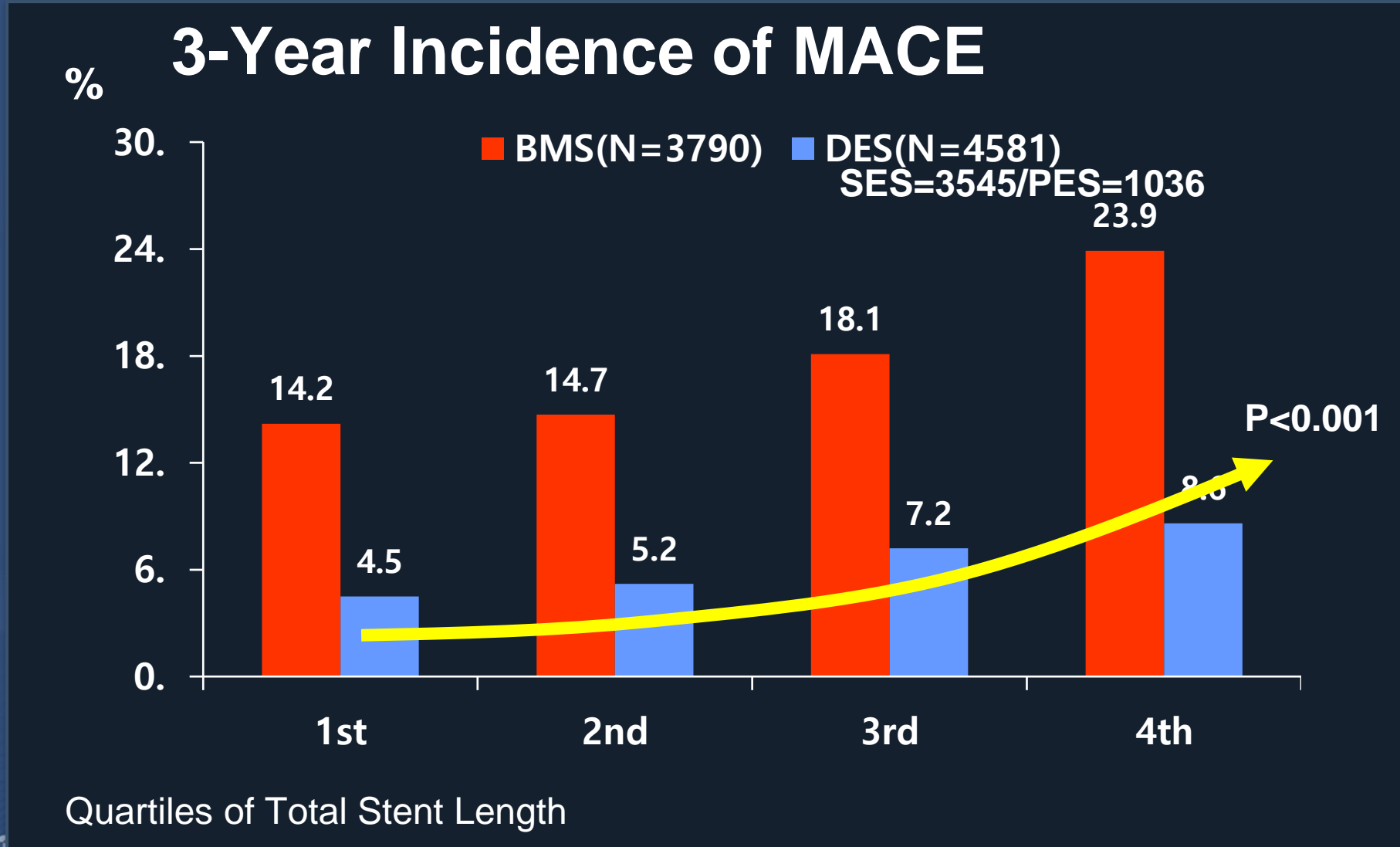


8 Year Follow-up of FMJ

Event Rate is Acceptable

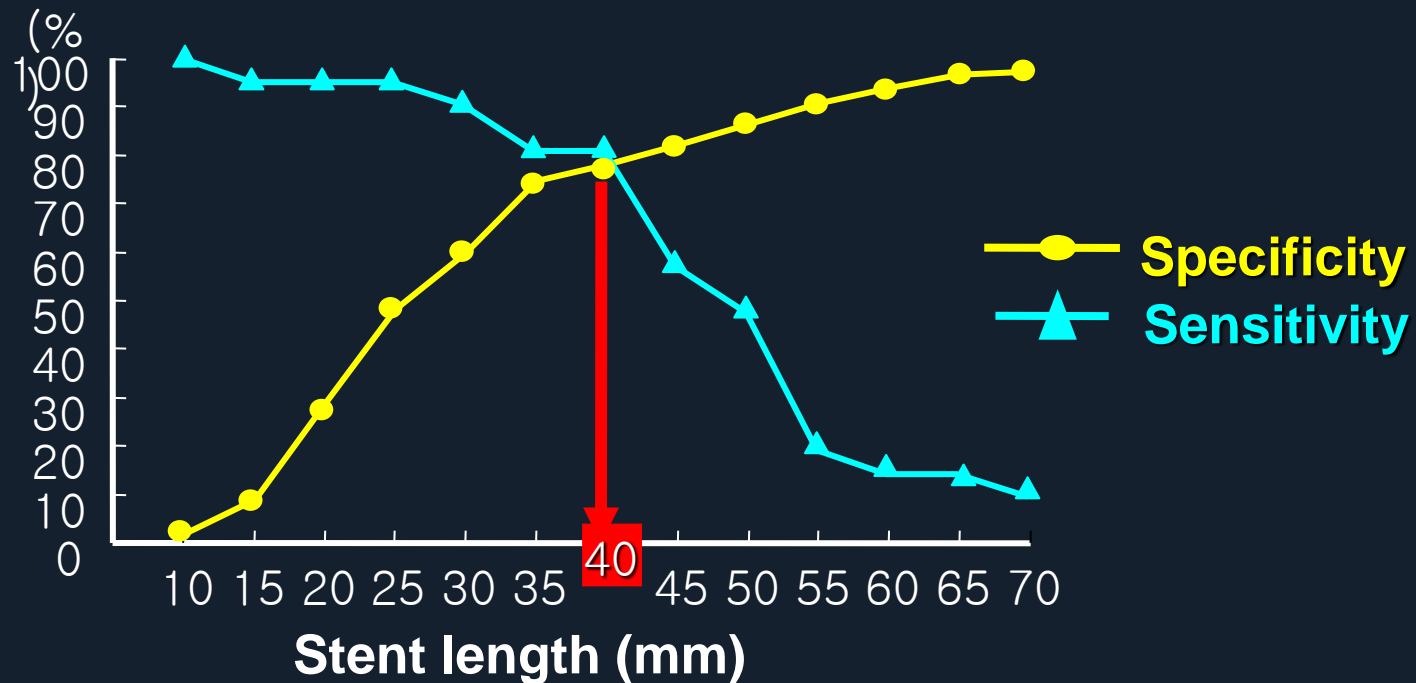


Stent Length and Outcomes

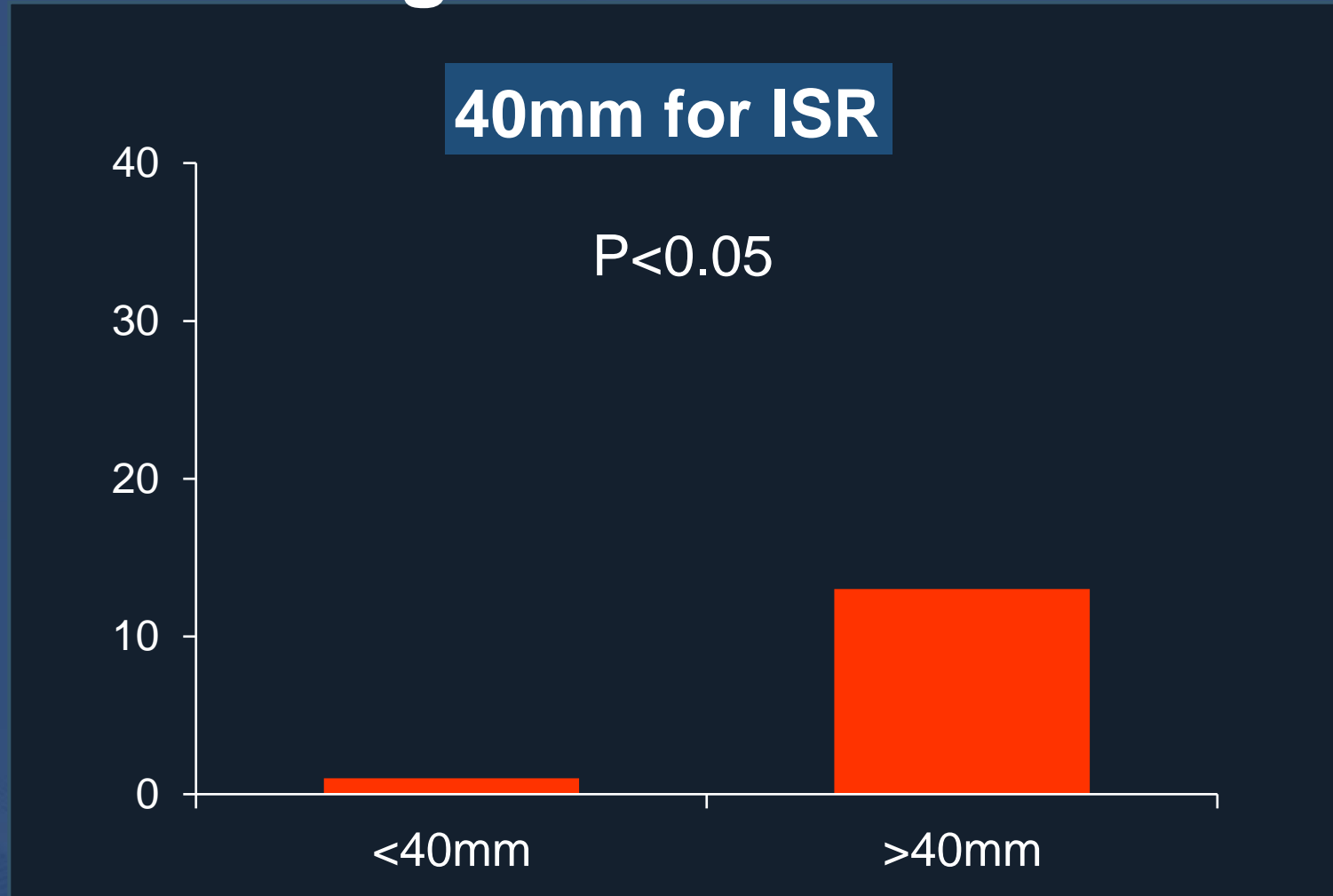


How Long?

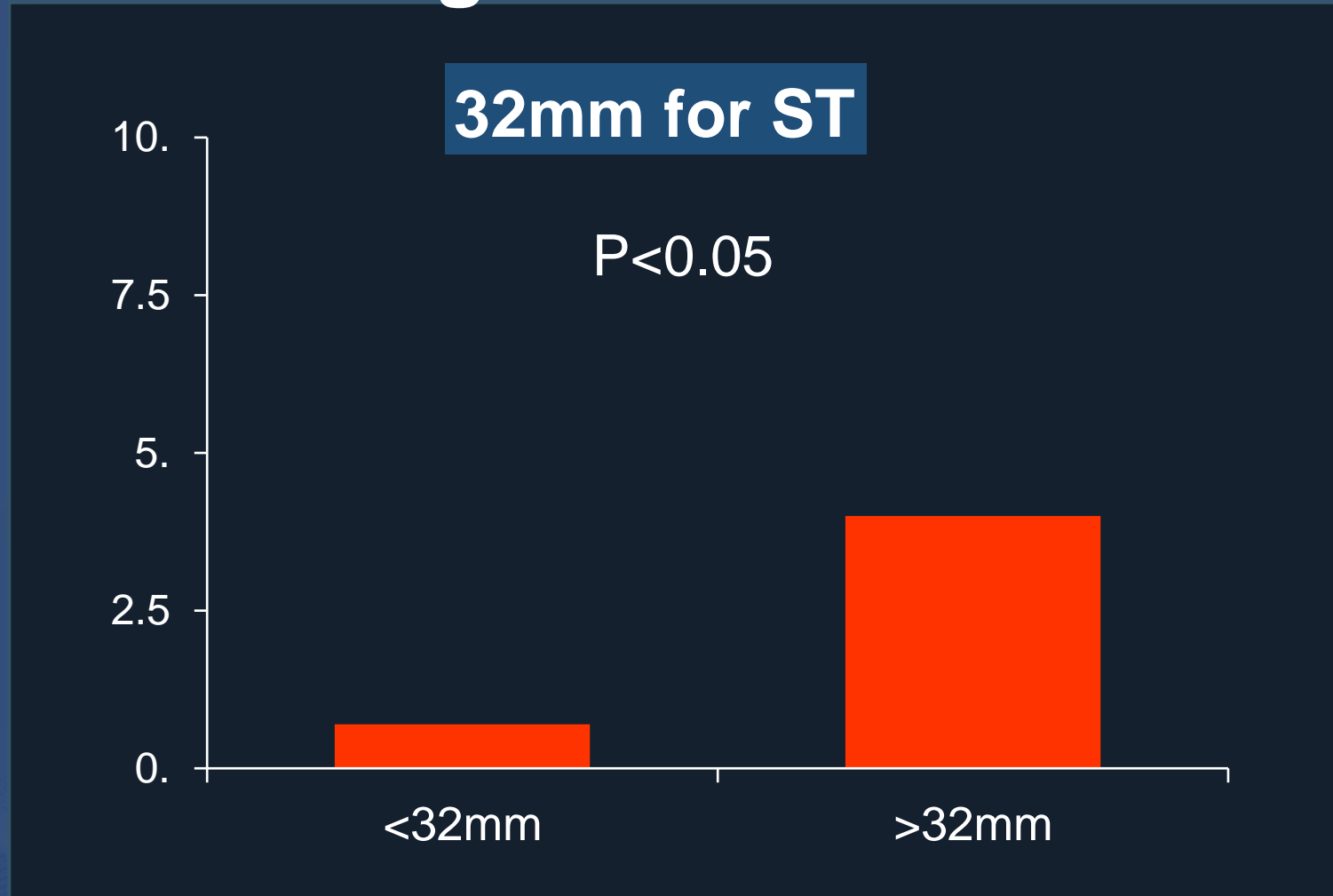
Stent Length 40 mm By IVUS



How Long? In-Stent Restenosis



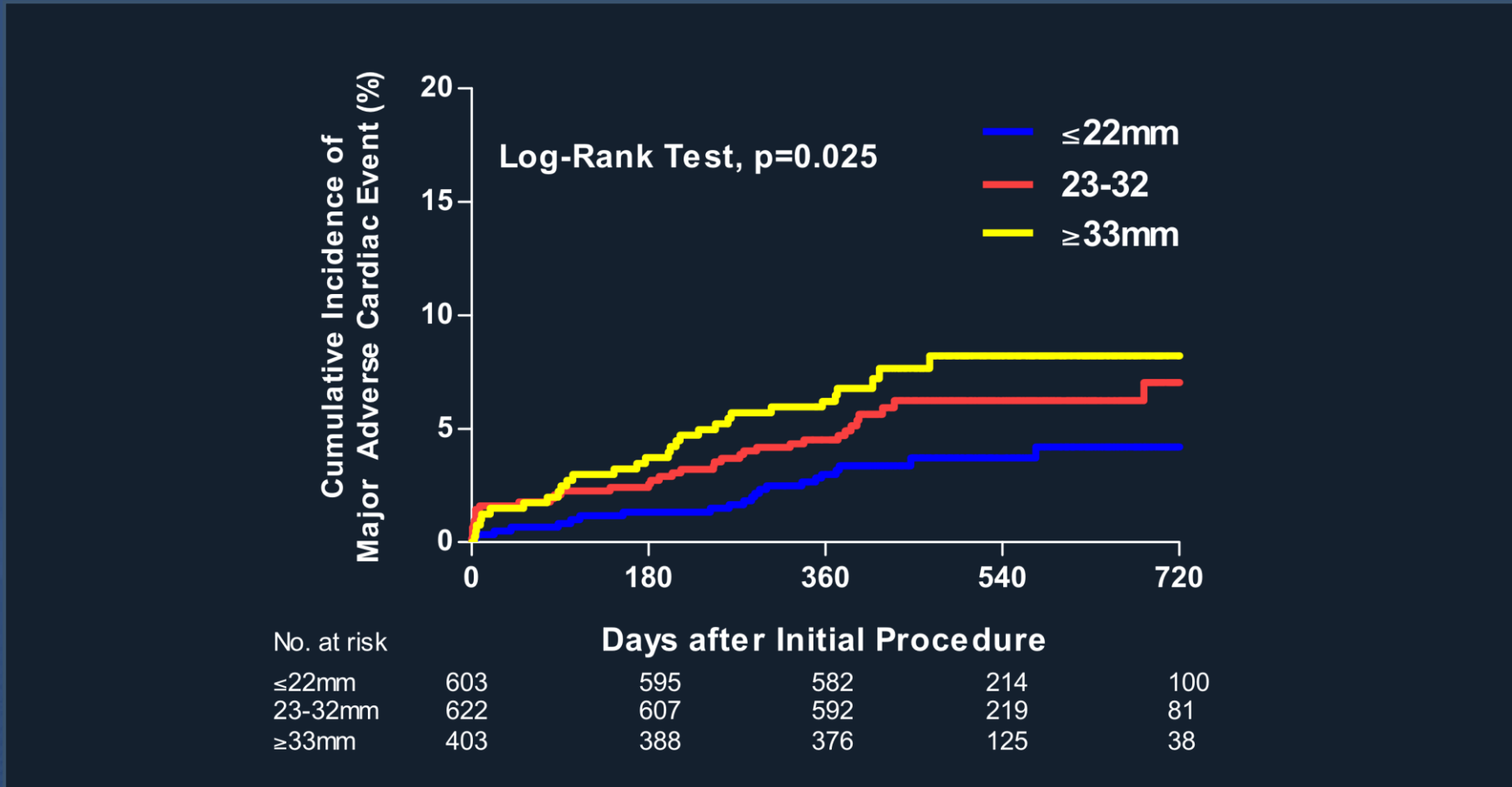
How Long? **Stent Thrombosis**



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

IVUS Utilization Modify the Stent Length Effect On Clinical Outcomes

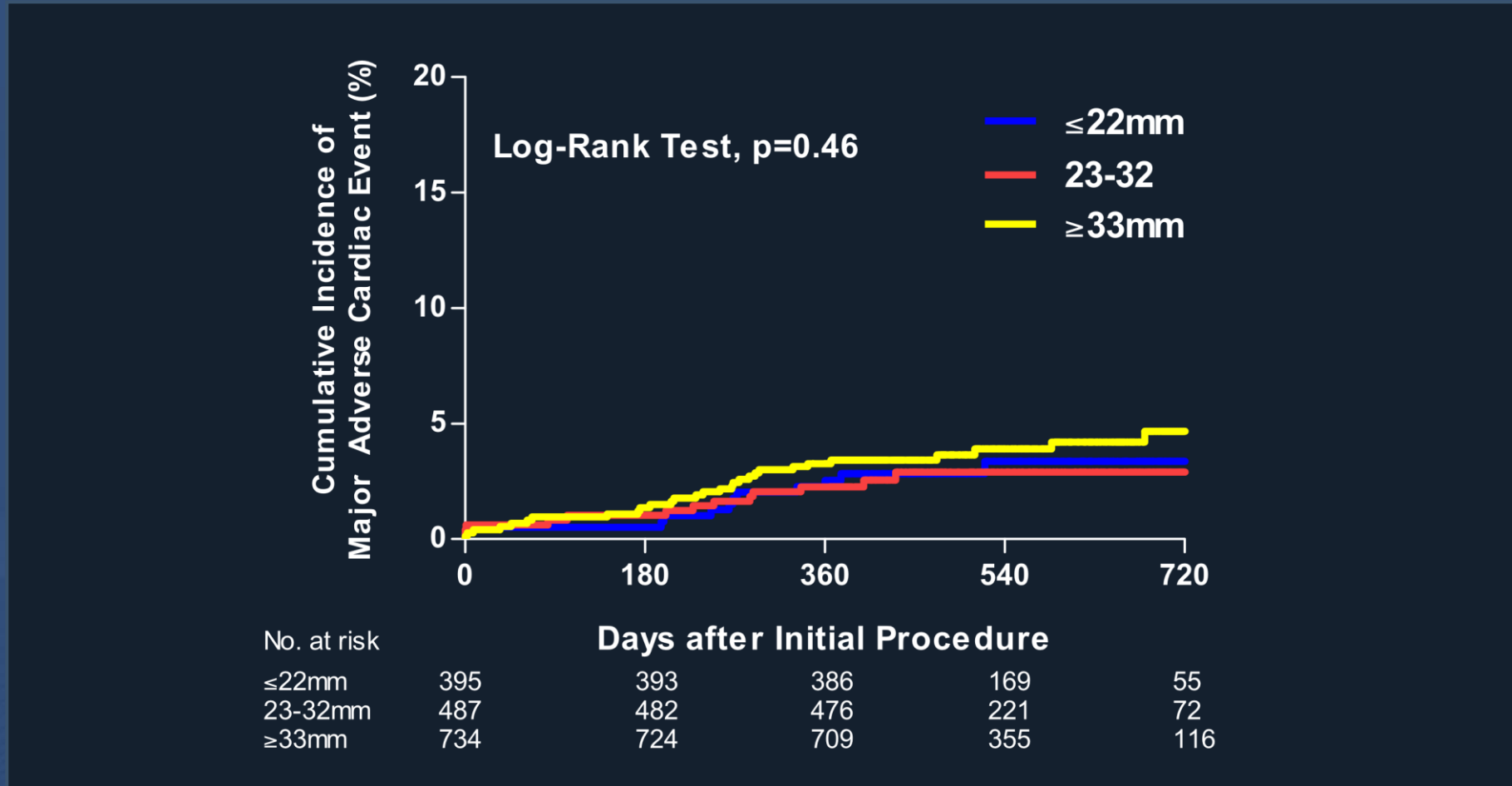
Without IVUS



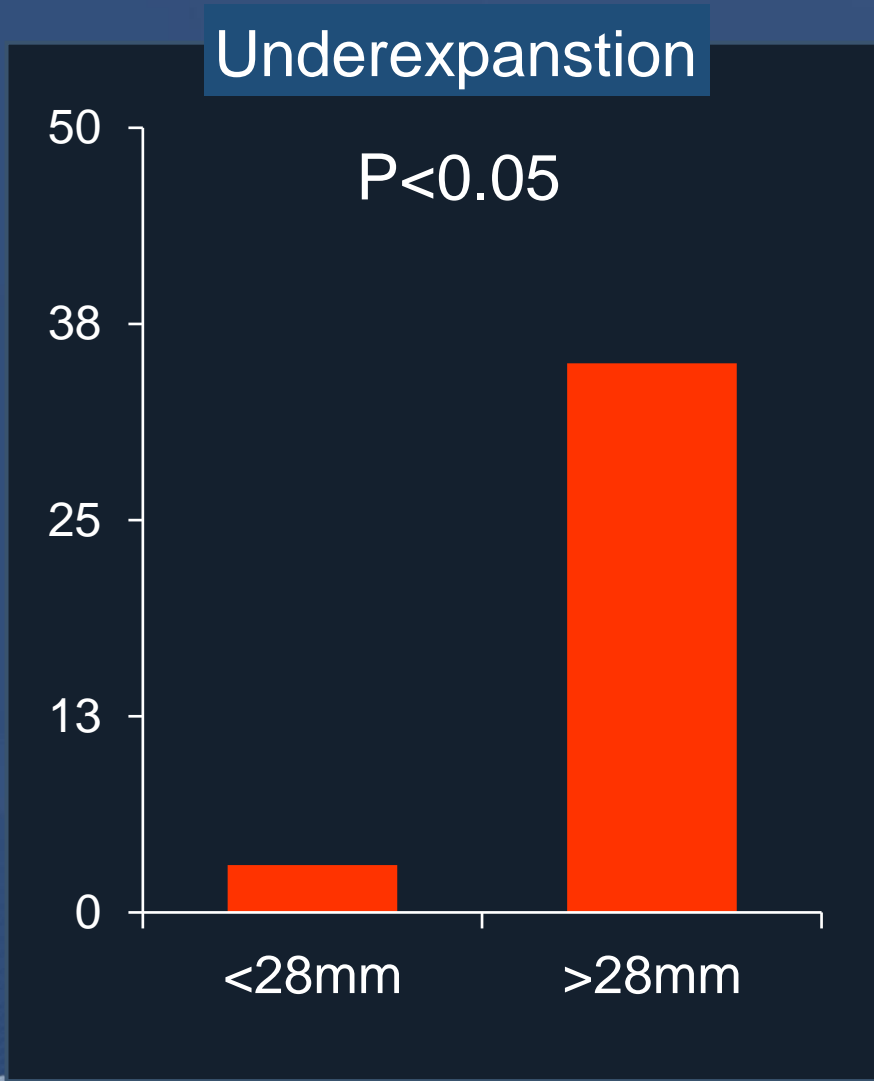
Ahn JM, Park SJ et al. Am J Cardiol 2013;111:829-35

IVUS Utilization Modify the Stent Length Effect On Clinical Outcomes

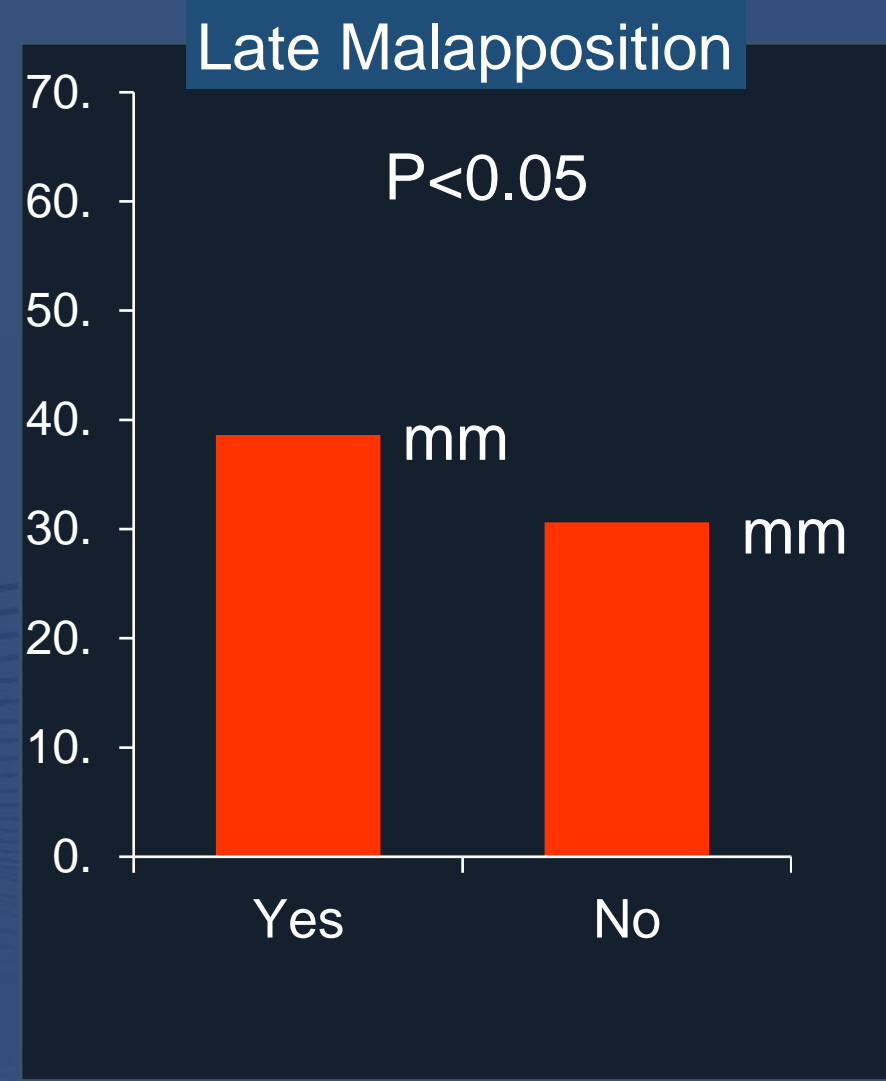
With IVUS



Stent Length and Optimal Stenting



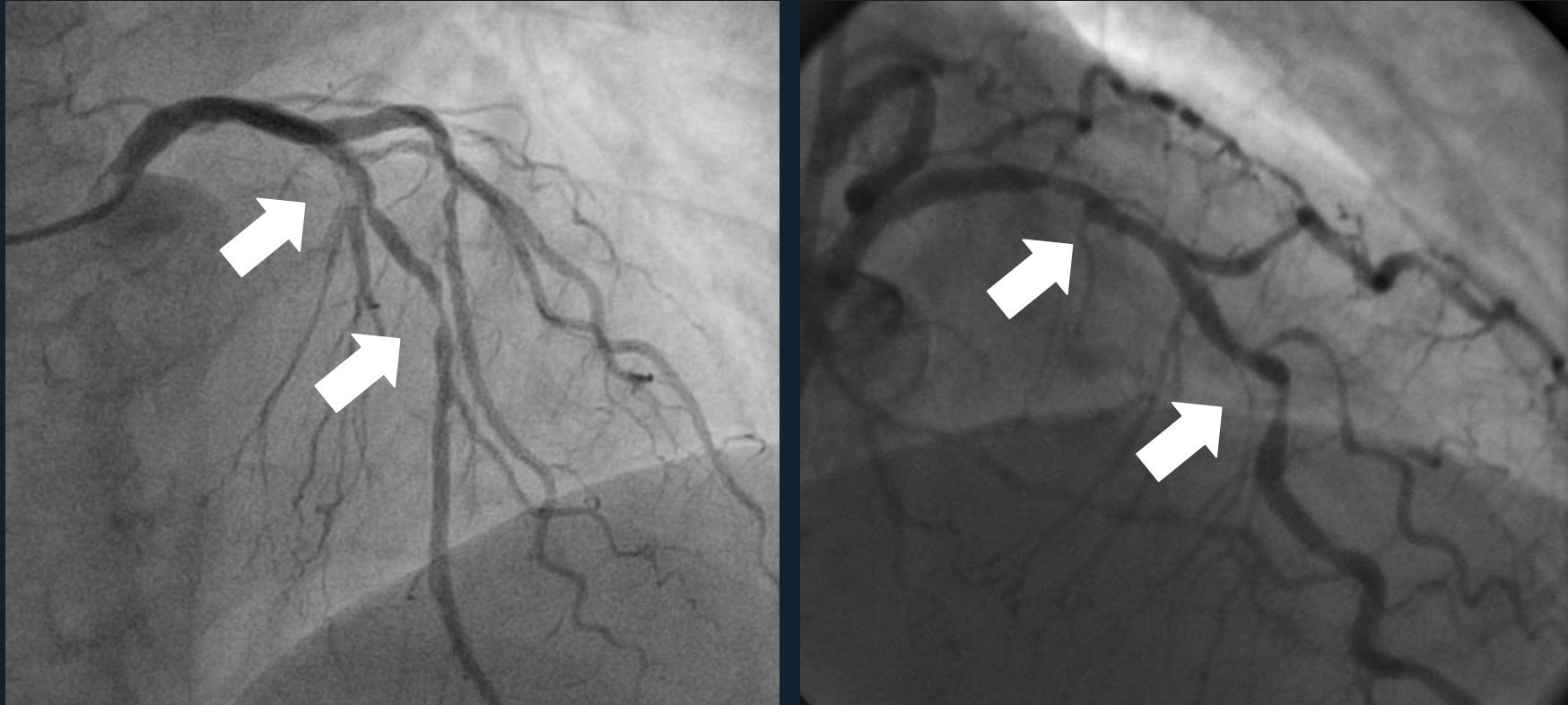
Kang SJ, et al *Circ Cardiovasc Interv* 2011;4:9-14



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

Tandem Lesions

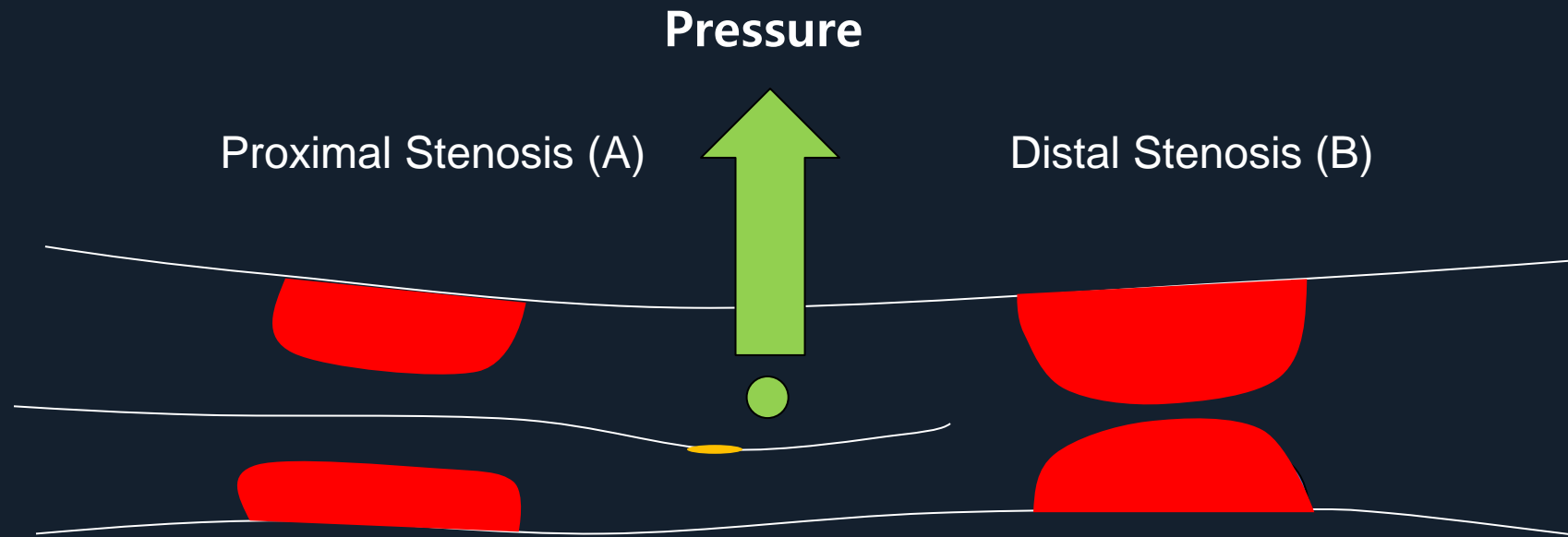
Multiple stenoses in series along one coronary



Long Stent Implantation (Full Metal Jacket)

But, If you use FFR wire, more selective stenting would be possible

Hemodynamic Interaction in Tandem Lesion



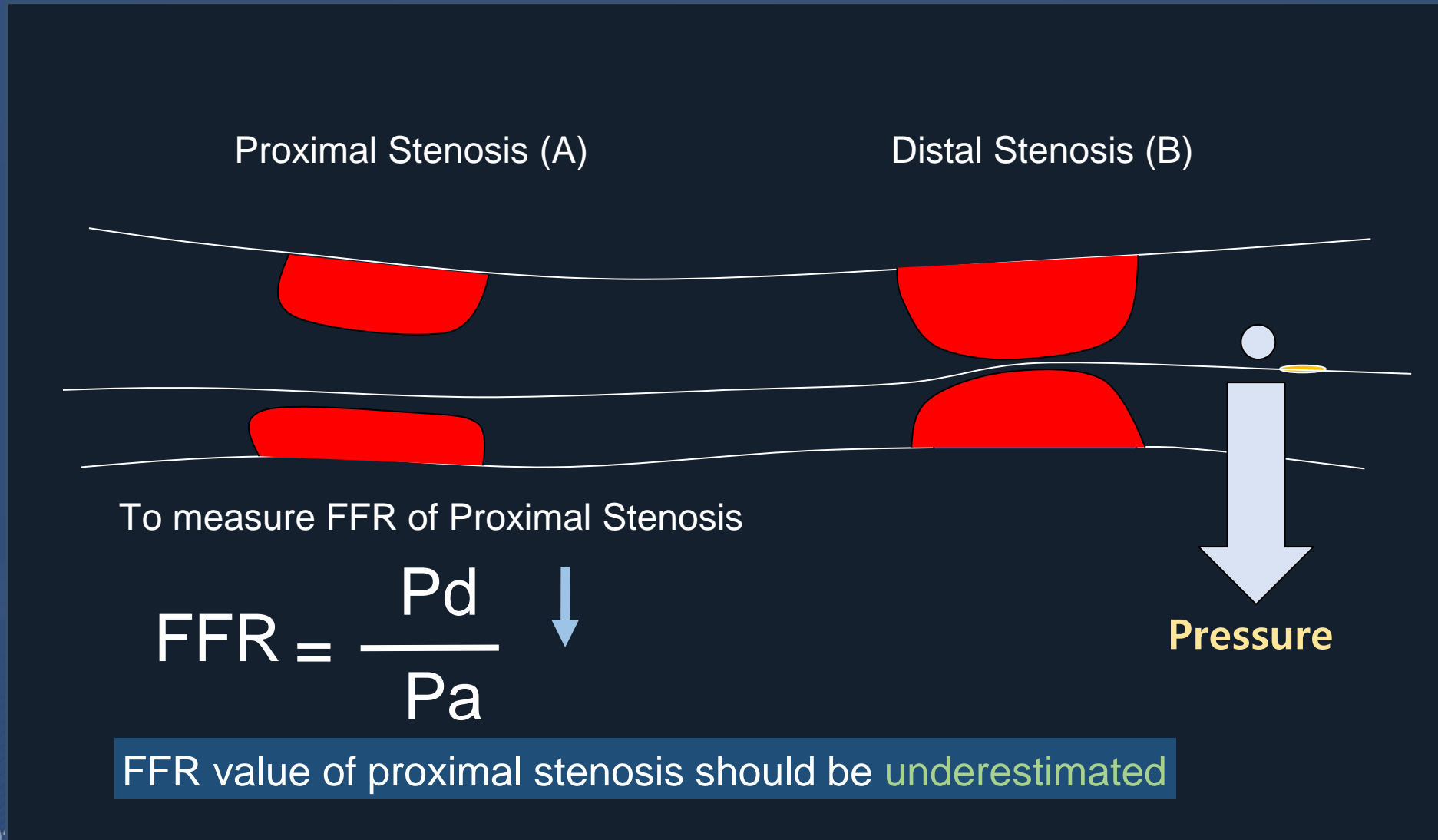
To measure FFR of Proximal Stenosis

$$FFR = \frac{P_d}{P_a}$$

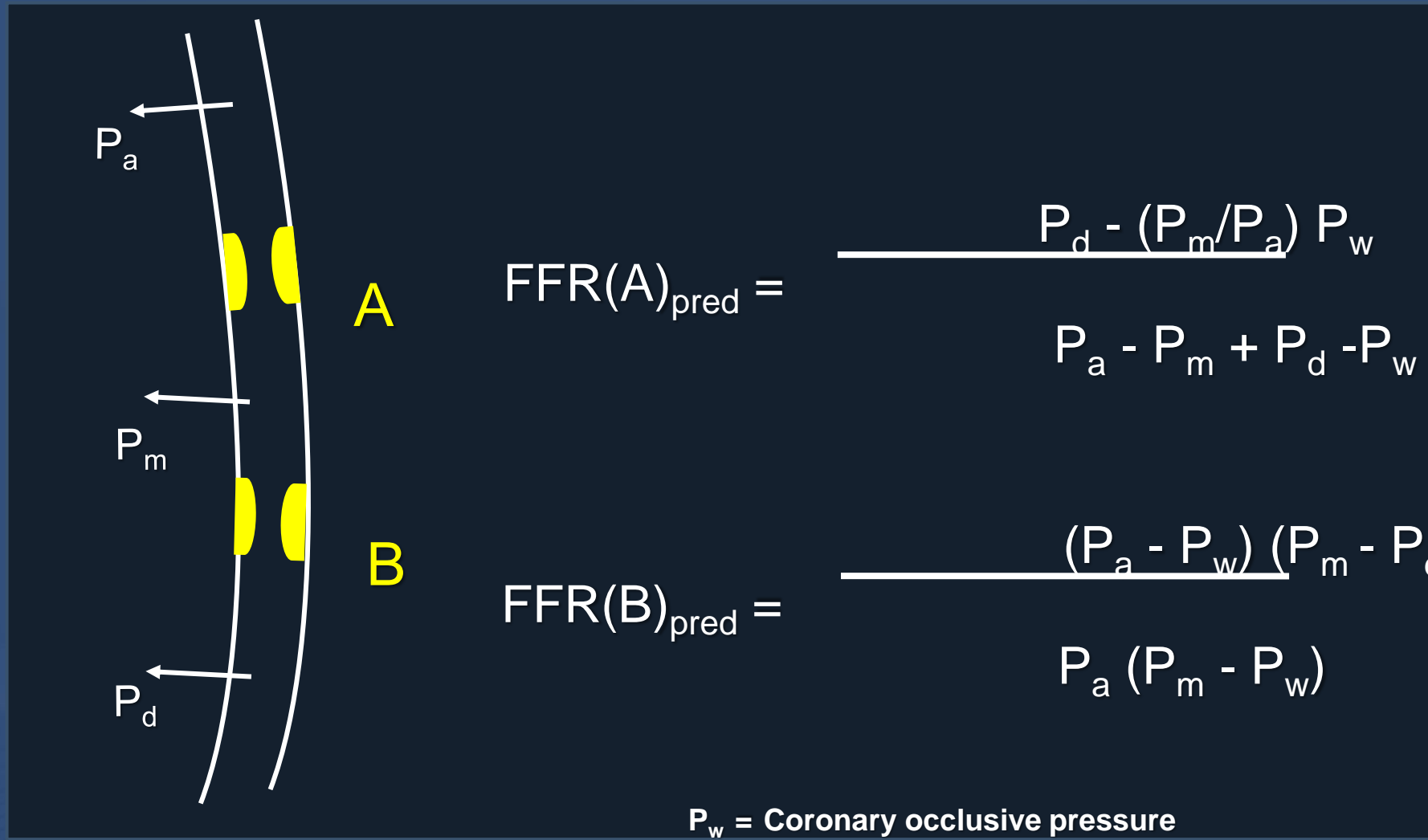
The diagram shows a green arrow pointing upwards from the numerator P_d , indicating that the distal pressure is higher than it would be in a single stenosis.

FFR value of proximal stenosis should be **overestimated**

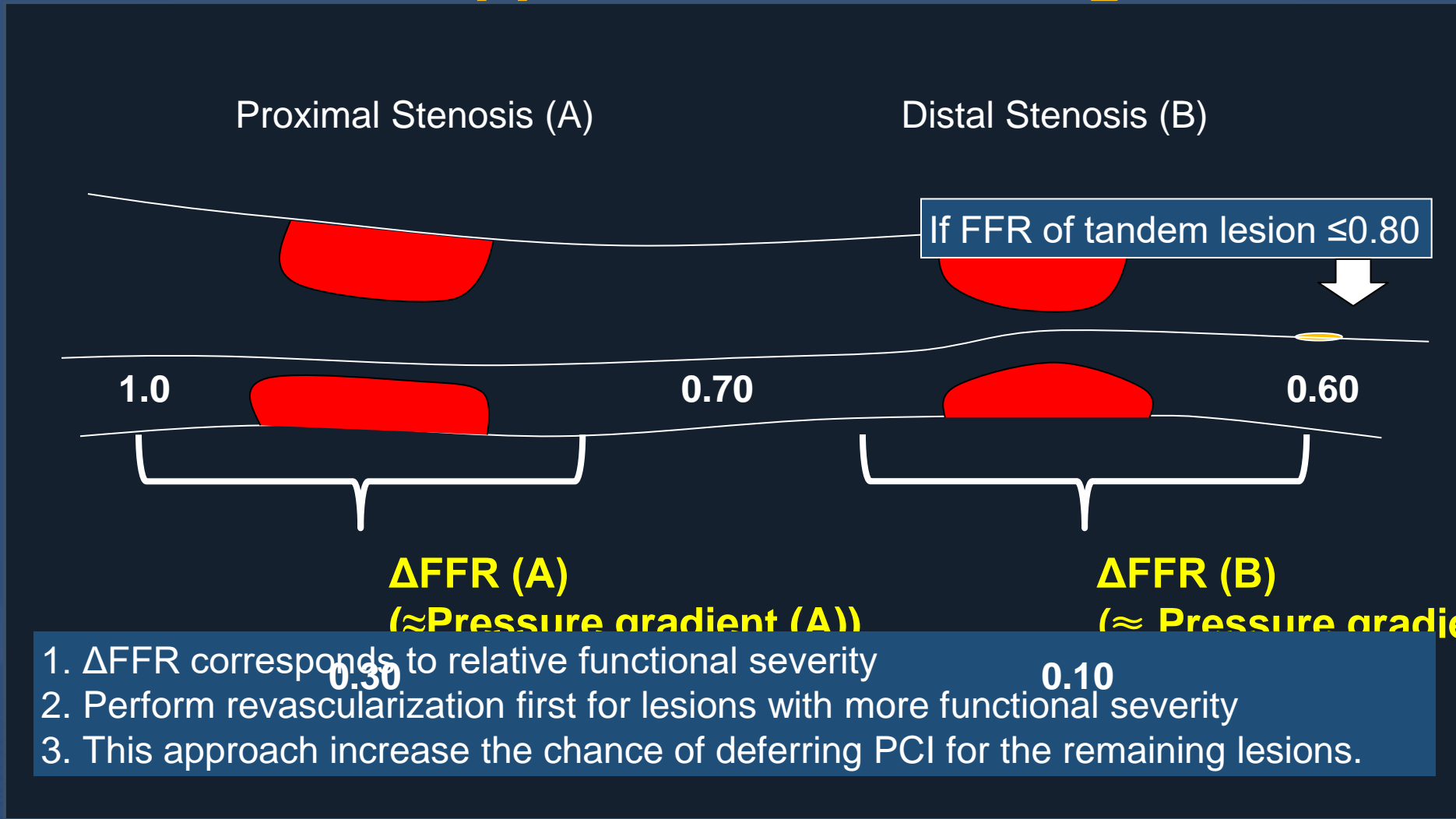
Hemodynamic Interaction in Tandem Lesion



The Separate Functional Significance of Tandem Stenoses



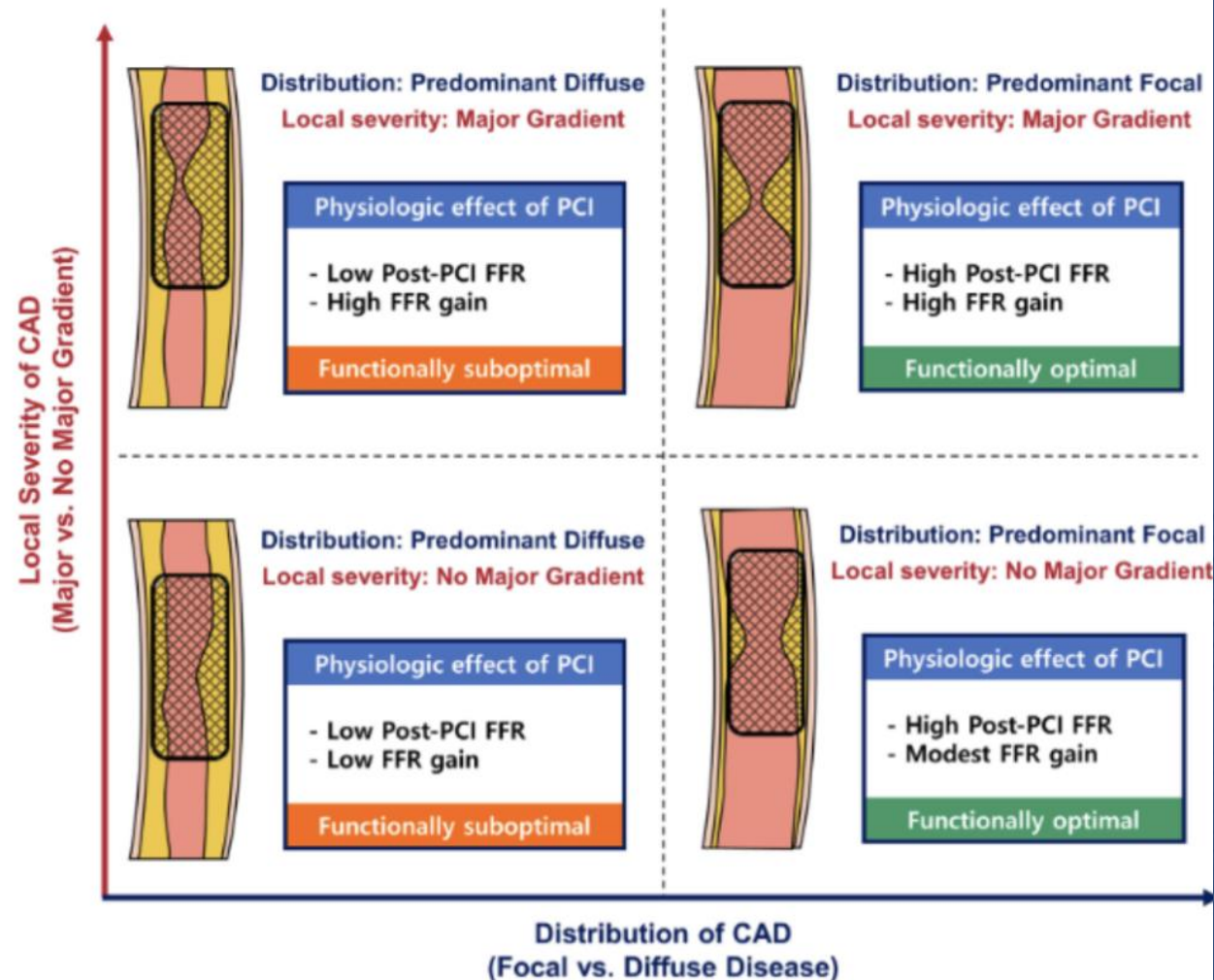
Practical Approach: Rule of Big Δ FFR



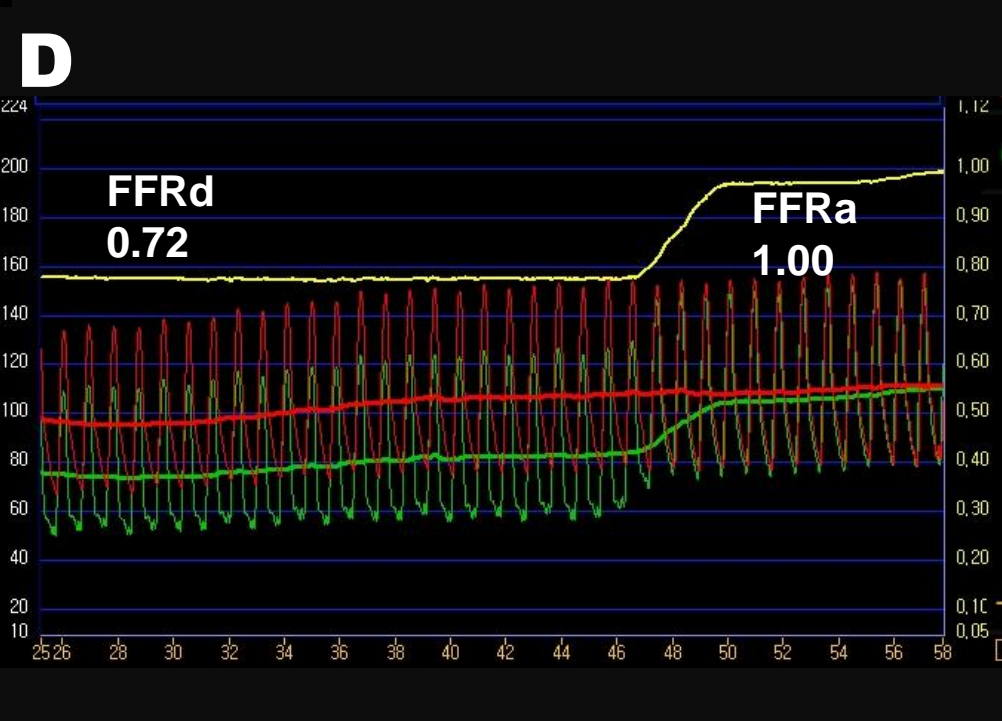
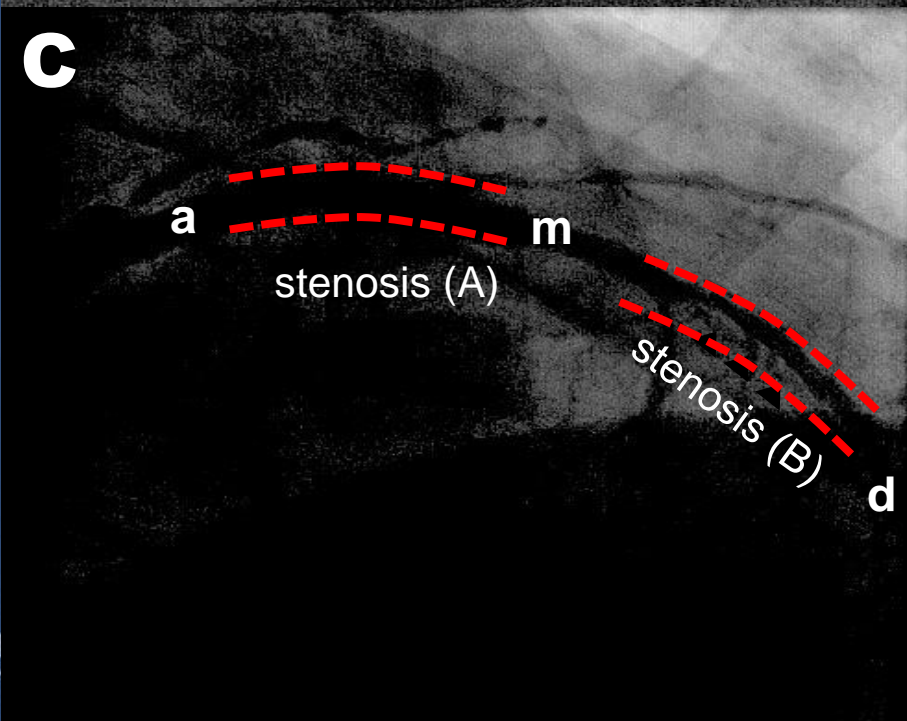
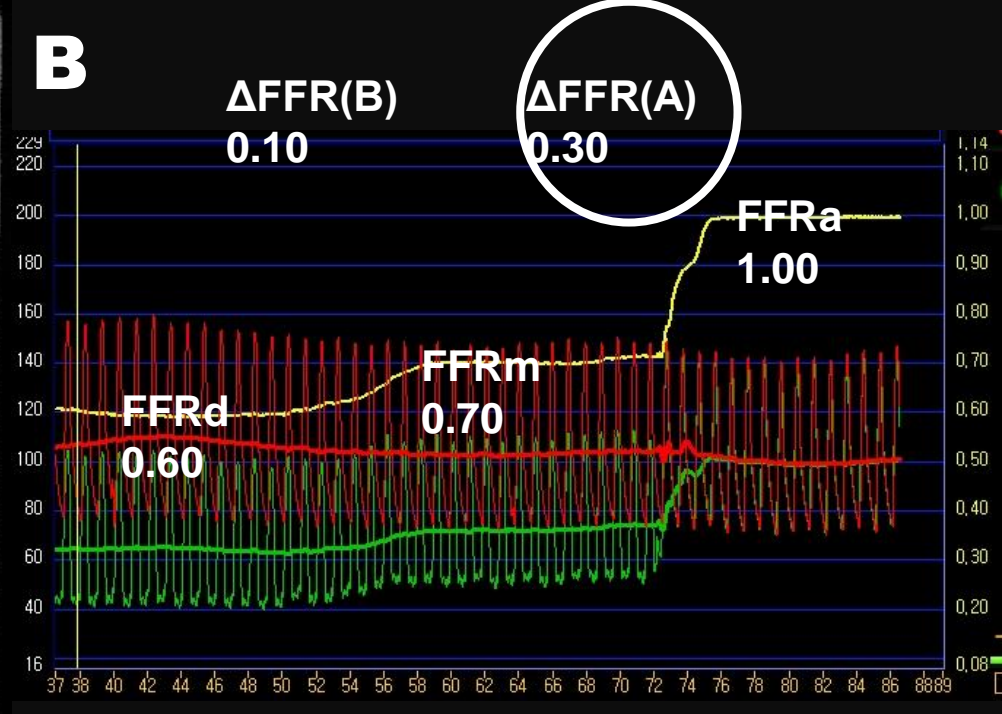
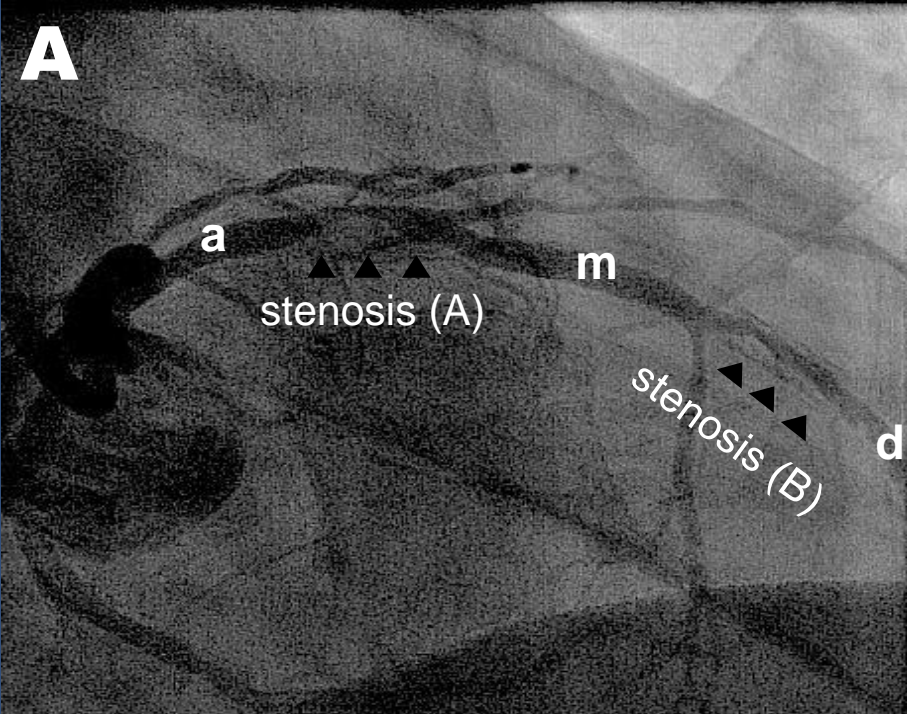
Practical Application of Coronary Physiologic Assessment: Asia-Pacific Expert Consensus Document

LONGITUDINAL VESSEL ANALYSIS FOR PHYSIOLOGIC DISEASE PATTERN

FIGURE 4 Concept of 2-Dimensional Characterization of Coronary Atherosclerotic Disease Patterns



JACC: Asia. 2023 Oct, 3 (5) 689–706



A

stenosis (A)

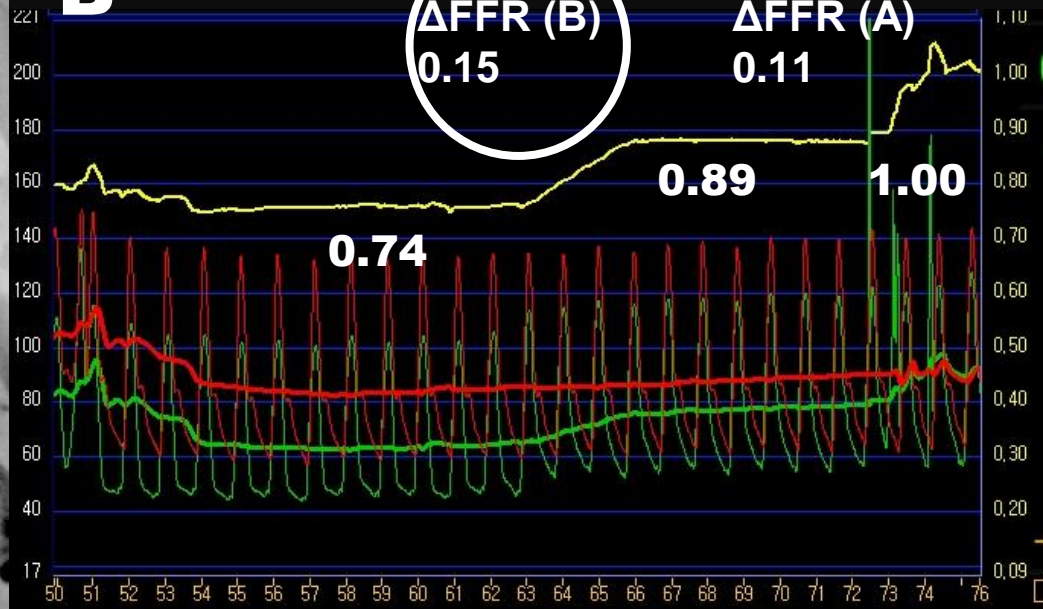
stenosis (B)

B $\Delta\text{FFR (B)}$
0.15 $\Delta\text{FFR (A)}$
0.11

0.74

0.89

1.00

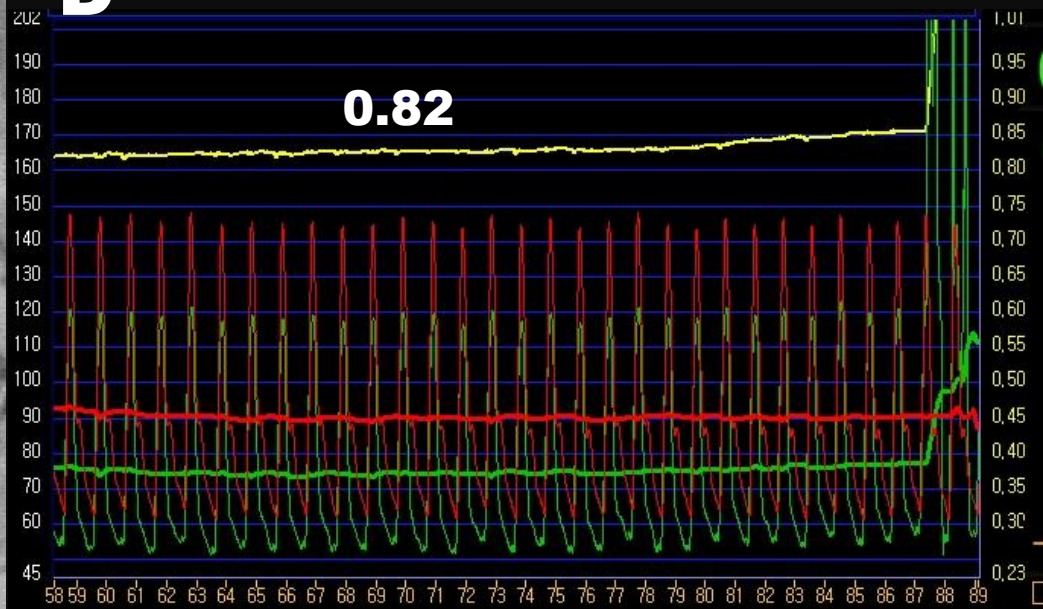
**C**

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 Δ FFR (“rule of big delta”)

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

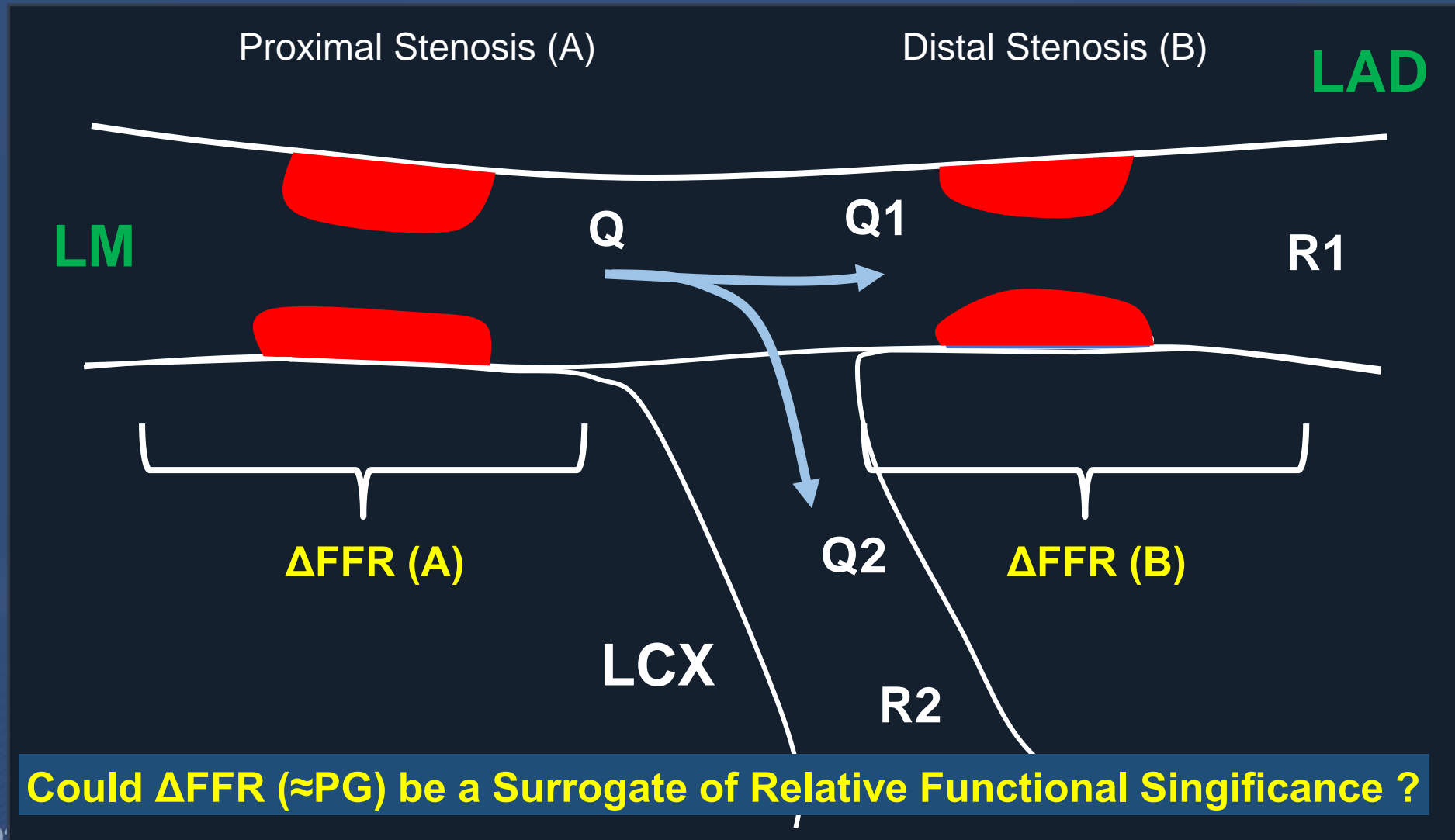
Proximal stenosis
treated only
N=16

Both stenoses
treated
N=16

Distal stenosis
treated only
N=12

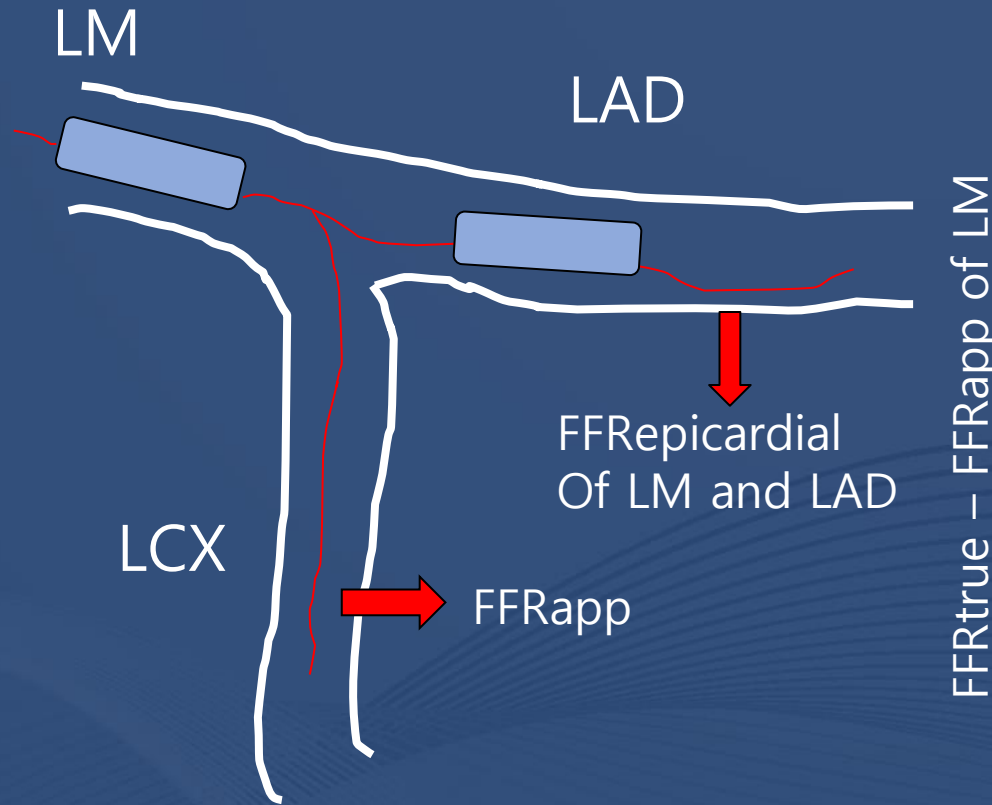
Both stenoses
treated
N=8

Tandem Lesion with Interposing Side Branch like LM

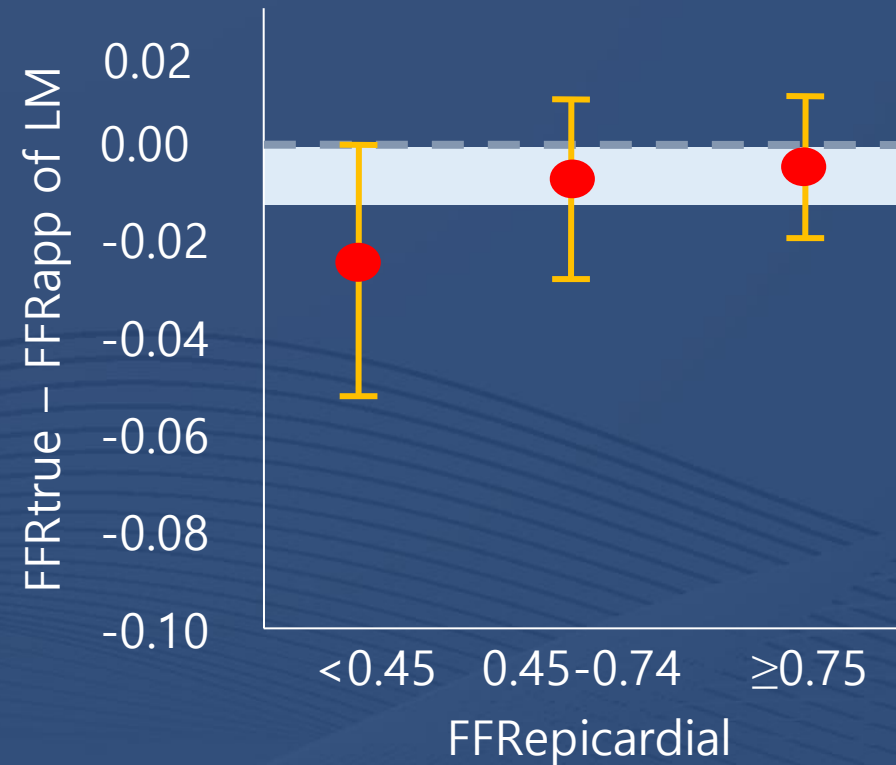


LM and Downstream Disease

If FFAapp was > 0.85 , FFRtrue was > 0.80

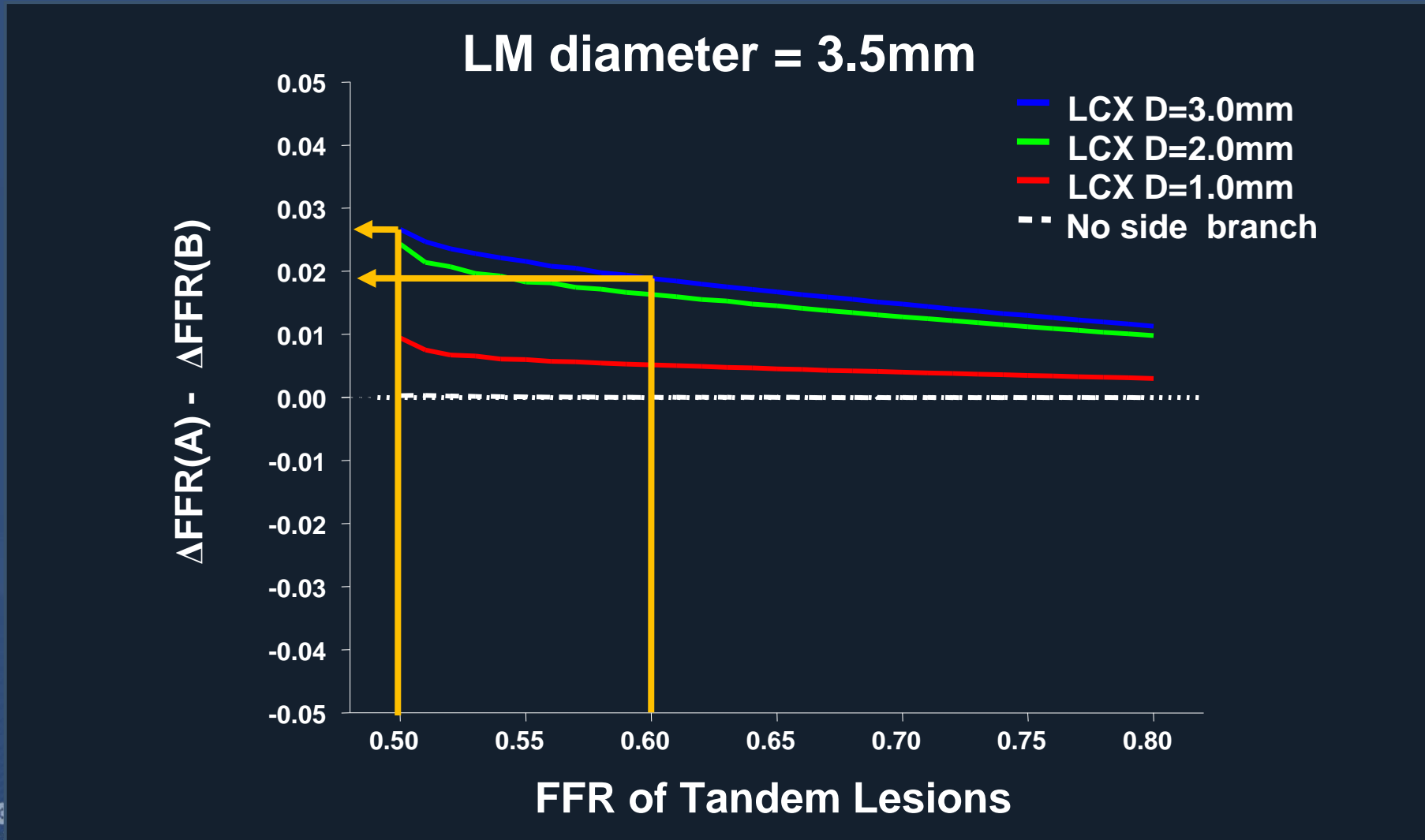


Human Validation

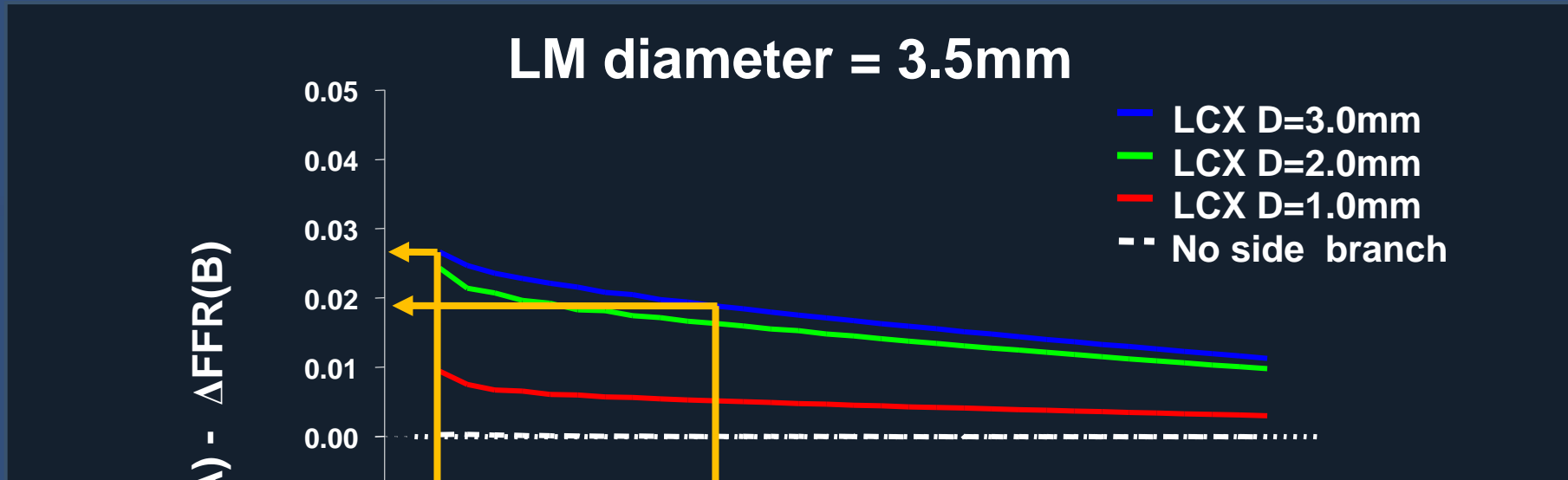


When Two Lesions are Functionally Equal,

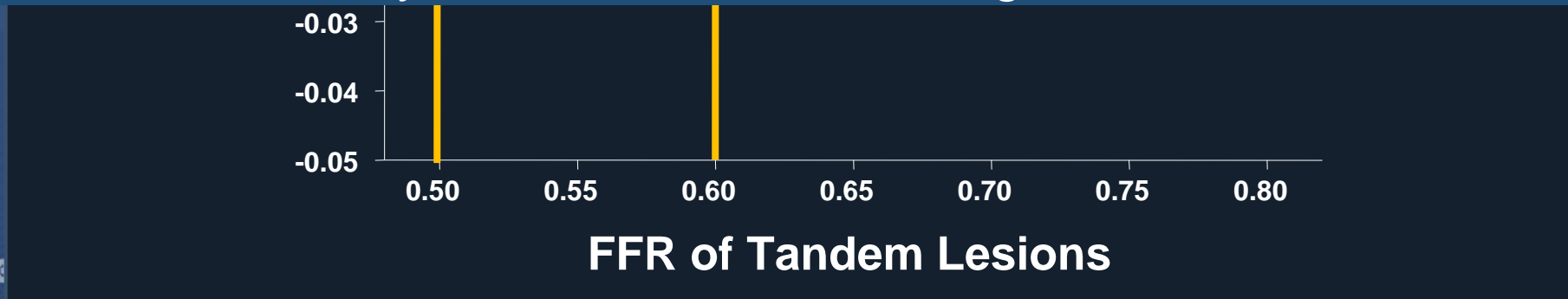
$$(FFR(A)_{\text{true}} = FFR(B)_{\text{true}})$$



When Two Lesions are Functionally Equal, (FFR(A)_{true} = FFR(B)_{true})

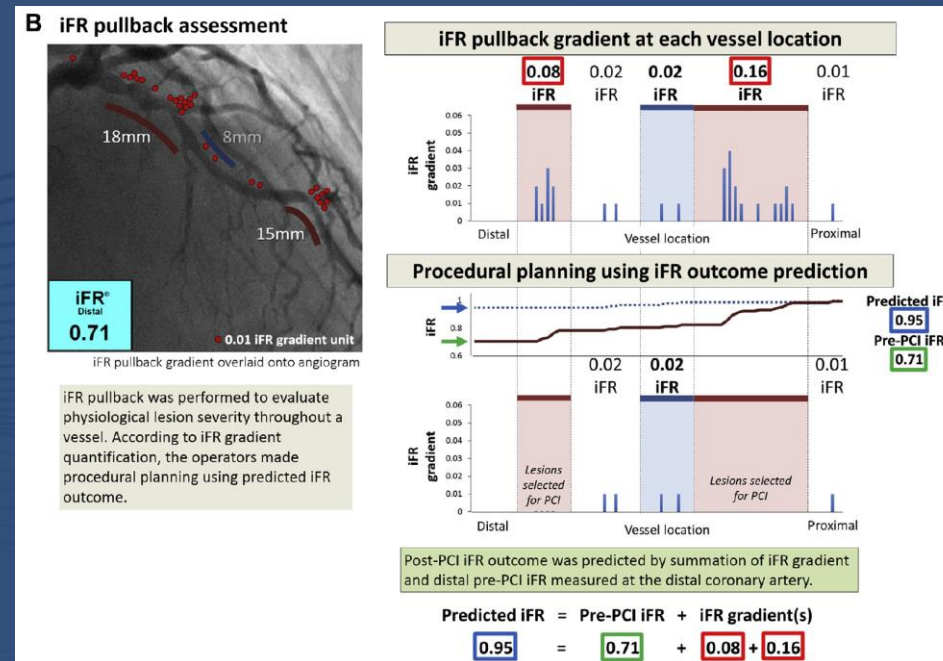
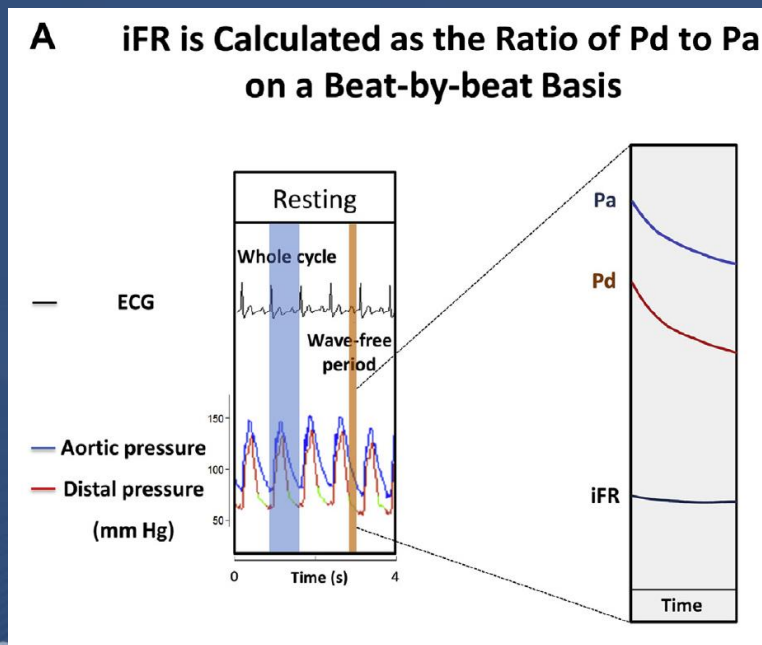


The impact of big side branch on Δ FFR is about $<0.02-0.03$.
This number may be below the clinical significance.

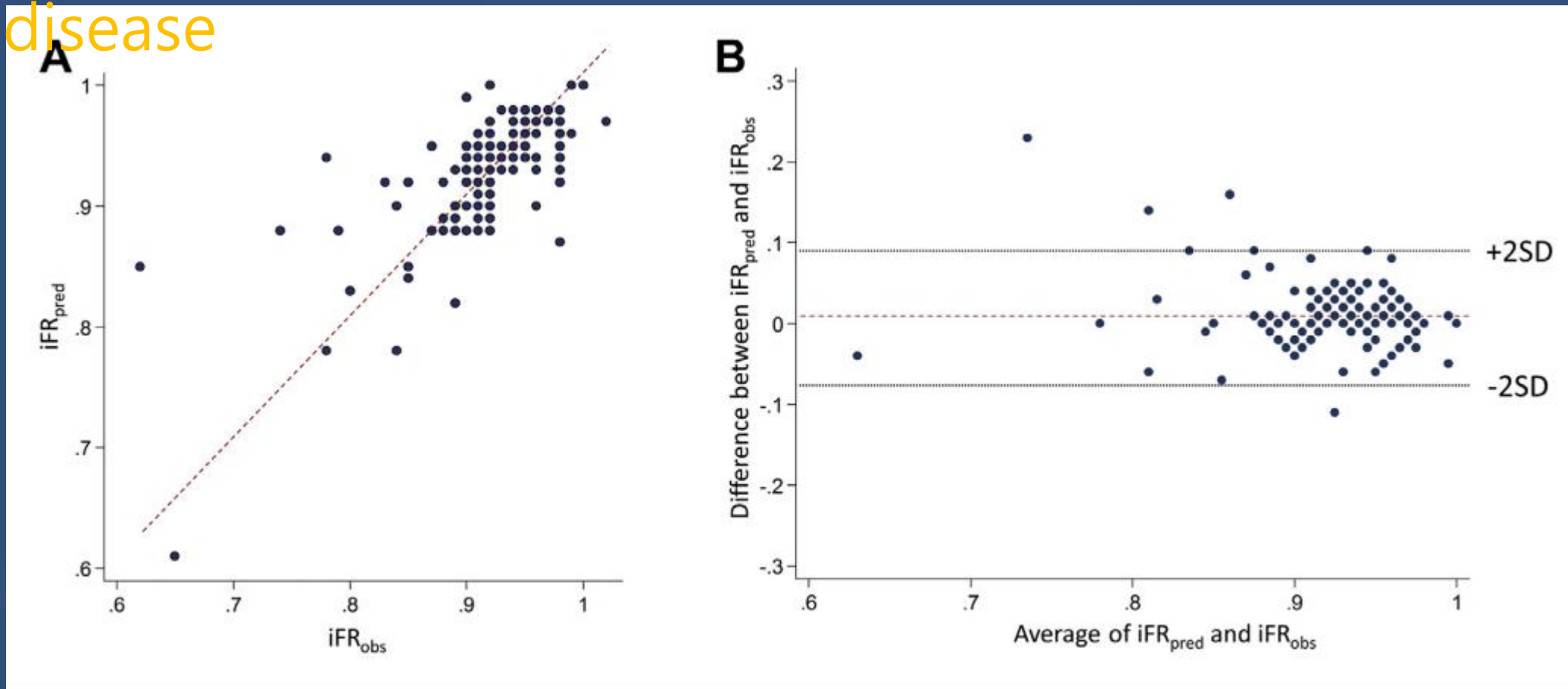


iFR GRADIENT Registry

- Prospective, observational study including 128 patients (19 participating sites)
- Angiographic intermediate tandem and/or diffuse lesions
- Operators submitted their procedural strategy with angio alone.
- iFR pull backs pre and post PCI, Target Post PCI iFR value > 0.89
- Accuracy between predicted and actual iFR was calculated.

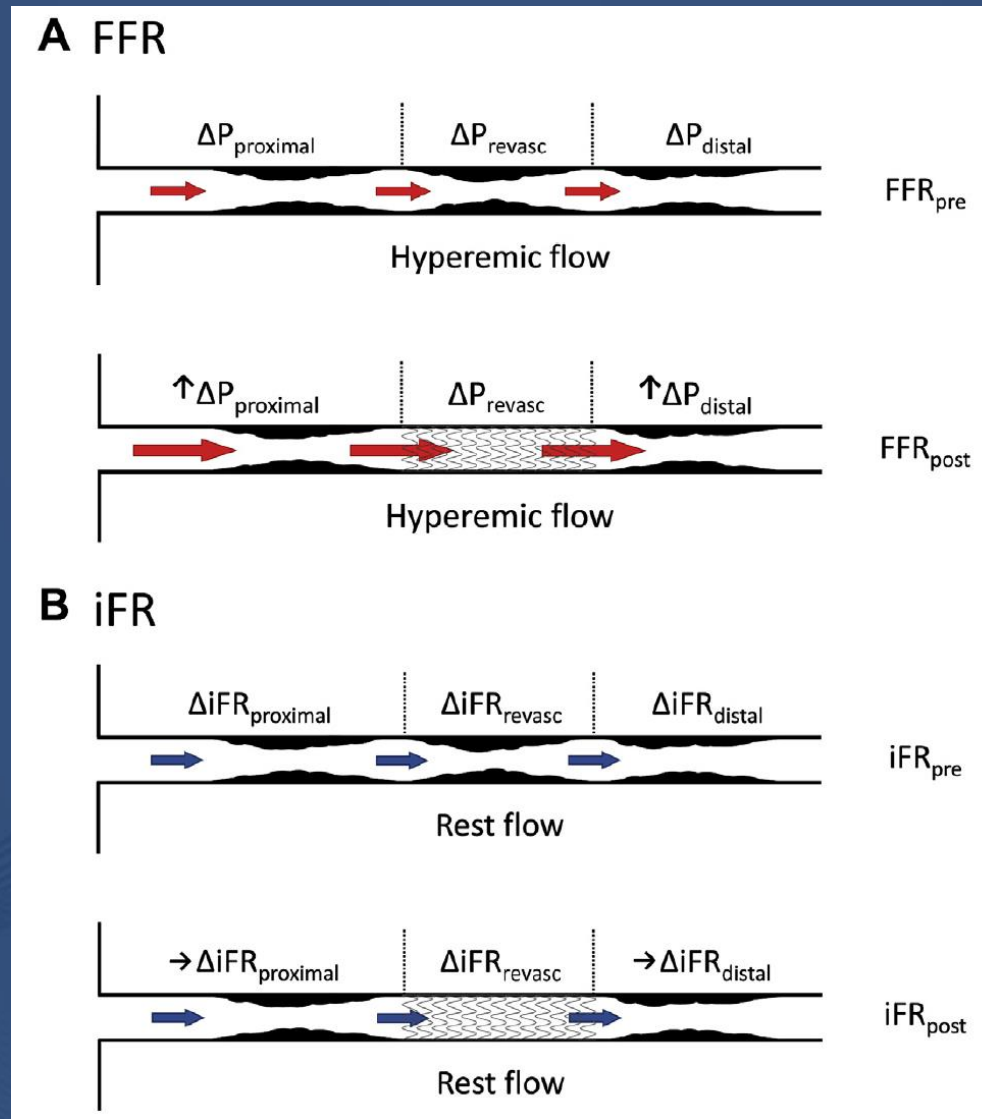


Close agreement between predicted iFR and observed iFR in the presence of diffuse and tandem disease



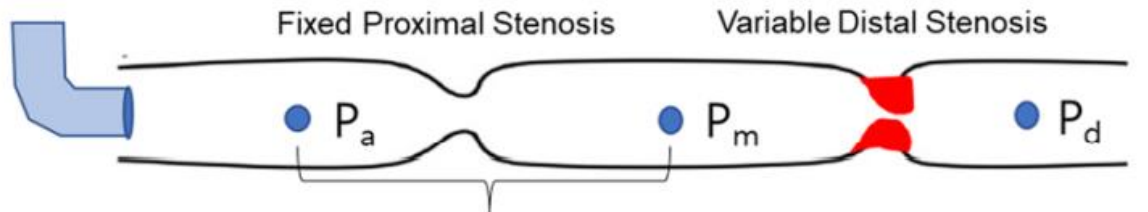
(A) A strong linear relationship was found between pullback-predicted iFR (iFR_{pred}) and observed iFR (iFR_{obs}). **(B)** No large systematic bias was observed between iFR_{pred} and iFR_{obs} . Abbreviations as in [Figure 1](#).

Prediction of Post-PCI FFR vs iFR

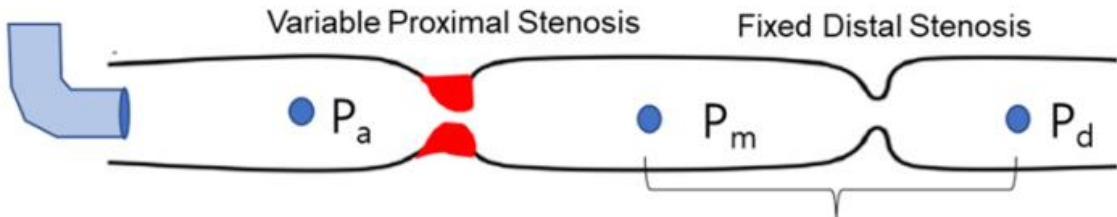


Impact of Serial Coronary Stenoses on Various Coronary Physiologic Indices

A Schema of Serial Coronary Stenoses



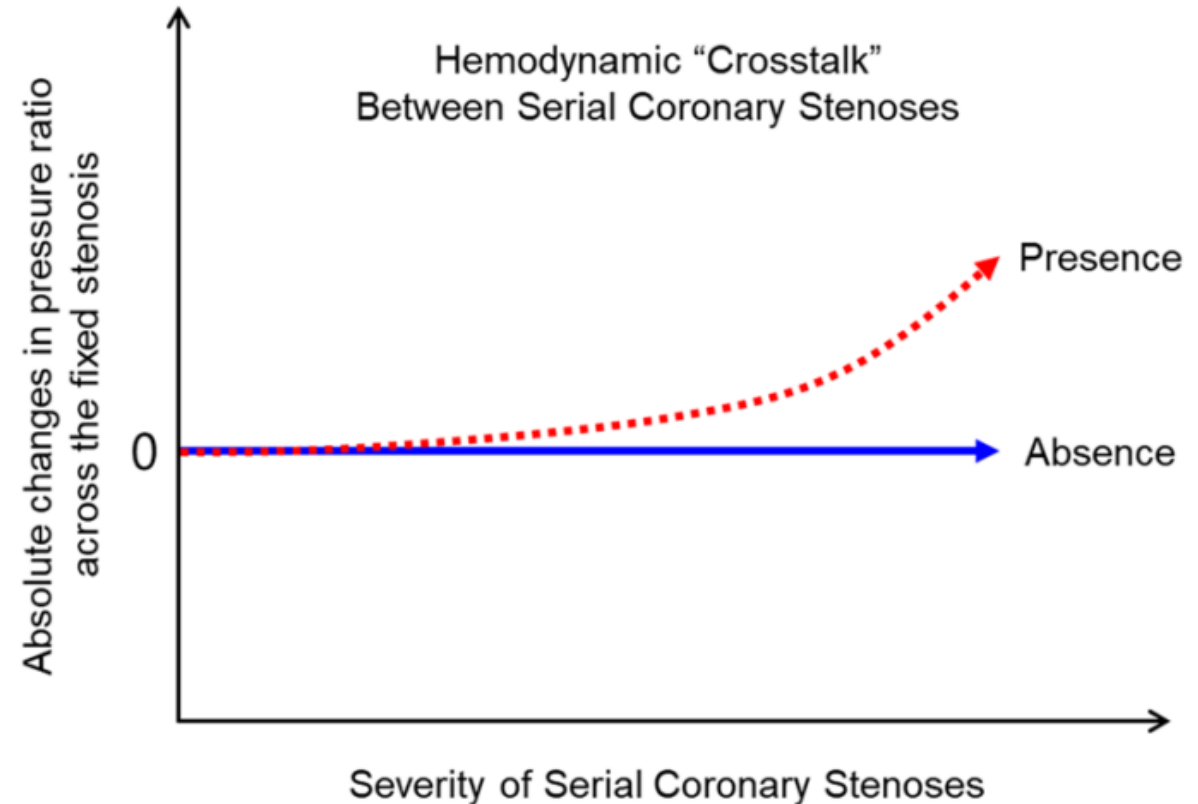
Absolute changes of the pressure ratio across the fixed stenosis according to the variable degree of distal stenosis = "Cross-talk"



"Cross-talk" = Absolute changes of the pressure ratio across the fixed stenosis according to the variable degree of proximal stenosis

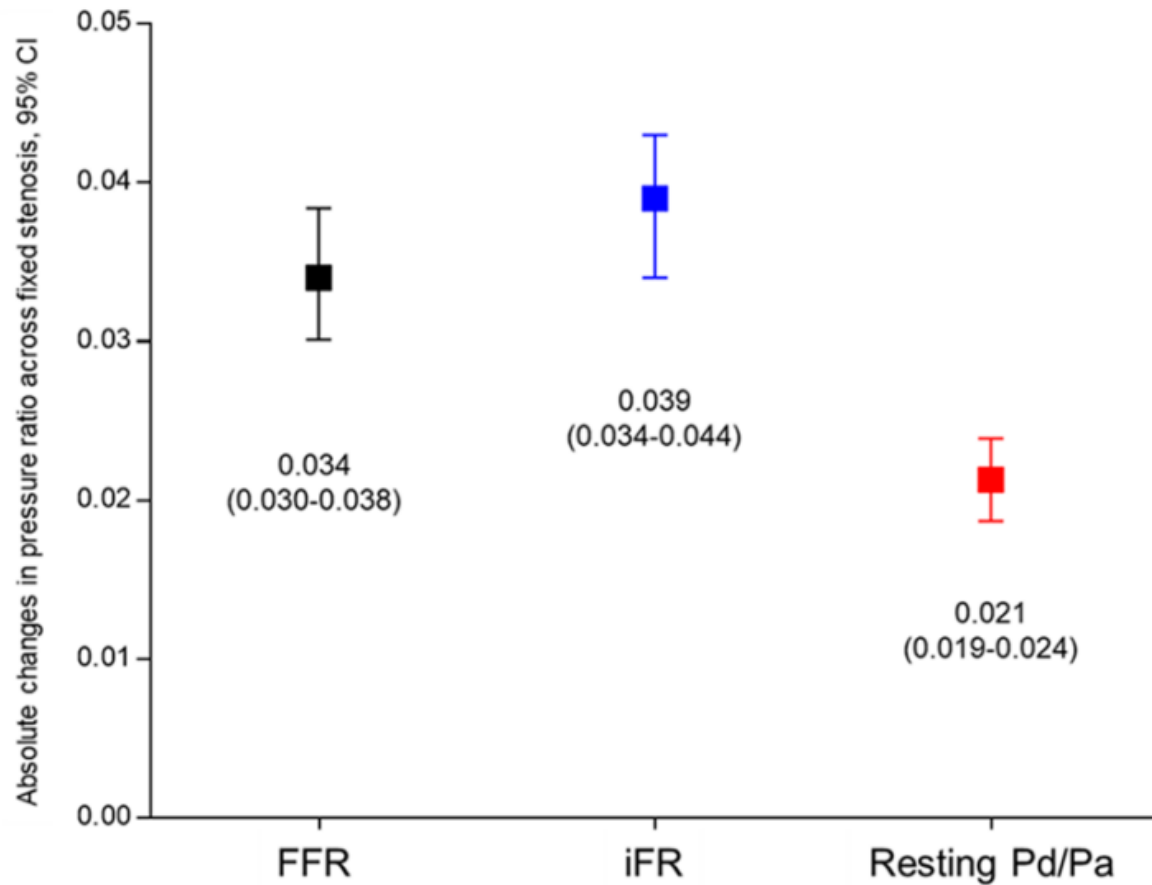
Functional severity of serial coronary stenoses was measured distal to distal stenosis
P = pressure ratio

B Conceptual Relationship of Hemodynamic Interdependence

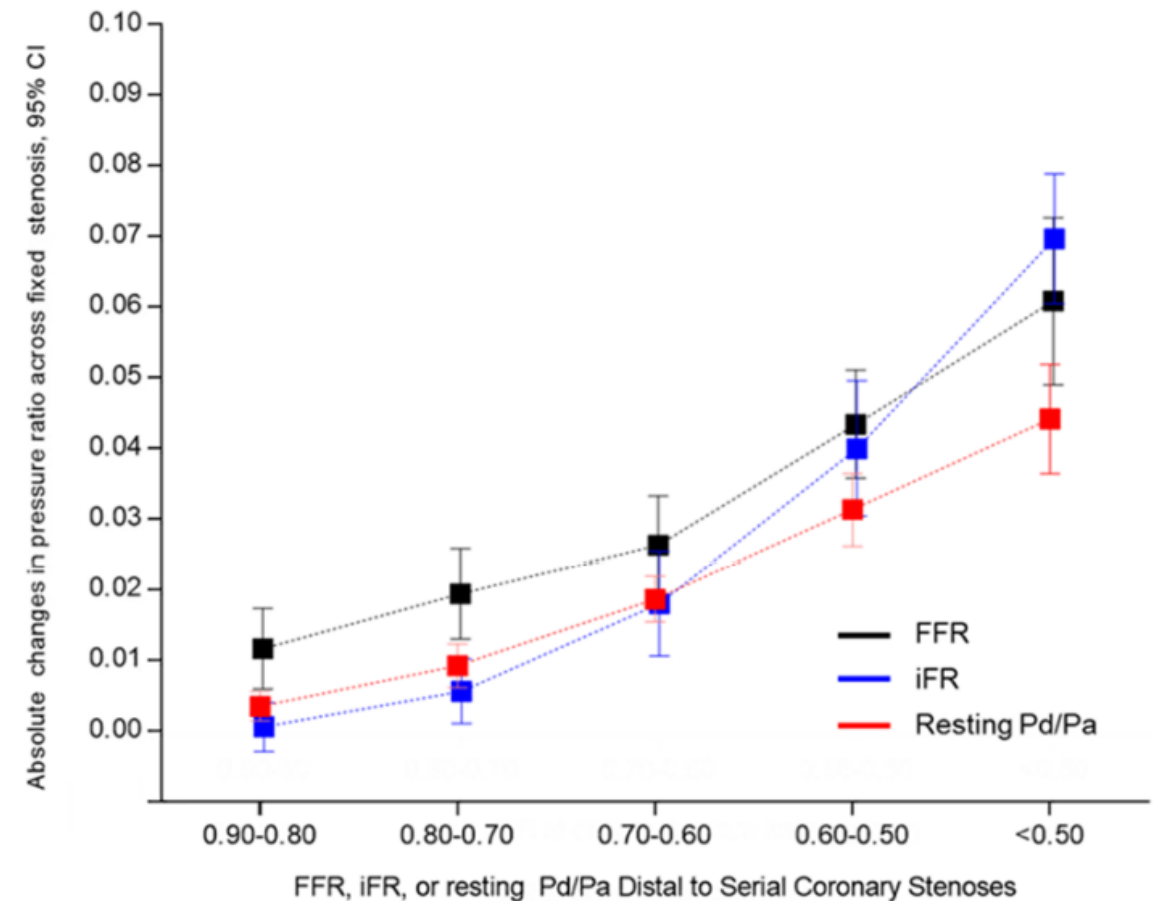


Impact of Serial Coronary Stenoses on Various Coronary Physiologic Indices

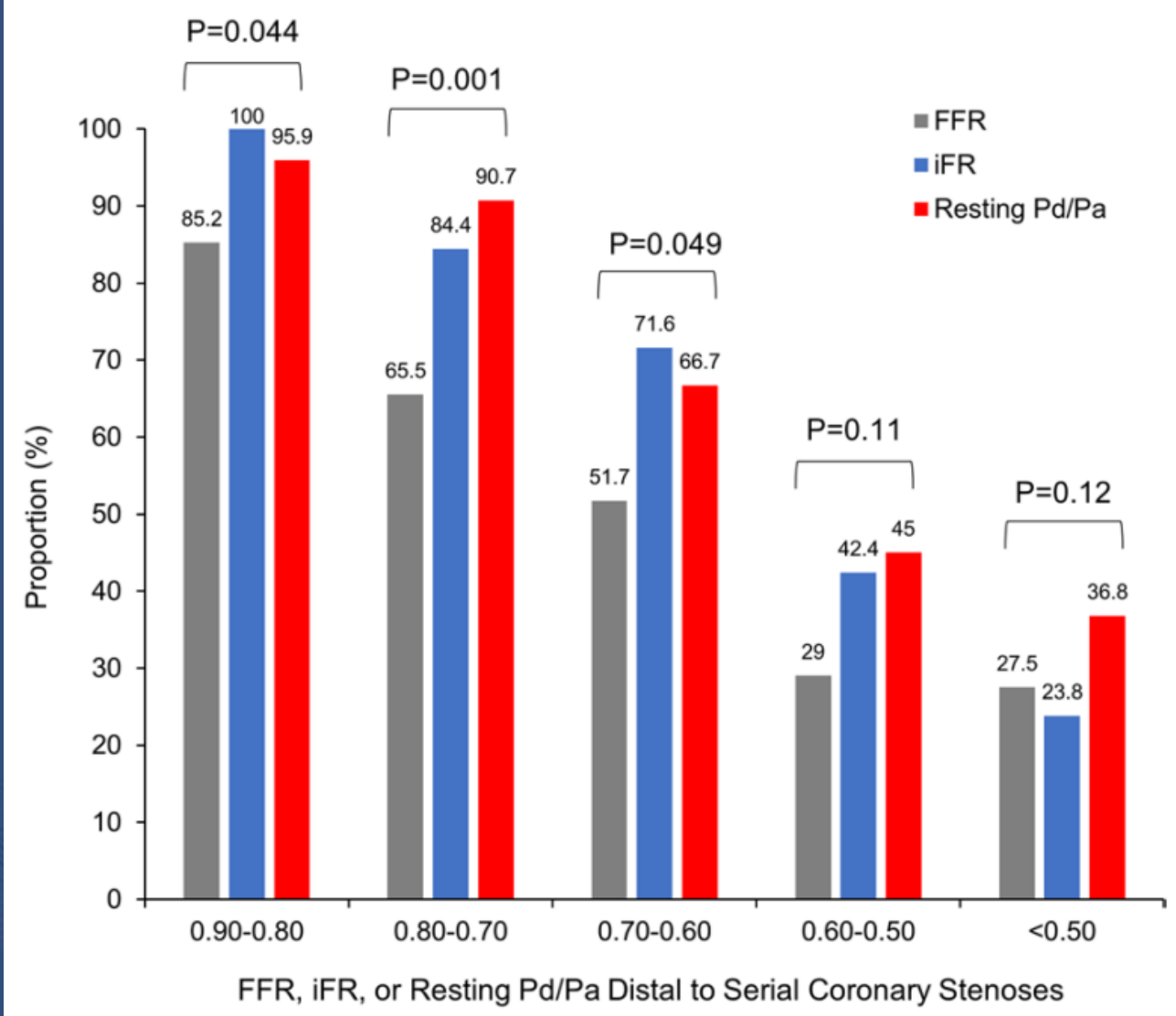
A Hemodynamic Interdependence In Overall Measurements



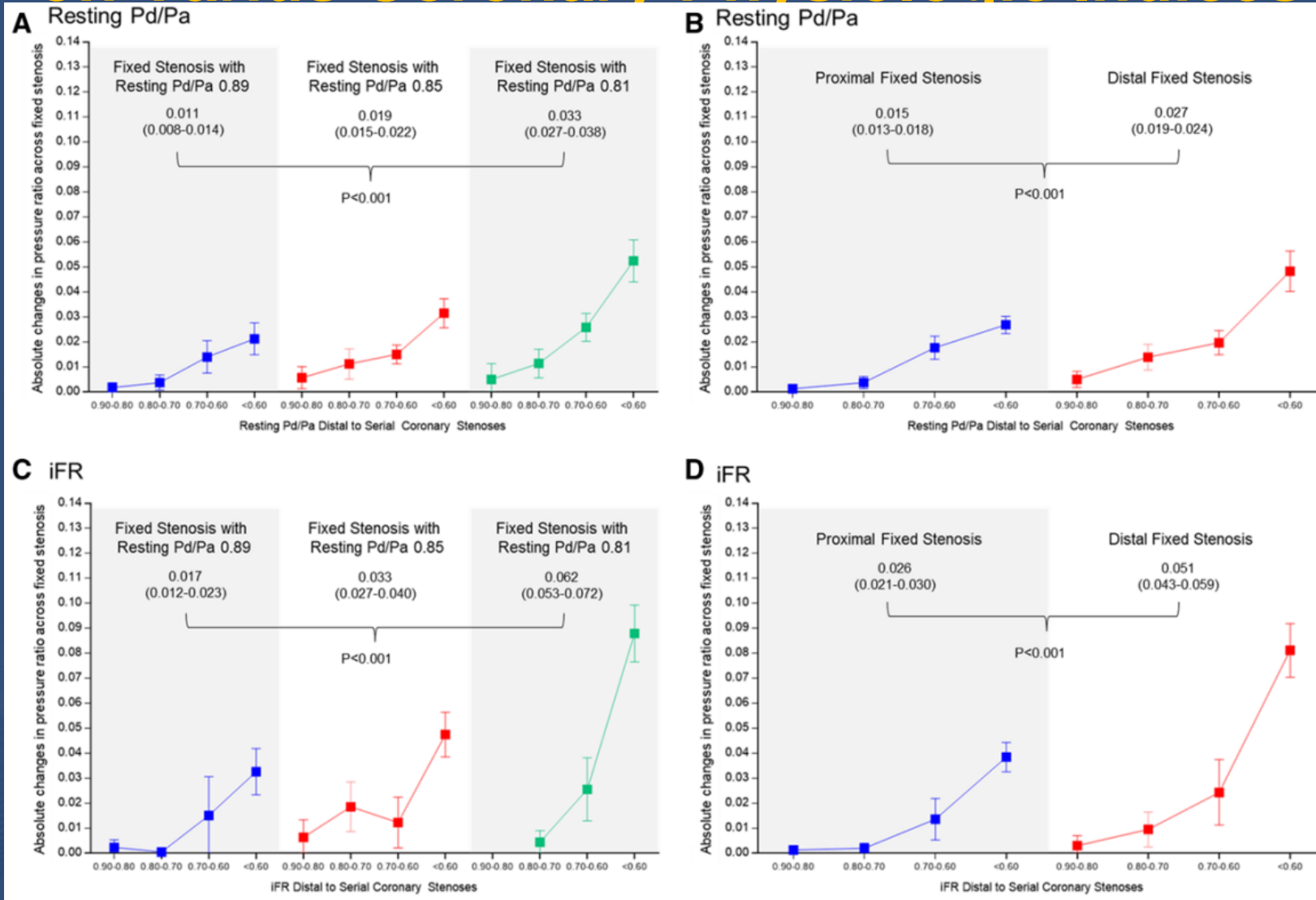
B The Impact of Serial Coronary Stenoses Severity



Impact of Serial Coronary Stenoses on Various Coronary Physiologic Indices



Impact of Serial Coronary Stenoses on Various Coronary Physiologic Indices



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.
- IVUS use may attenuate the detrimental effect of the increase of implanted stent length, supporting the favor of IVUS utilization, particularly during PCI with the long stent implantation.

Summary

- For functional lesion assessment of the coronary tandem lesions, Δ FFR 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.