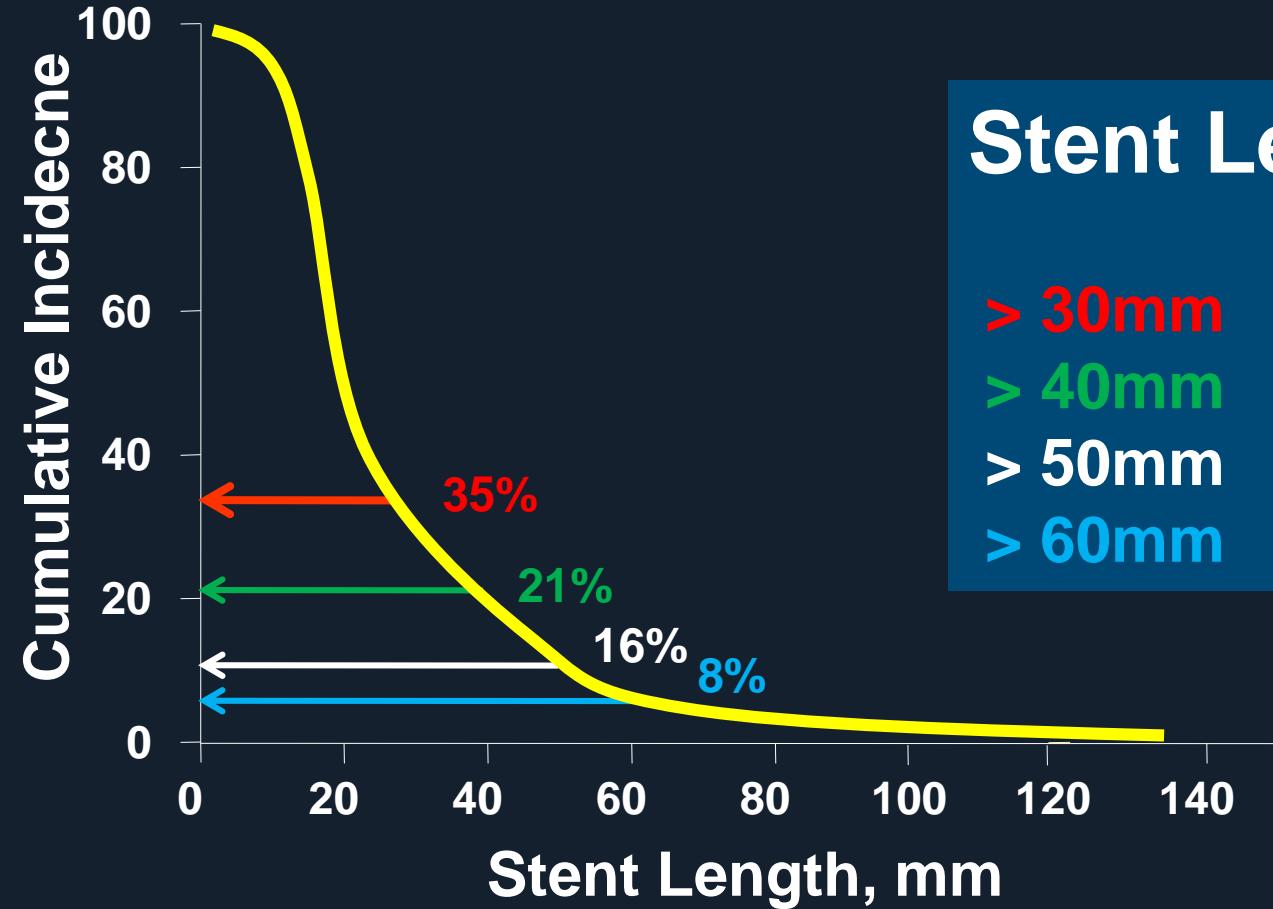


# Tandem Lesion

# Incidence of Long Stenting

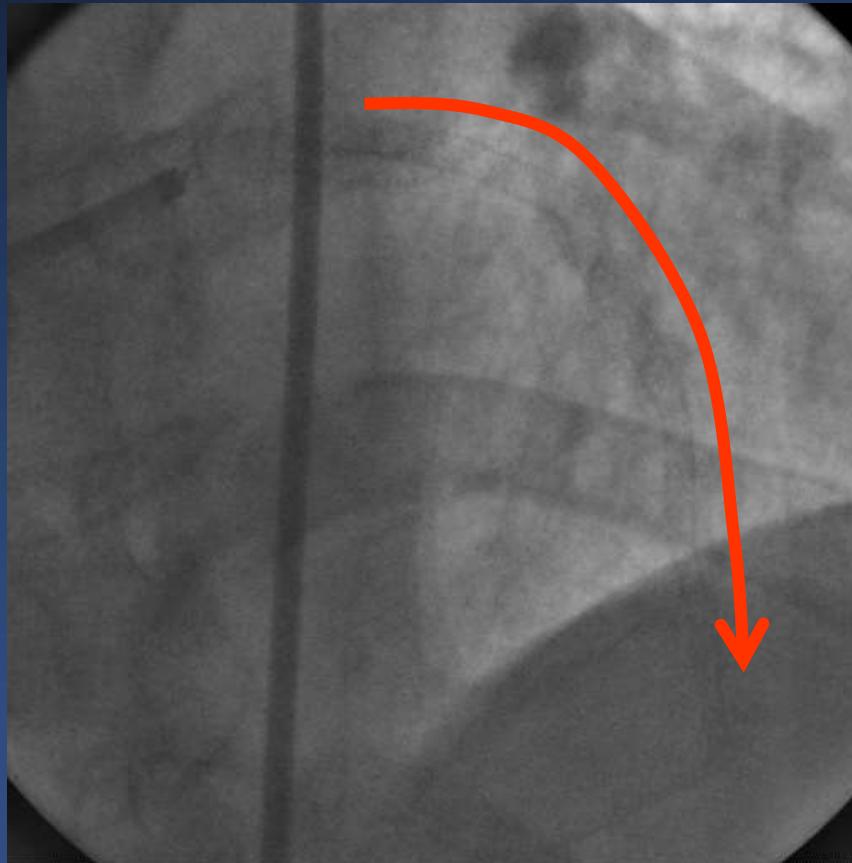


## Stent Length

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

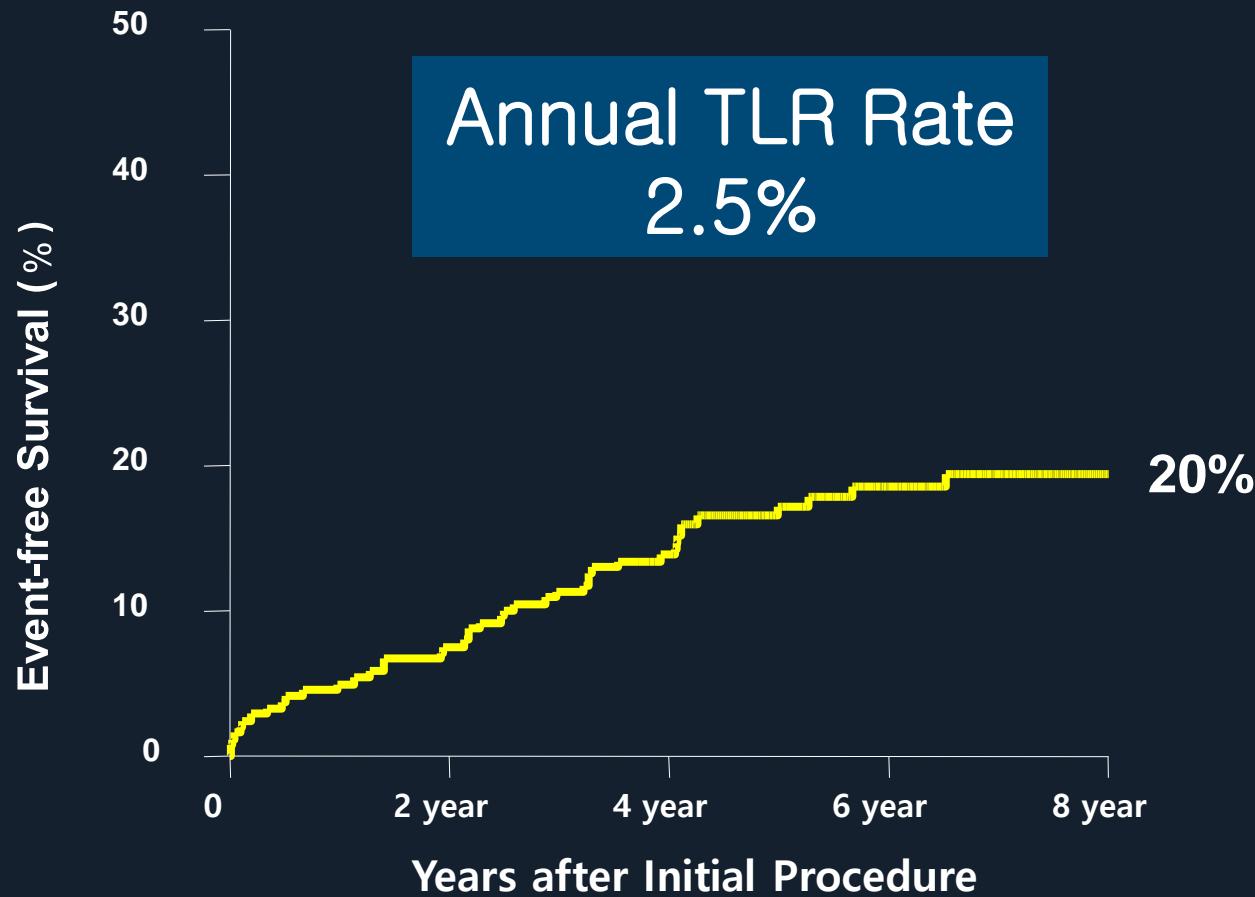
# **“Full Metal Jacket”**

**Multiple or overlapping stent implantation**



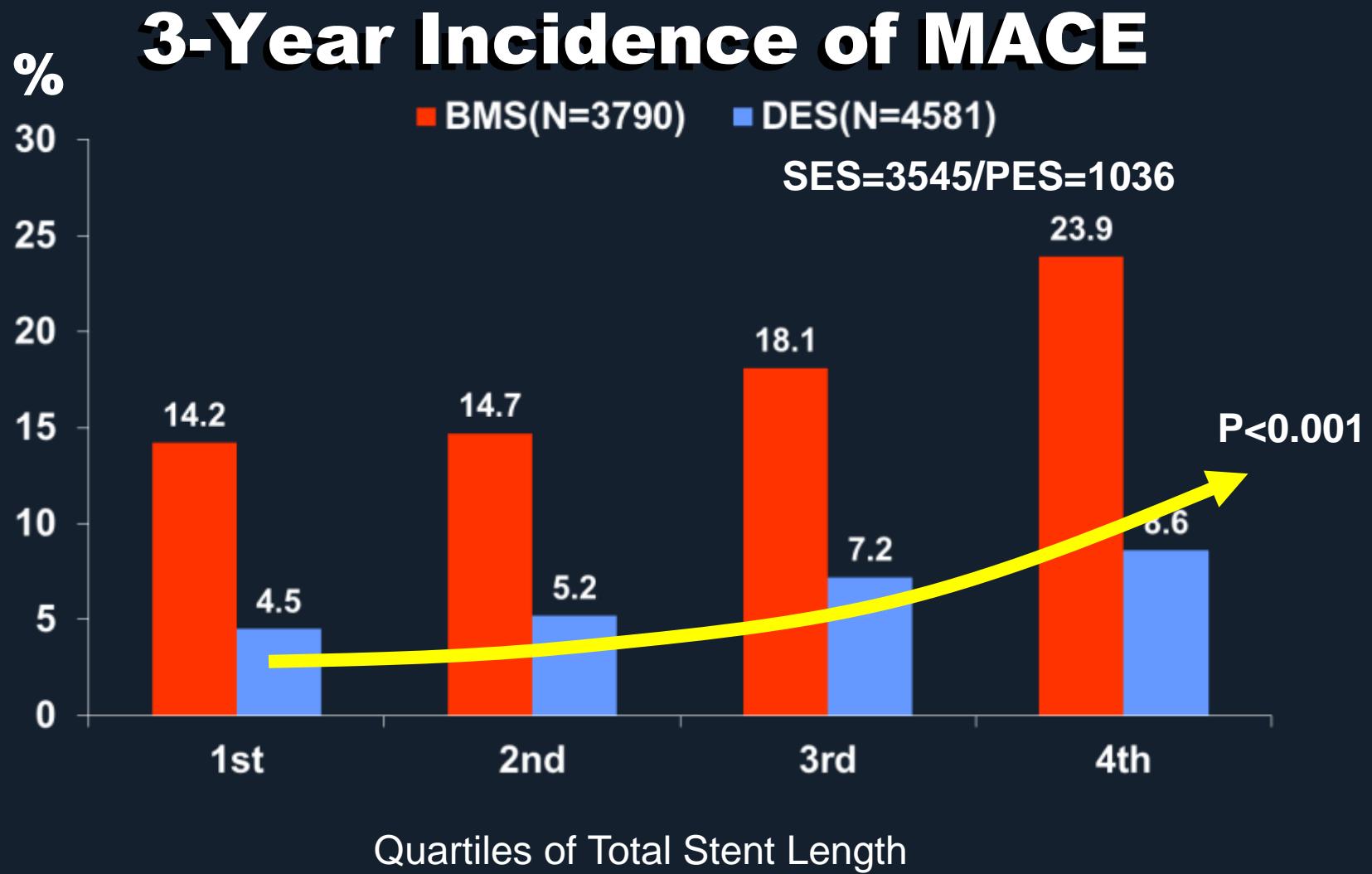
# 8 Year Follow-up of FMJ

**Event Rate is Acceptable**



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

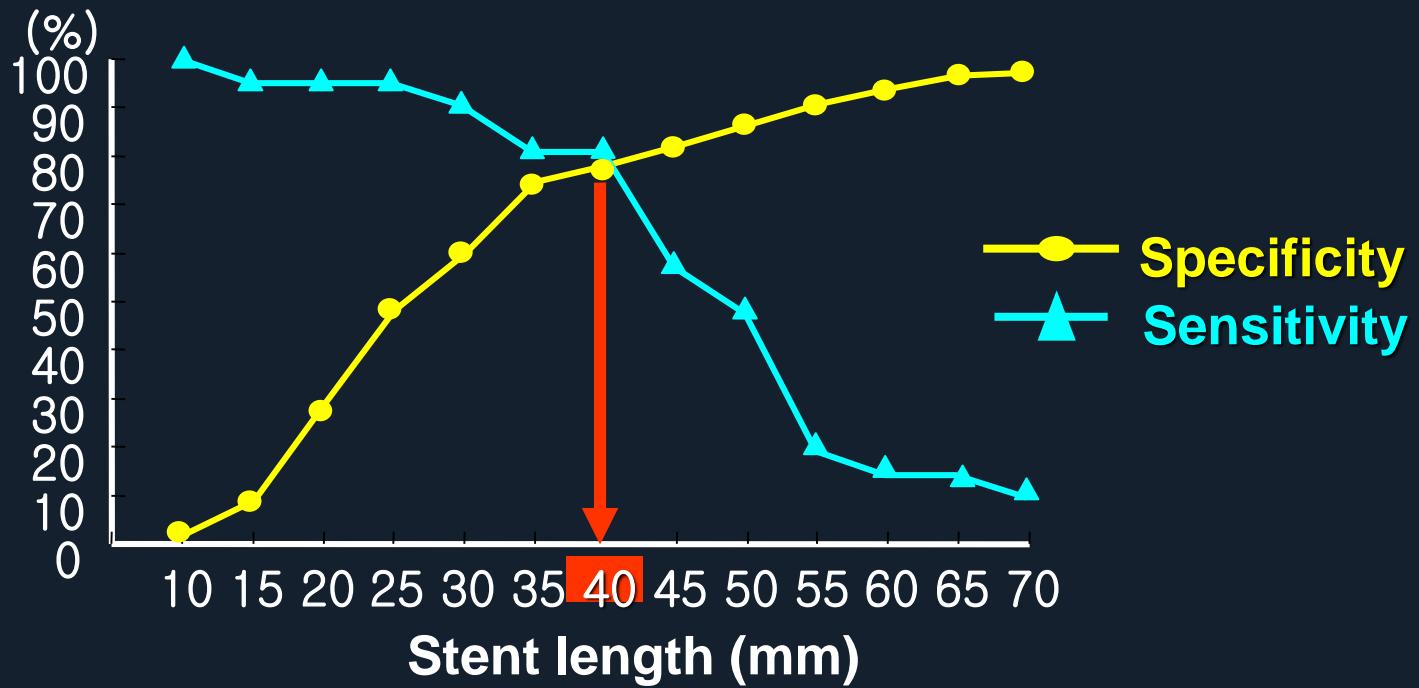
# Stent Length and Outcomes



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

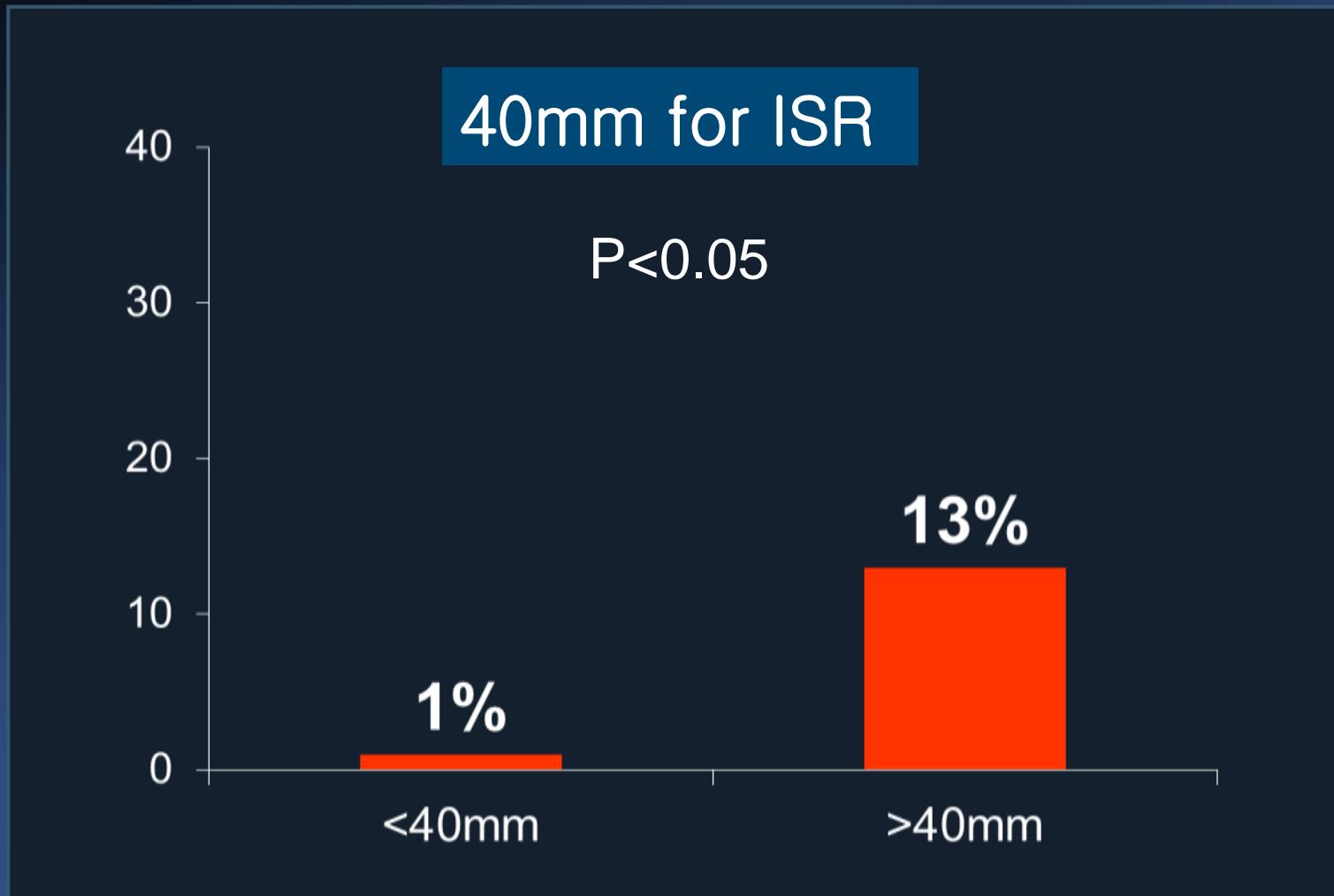
# How Long?

*Stent Length 40 mm By IVUS*



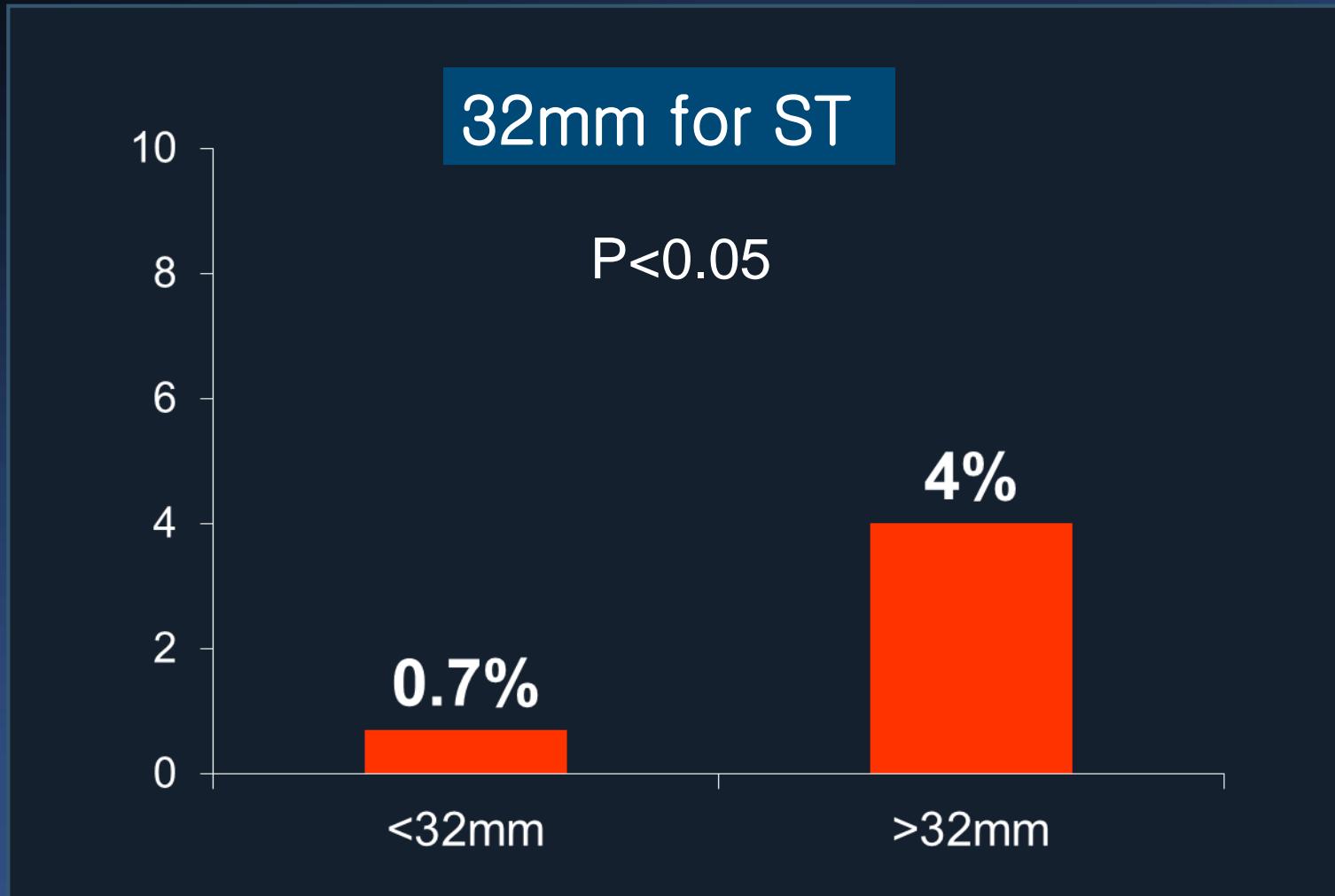
Hong MK, Park SJ, et al. Eur Heart J 2006 Jun;27(11):1305-10

# How Long? In-Stent Restenosis



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

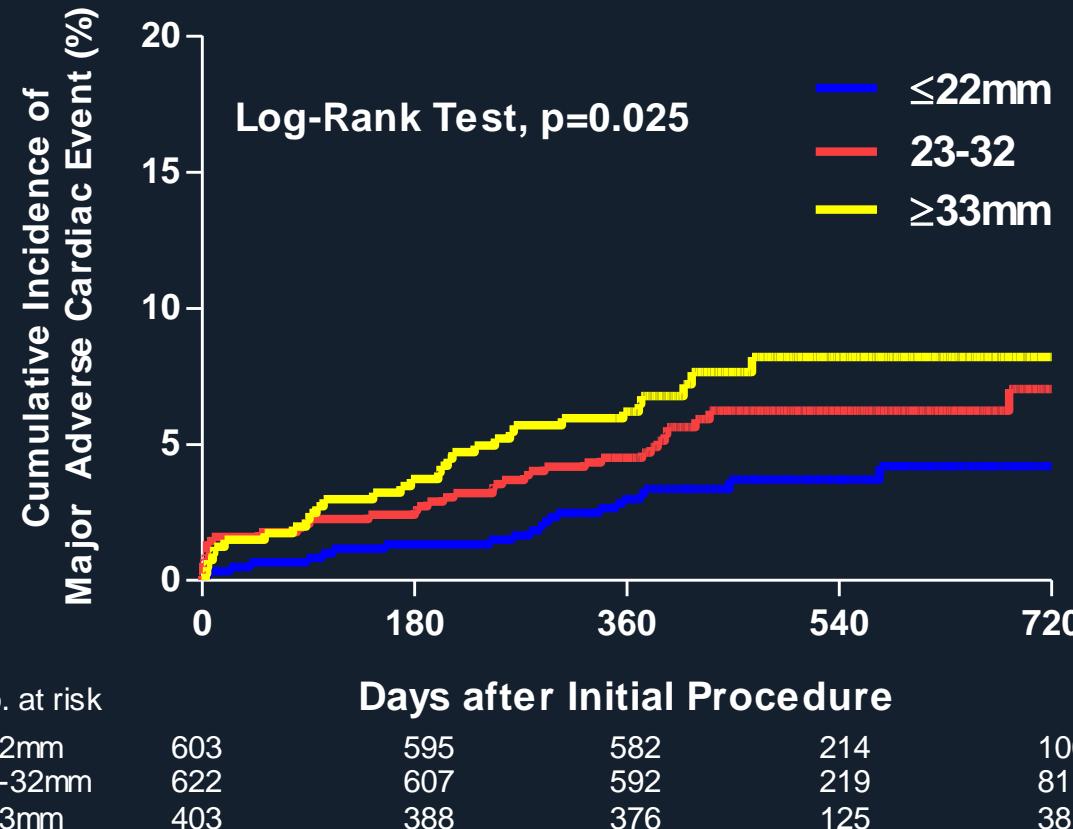
# How Long? Stent Thrombosis



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

# IVUS Utilization Modify the Stent Length Effect On Clinical Outcomes

## Without IVUS

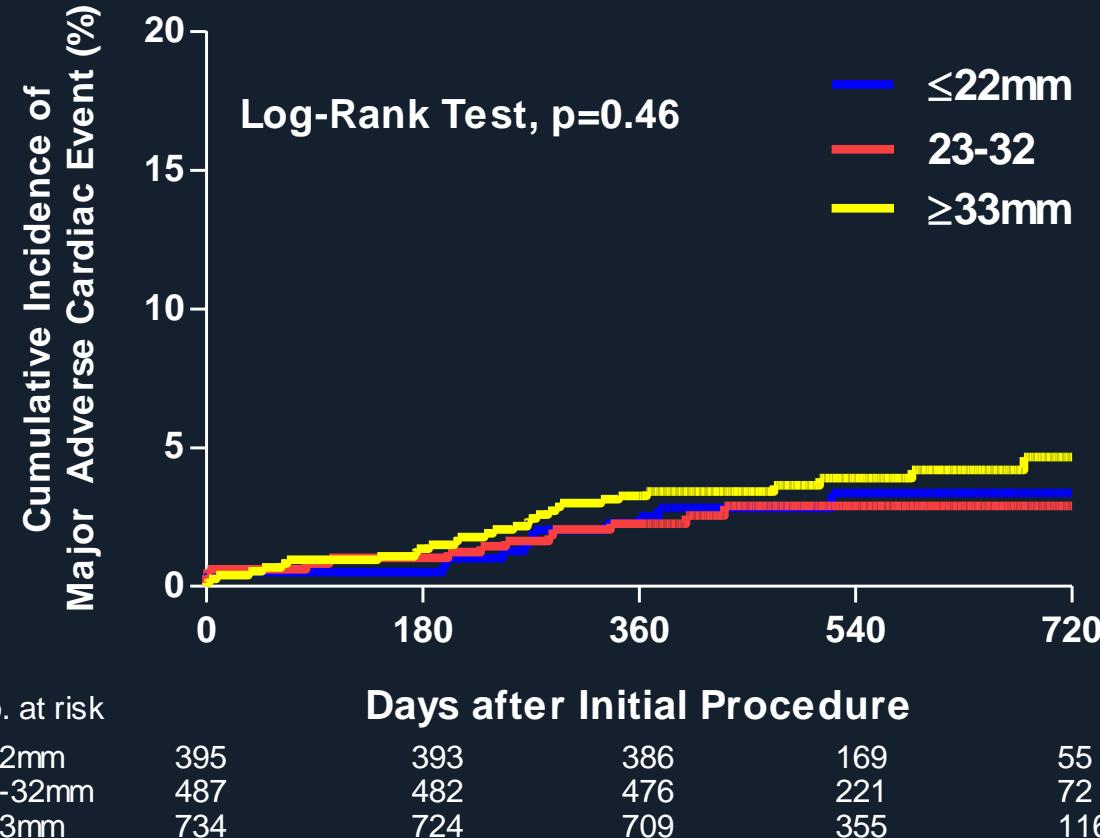


Ahn JM, Park SJ et al. Am J Cardiol 2013;111:829-35



# IVUS Utilization Modify the Stent Length Effect On Clinical Outcomes

## With IVUS

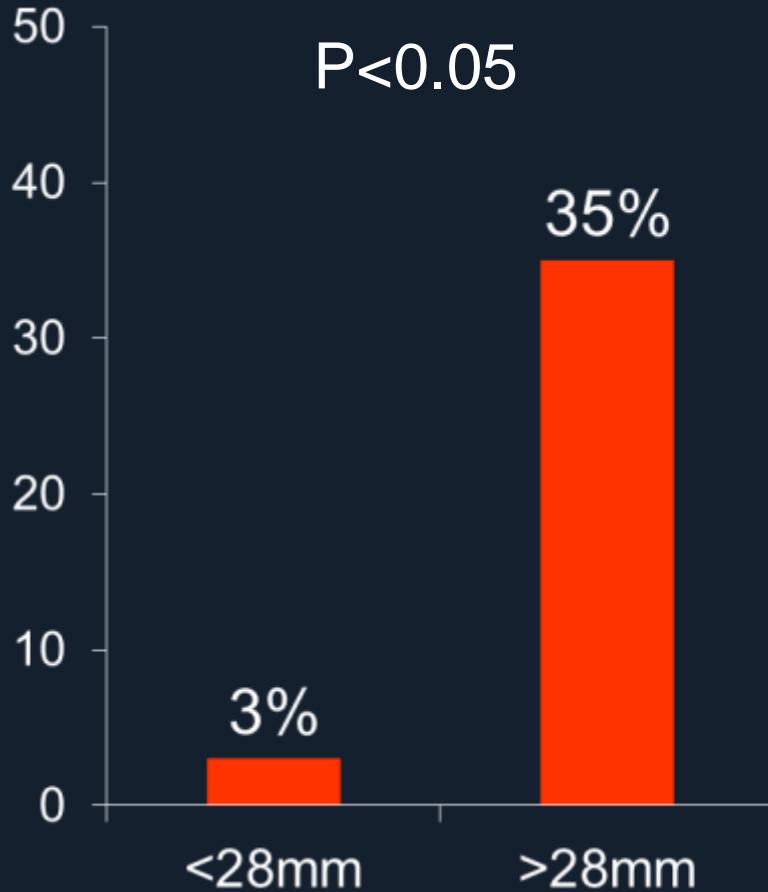


Ahn JM, Park SJ et al. Am J Cardiol 2013;111:829-35

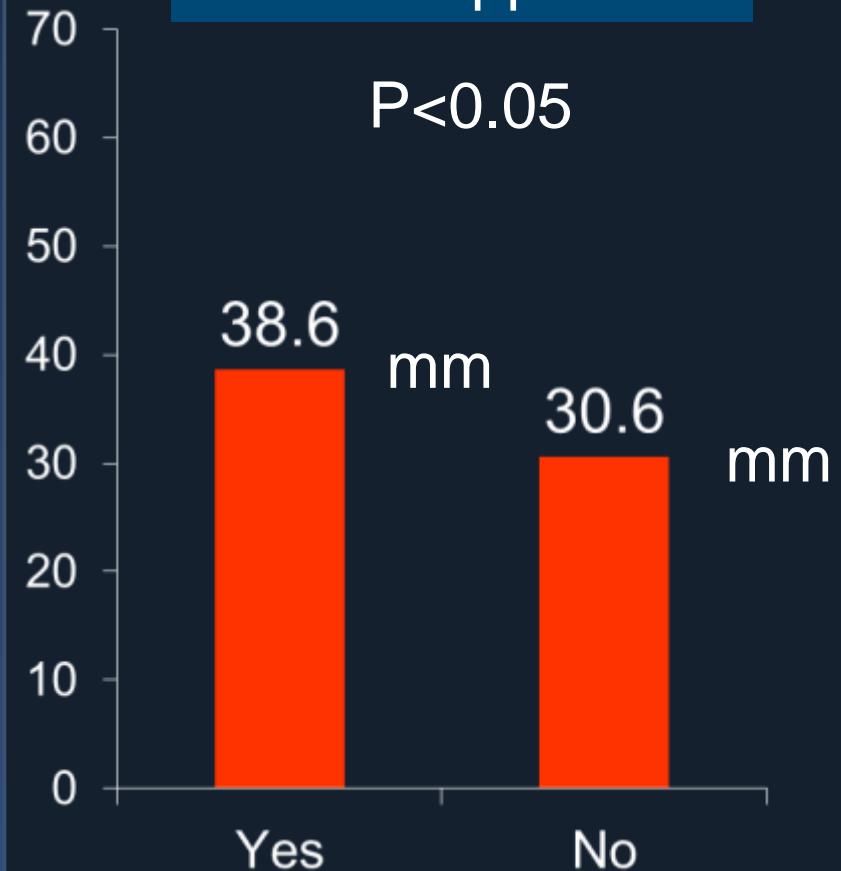


# Stent Length and Optimal Stenting

Underexpansion

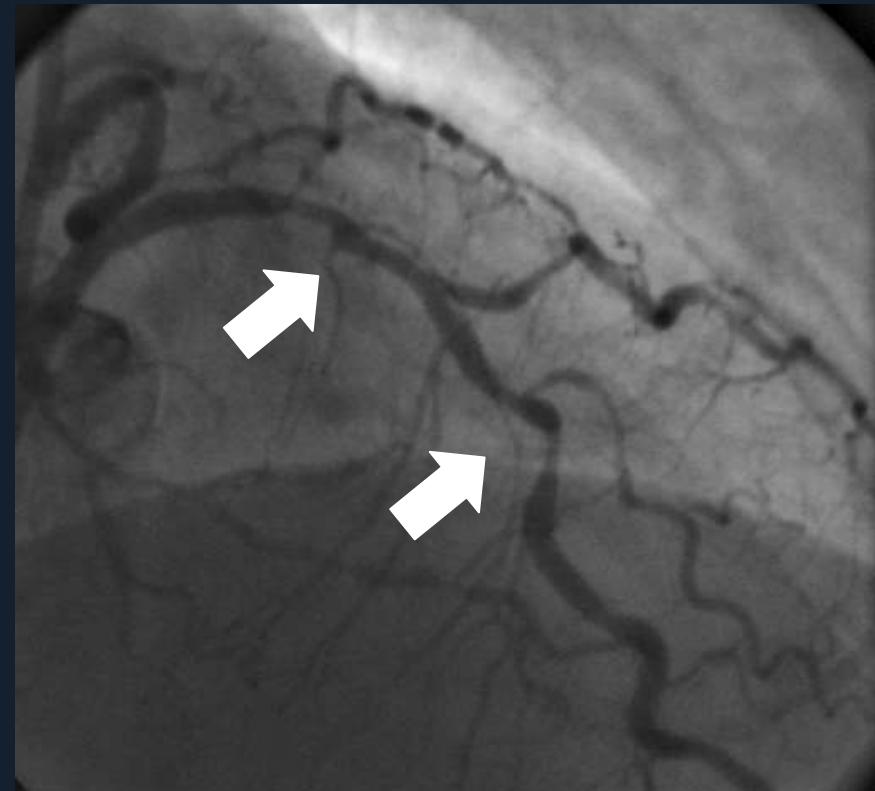
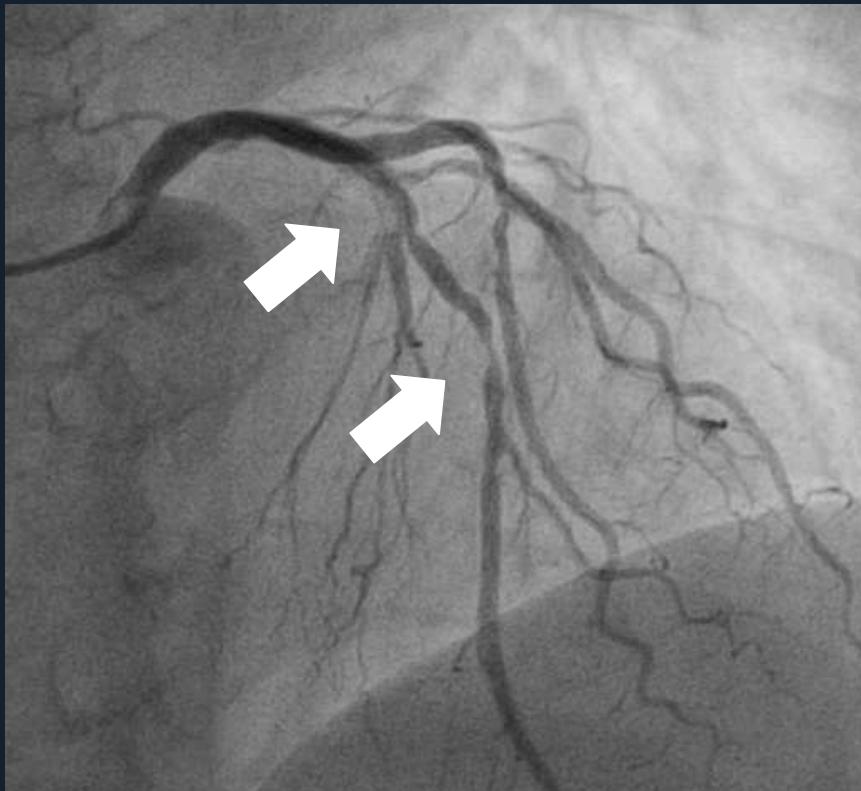


Late Malapposition



# Tandem Lesions

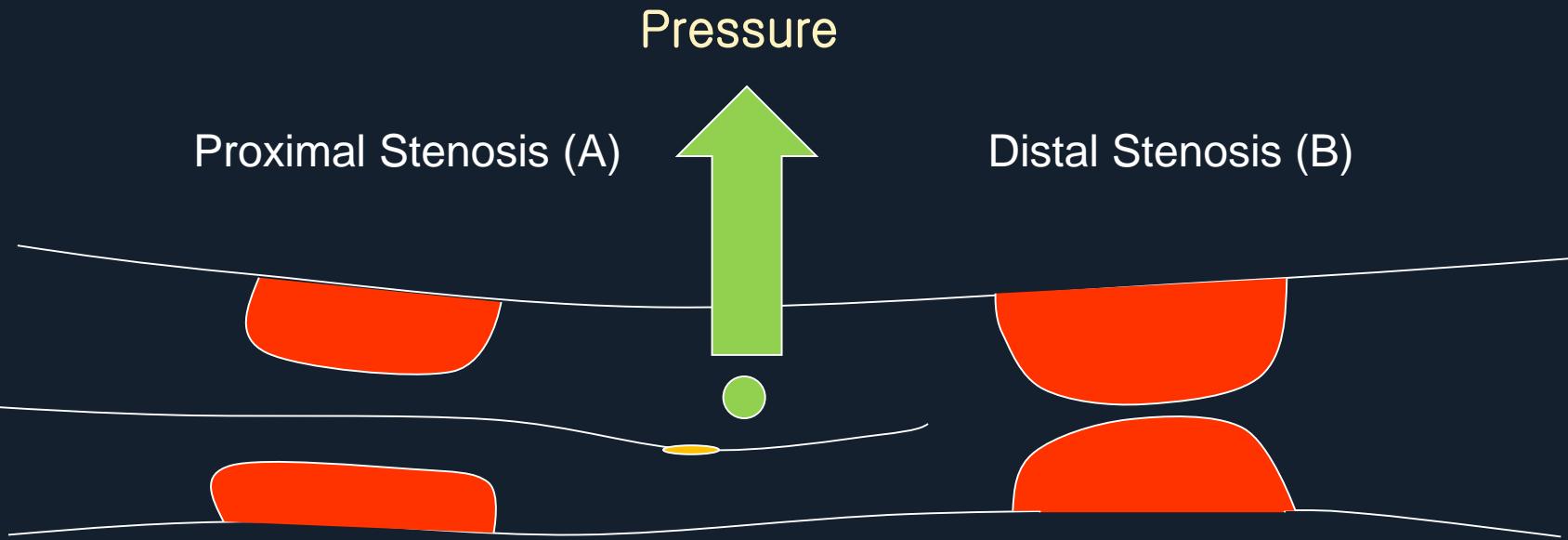
Multiple stenoses in series along one coronary artery



Long Stent Implantation (Full Metal Jacket)

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

# Hemodynamic Interaction in Tandem Lesion



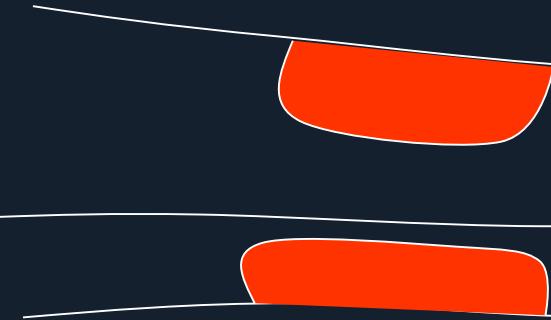
To measure FFR of Proximal Stenosis

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

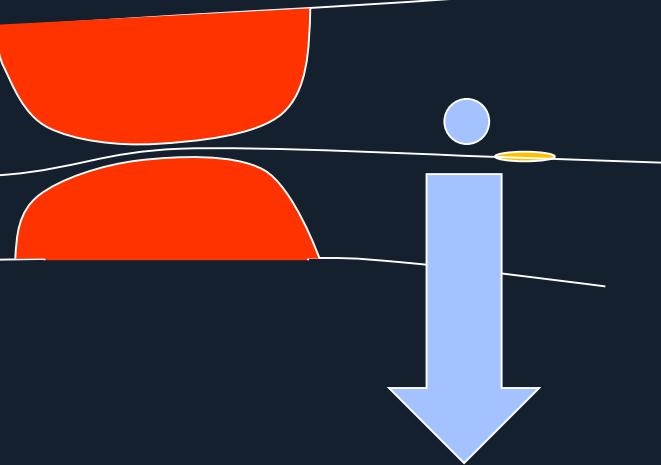
FFR value of proximal stenosis should be overestimated

# Hemodynamic Interaction in Tandem Lesion

Proximal Stenosis (A)



Distal Stenosis (B)



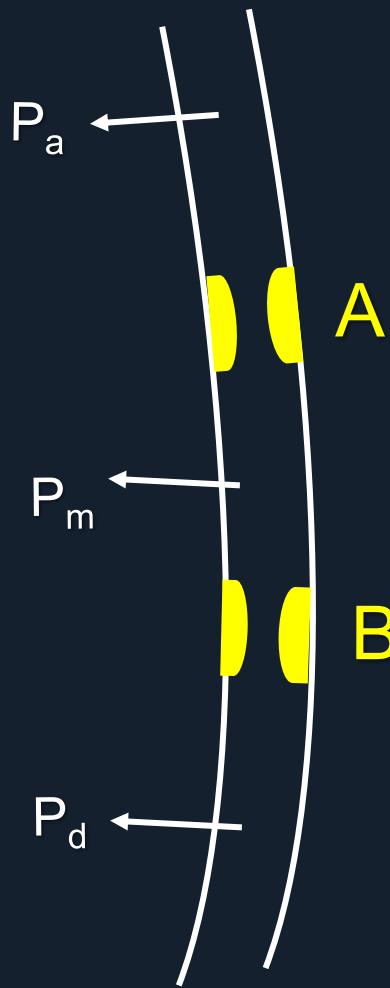
To measure FFR of Proximal Stenosis

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

Pressure

FFR value of proximal stenosis should be underestimated

# The Separate Functional Significance of Tandem Stenoses

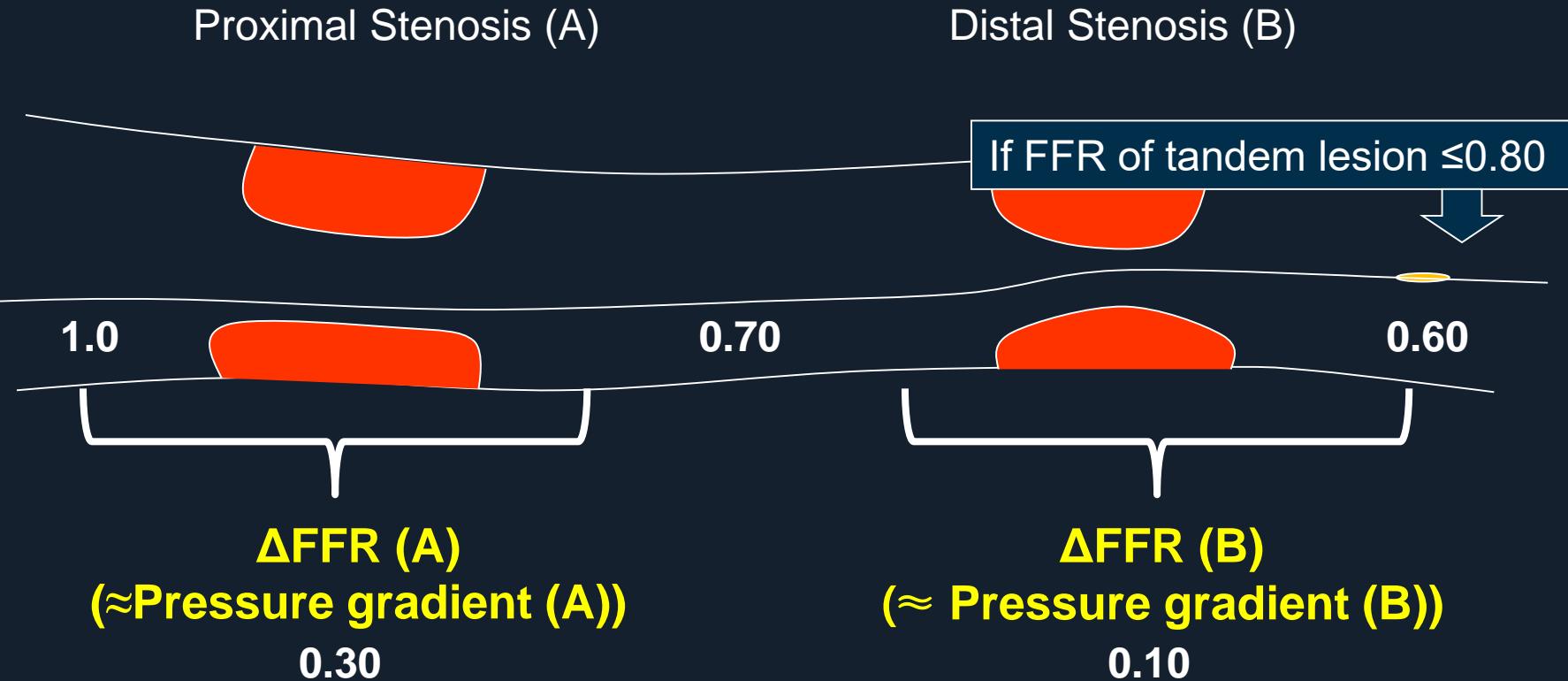


$$\text{FFR(A)}_{\text{pred}} = \frac{P_d - (P_m/P_a) P_w}{P_a - P_m + P_d - P_w}$$

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

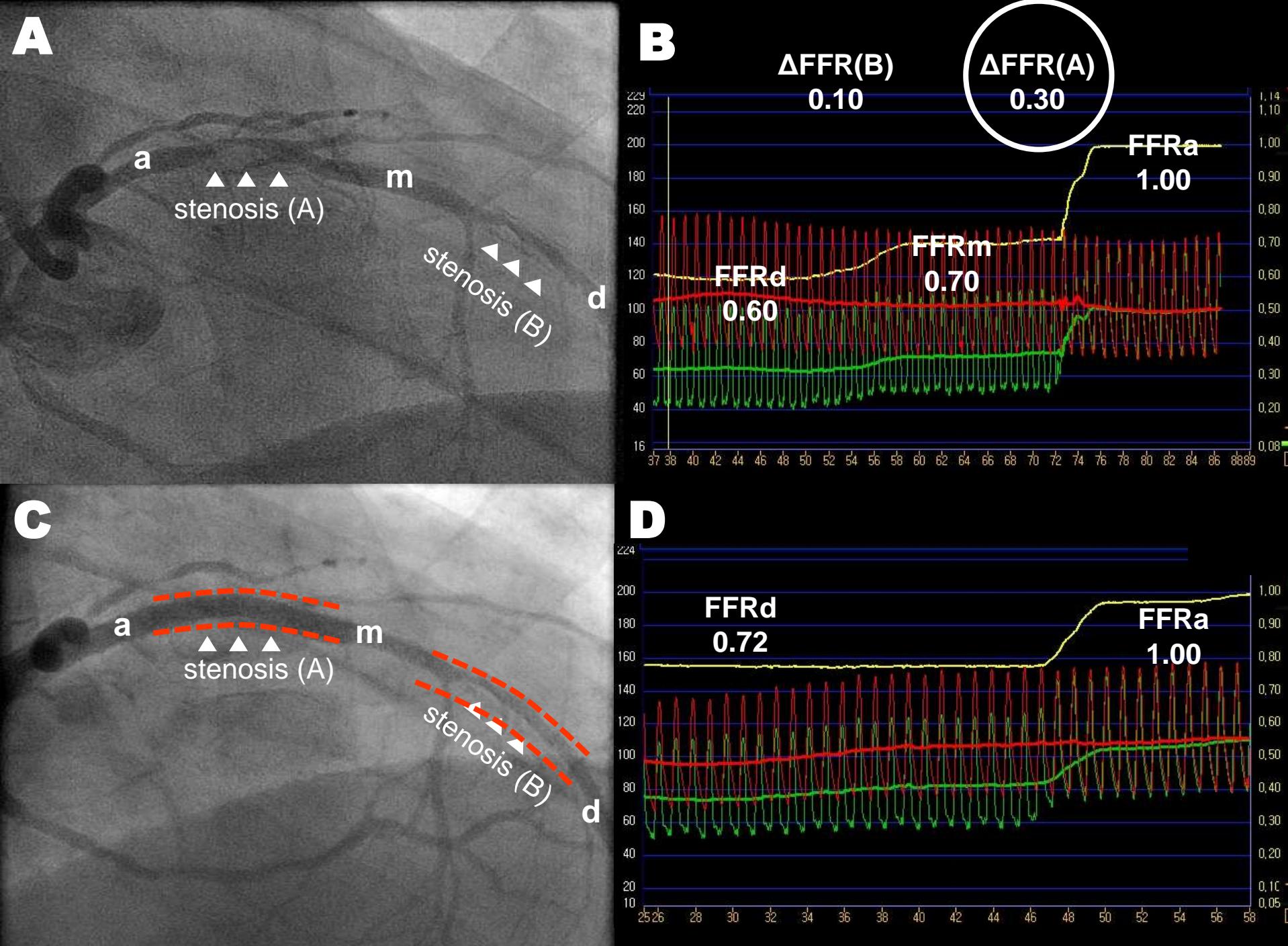
$P_w$  = Coronary occlusive pressure

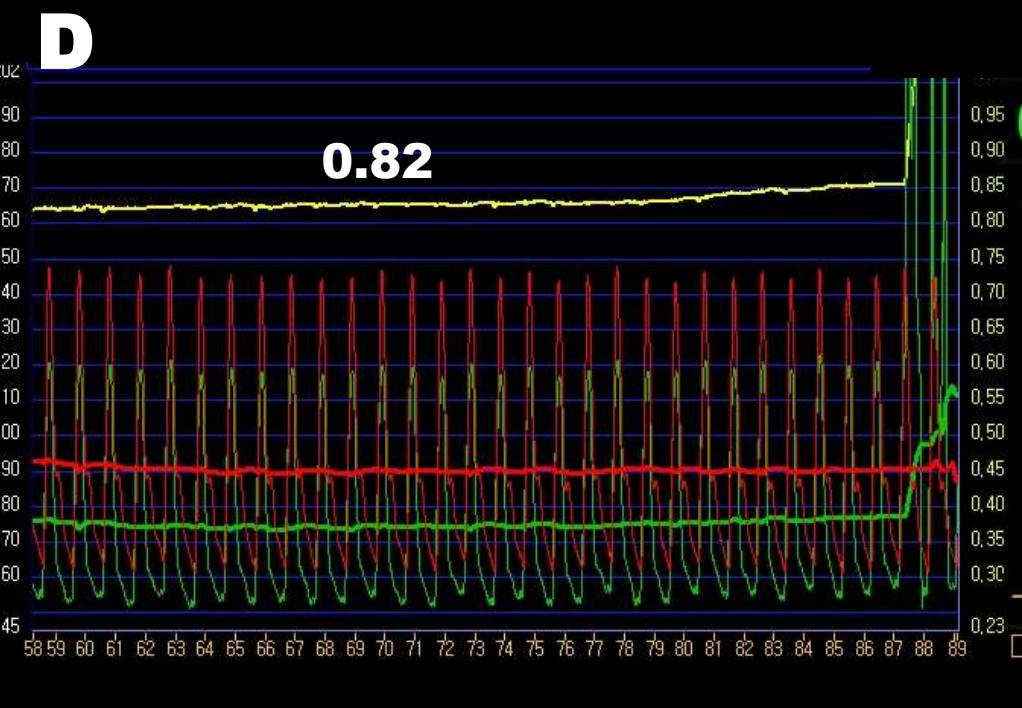
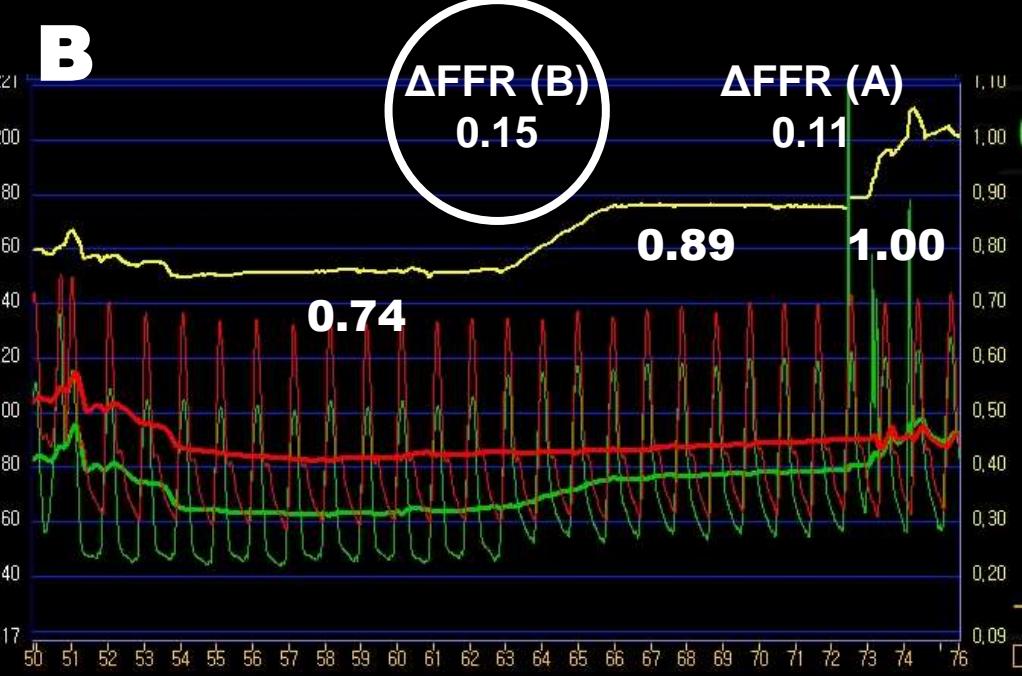
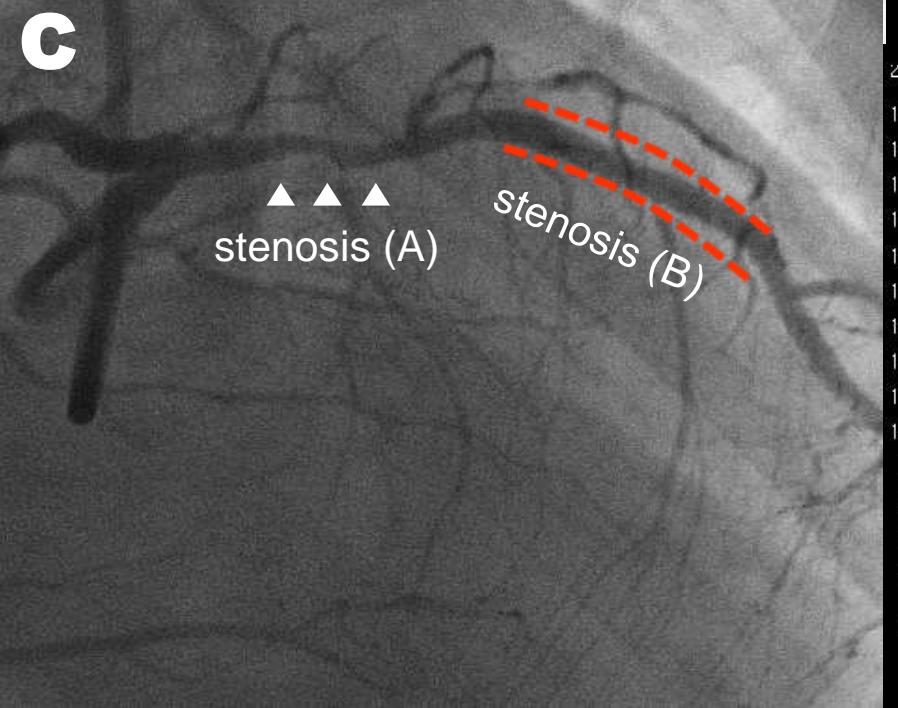
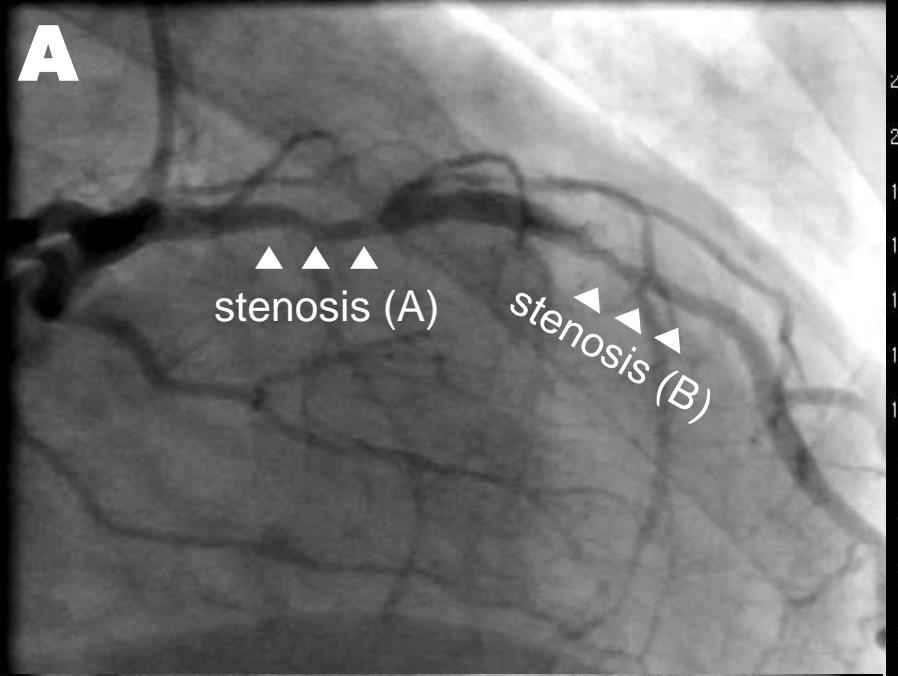
# Practical Approach: Rule of Big $\Delta$ FFR



1.  $\Delta\text{FFR}$  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.





# According to the Rule of “Big Delta”

52 patients with coronary tandem lesion with FFR  $\leq 0.80$

Prioritizing the treatment according to  $\Delta$ FFR (“rule of big delta”)

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

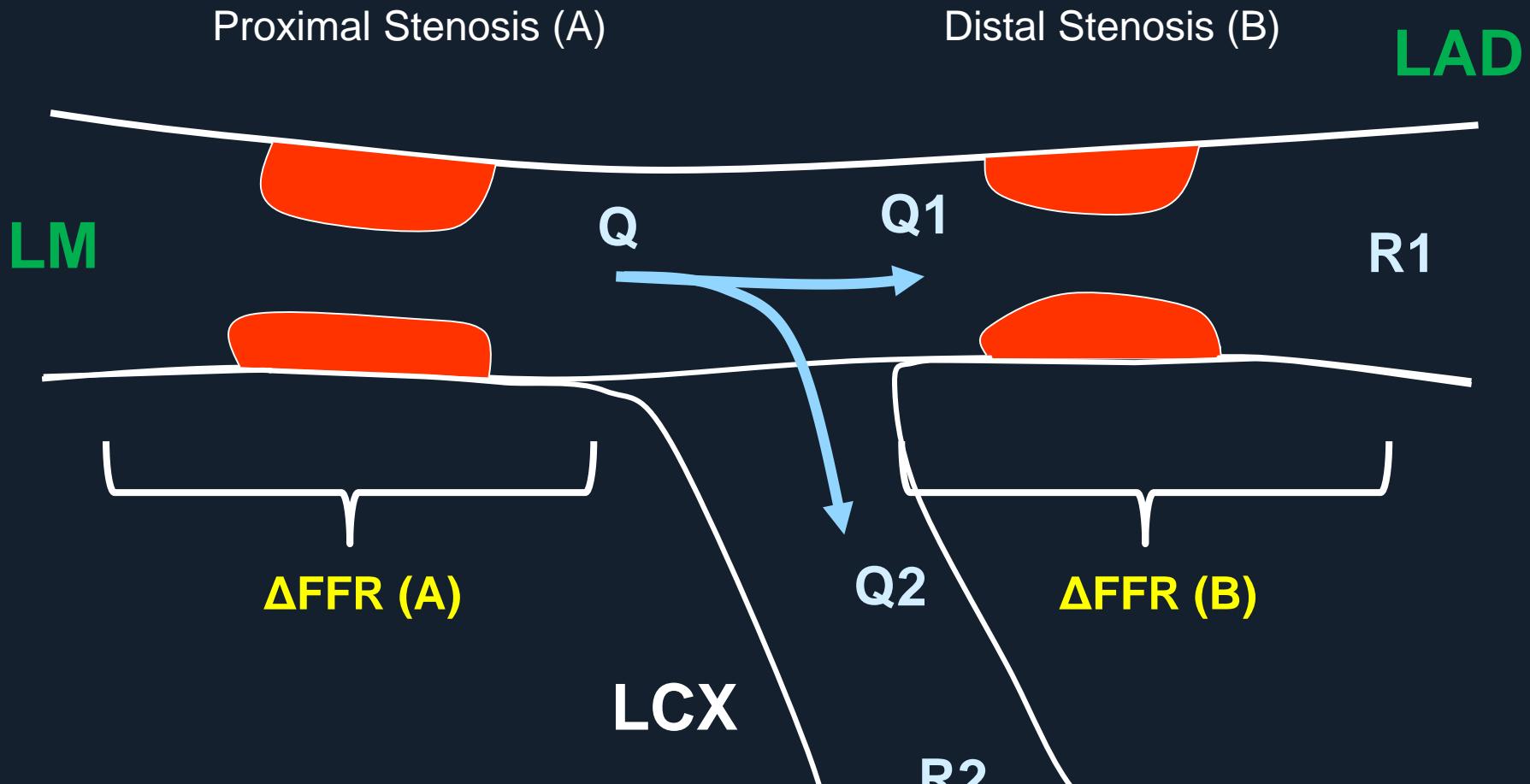
Proximal stenosis  
treated only  
N=16

Both stenoses  
treated  
N=16

Distal stenosis  
treated only  
N=12

Both stenoses  
treated  
N=8

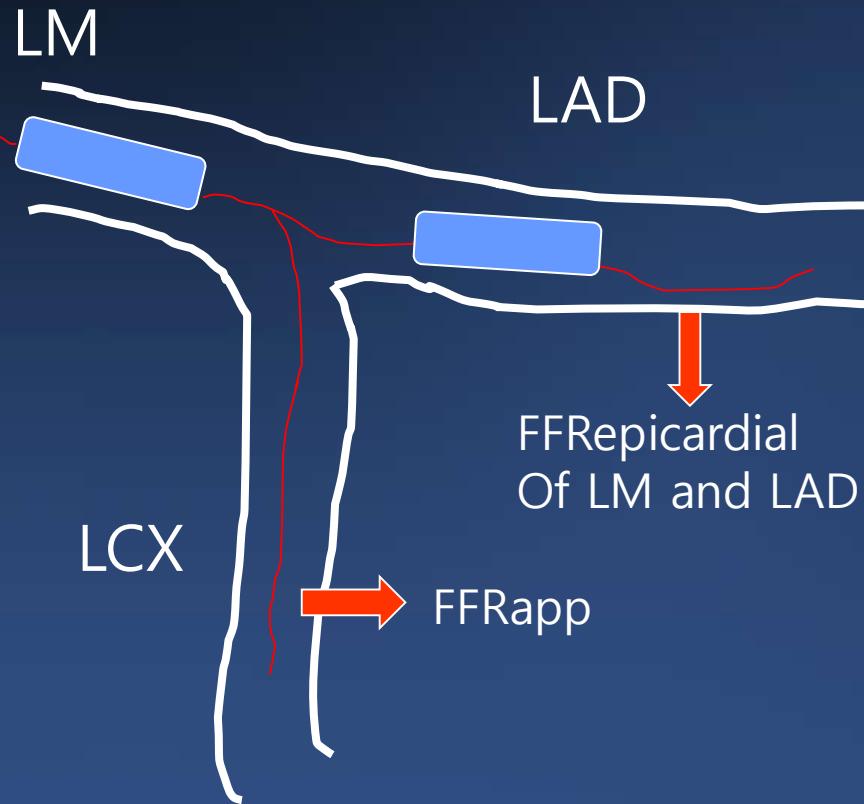
# Tandem Lesion with Interposing Side Branch like LM



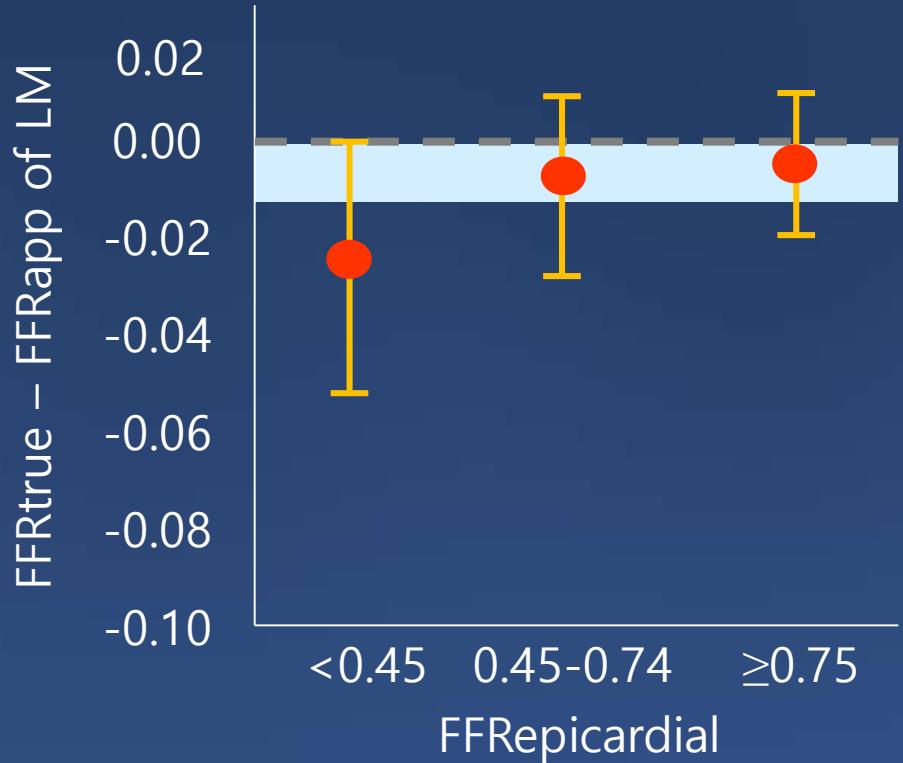
Could  $\Delta FFR$  ( $\approx PG$ ) be a Surrogate of Relative Functional Singificance ?

# LM and Downstream Disease

If FFAapp was  $> 0.85$ , FFRtrue was  $> 0.80$

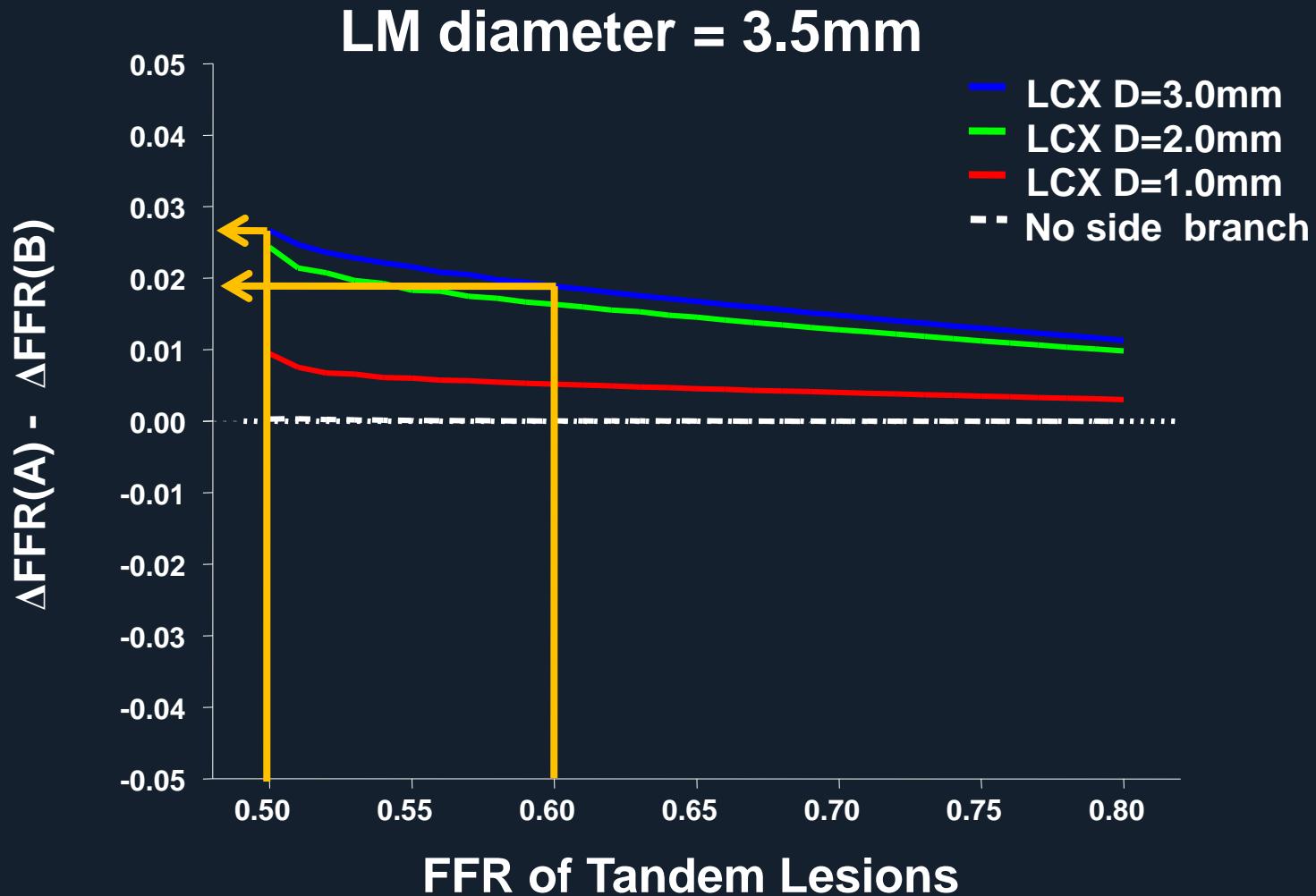


## Human Validation



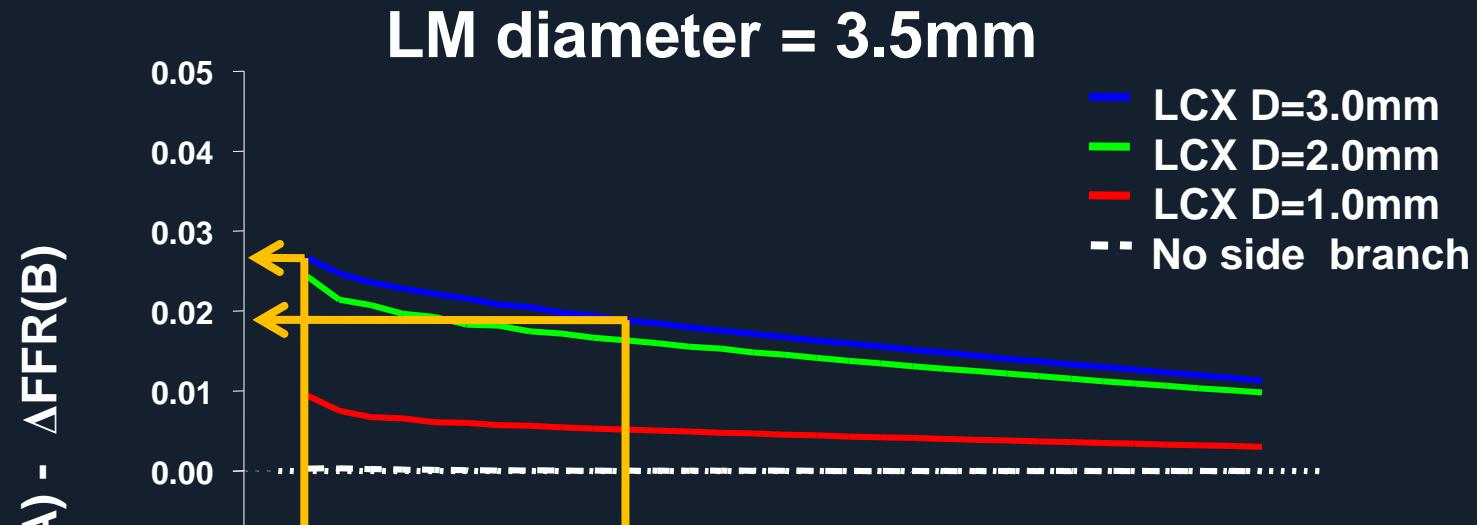
# When Two Lesions are Functionally Equal,

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

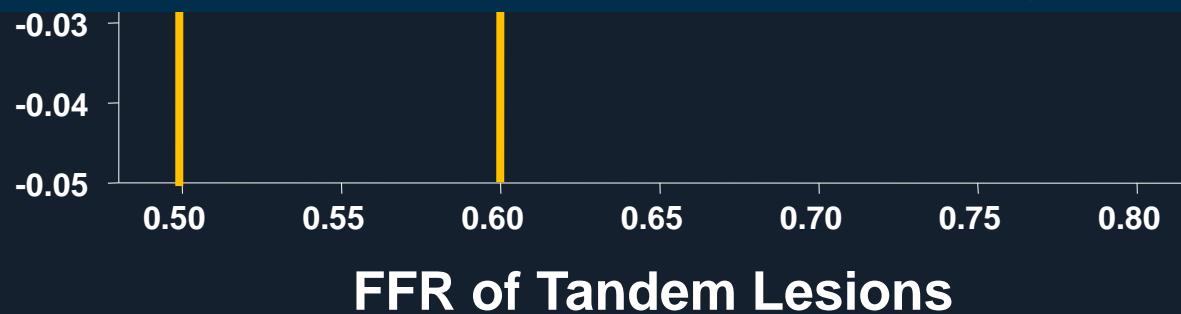


# When Two Lesions are Functionally Equal,

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



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



# 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,  $\Delta\text{FFR}$  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.