



When and How?

Use of FFR in Non-Left Main Bifurcations

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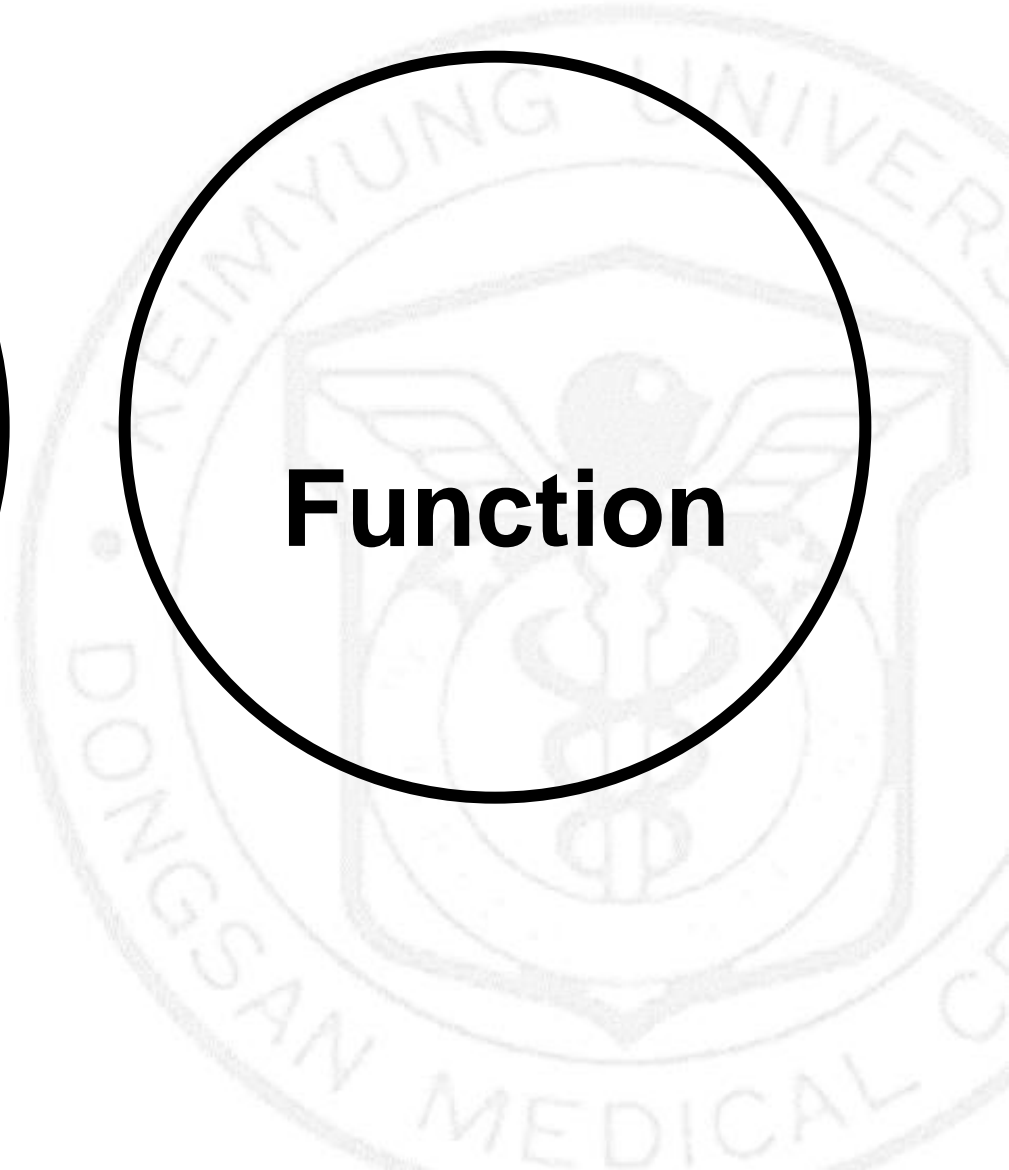


Bifurcation

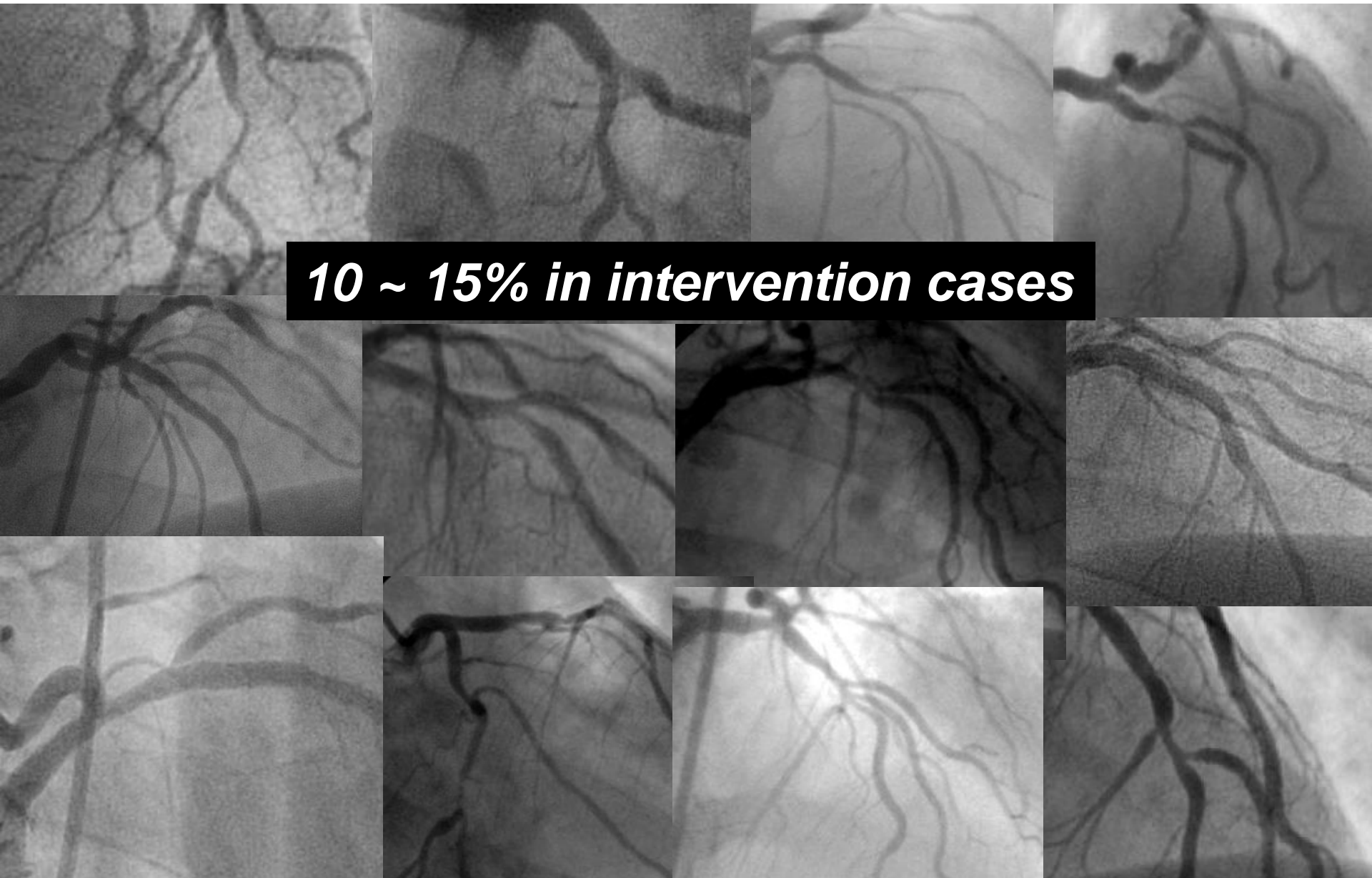


Anatomy

Function

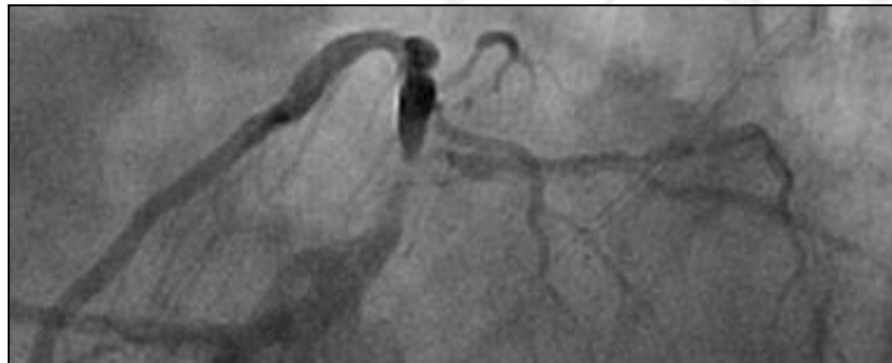
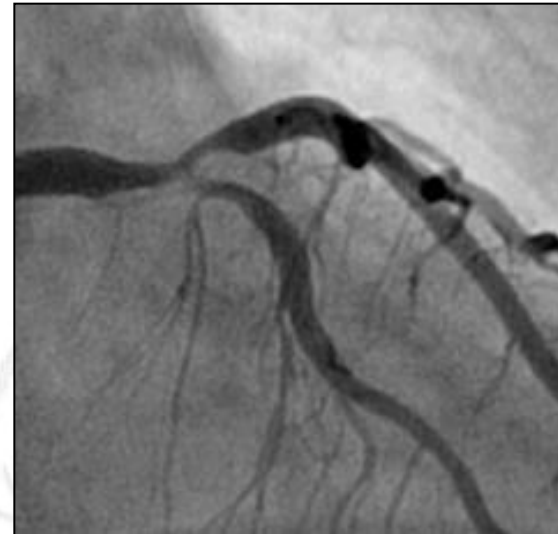


Bifurcation



10 ~ 15% in intervention cases

No doubt for Physiology



Sometimes, we need complex procedure

What are the problems in Bifurcation PCI



Anatomic considerations in CAD

Angiography vs. Histology

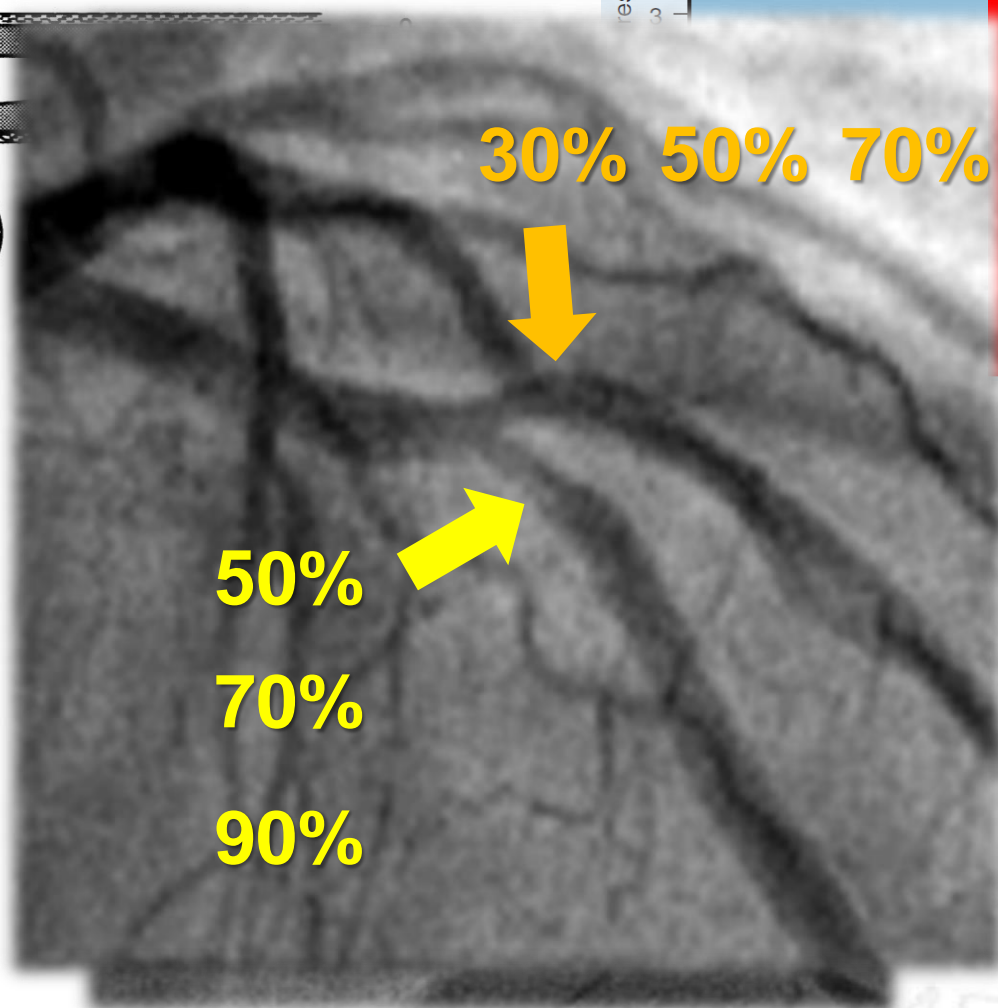
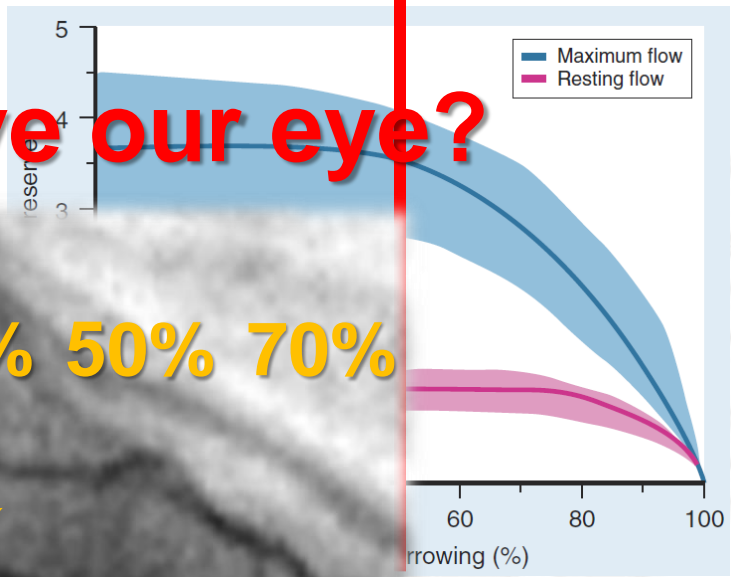
diameter decrease 50%

angiographic view (diameter) 50%

histologic view (area) 75%

cross-sectional decrease 75%

Can we believe our eye?



Surgery 1963;54:250
AJC 1974;33:87



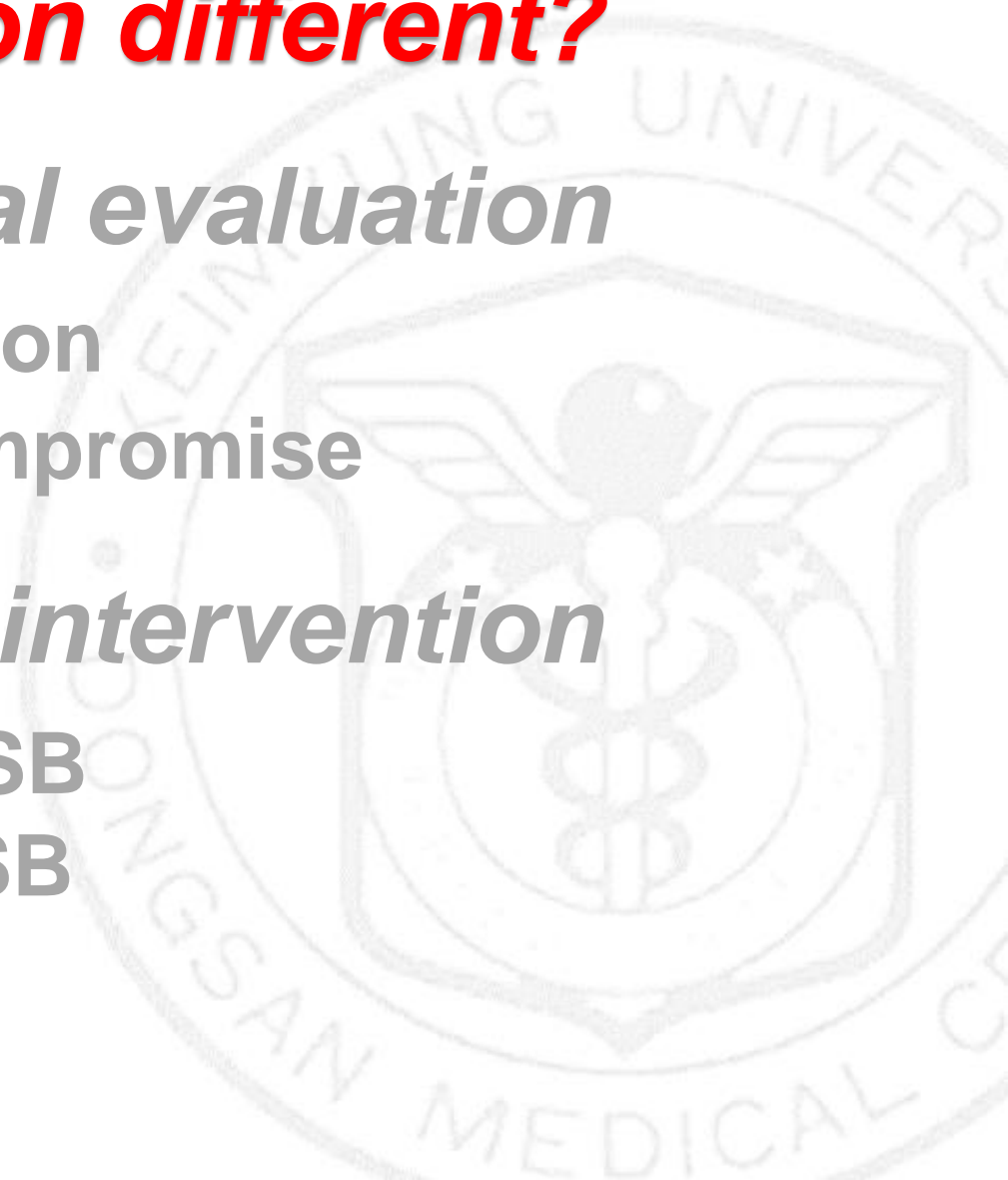
Why is Bifurcation different?

Pre-interventional evaluation

Ischemia in bifurcation
predictors of SB compromise

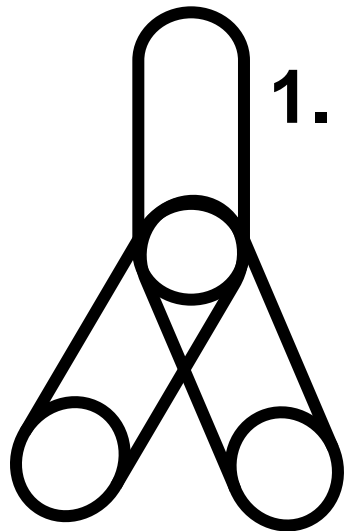
During and post intervention

Evaluation of jailed SB
Prognosis of jailed SB



What is different?

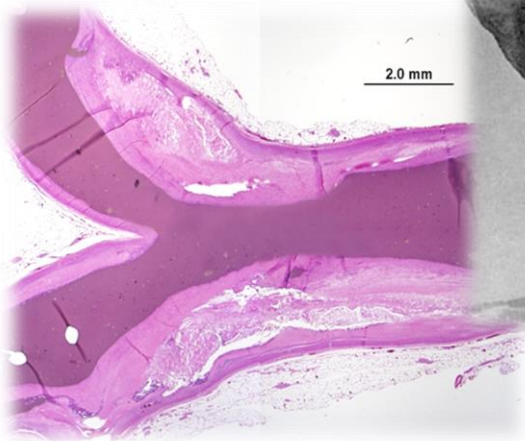
1. Combination of 3 ostial lesions



2. Murray's rule



4. Eccentric plaque



3. Negative remodeling



Shear Stress in Bifurcation

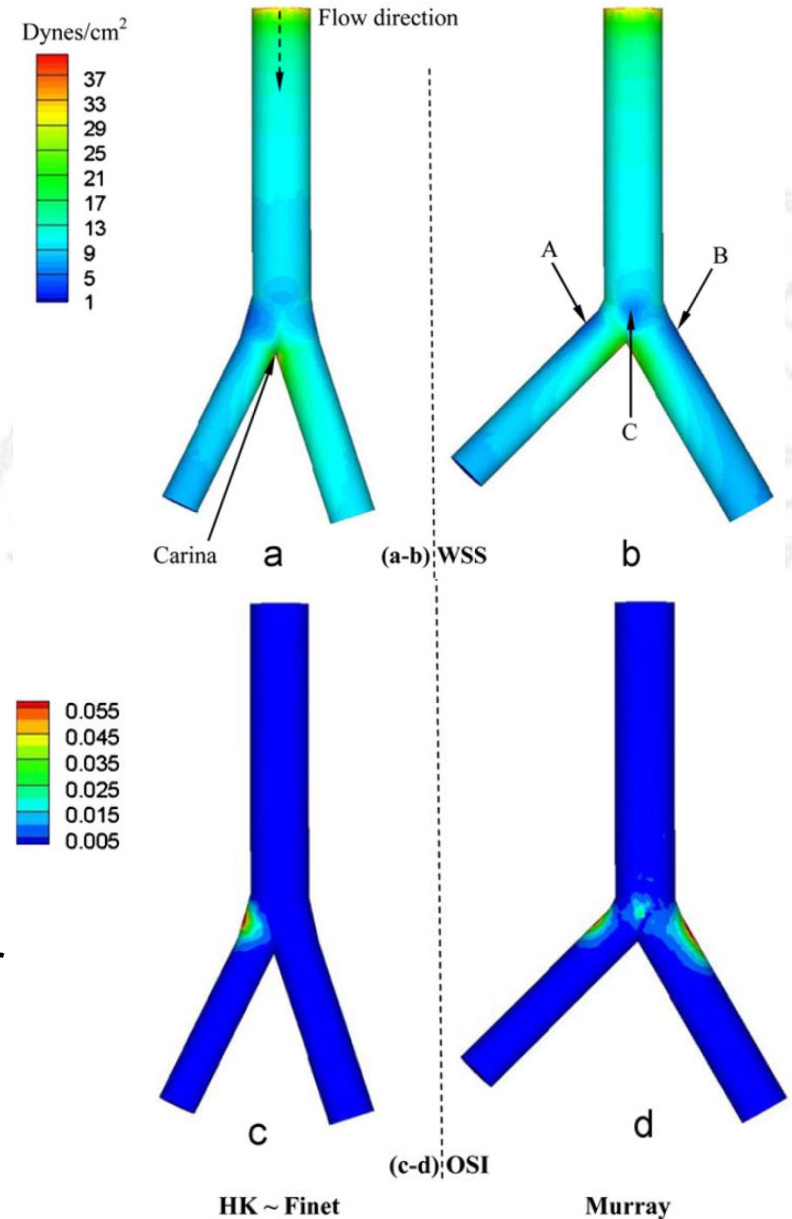
Murray diameter model

$$D_m^3 = D_l^3 + D_s^3$$

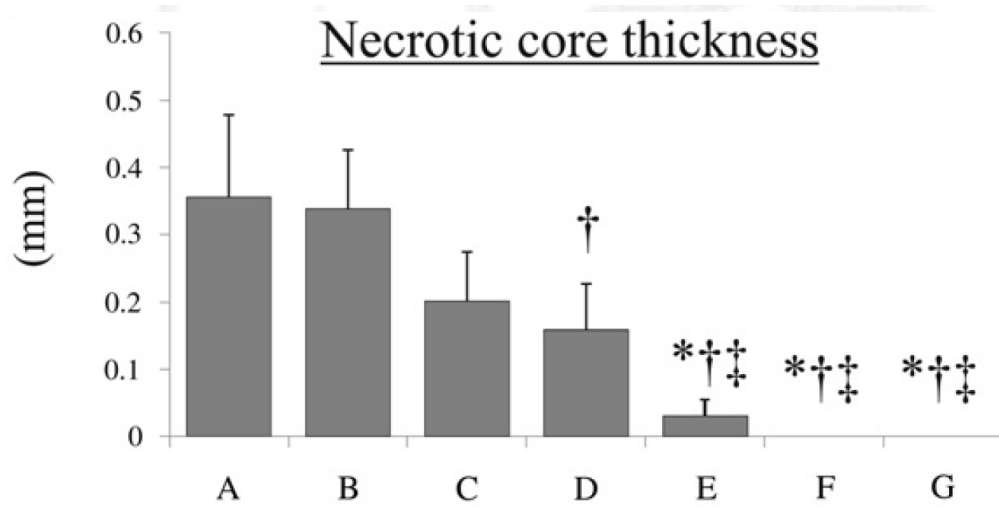
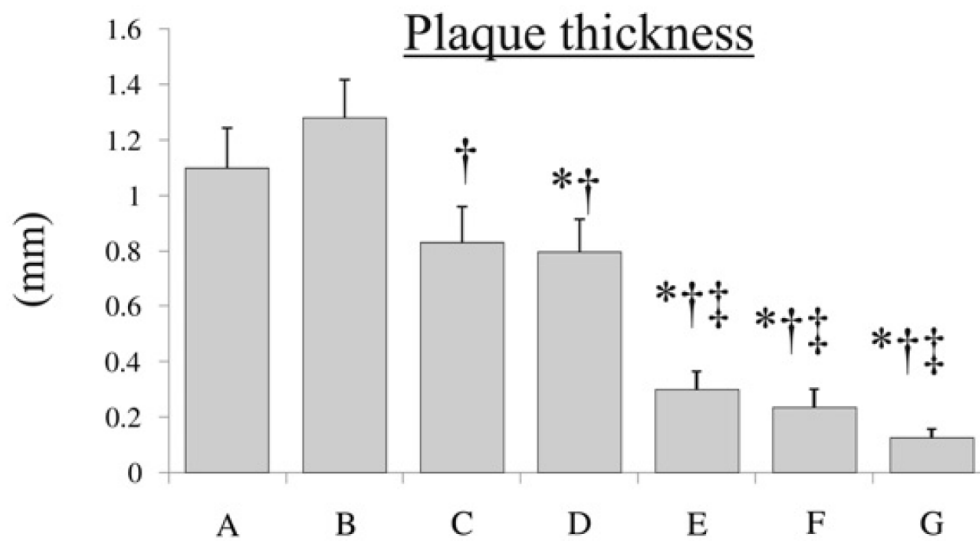
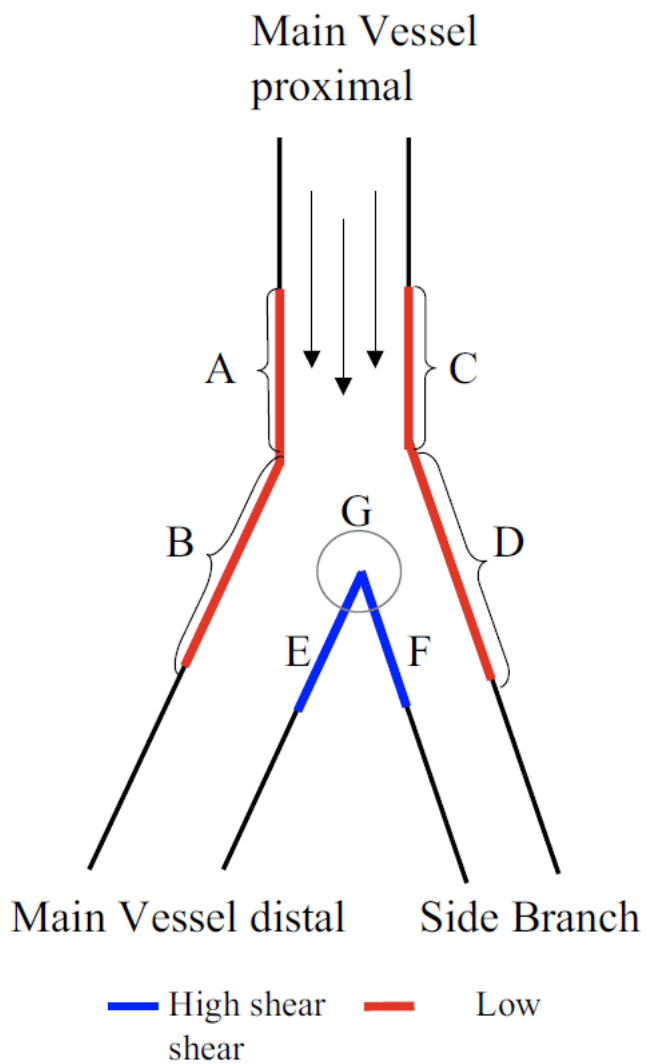
HK diameter model

$$D_m^{7/3} = D_l^{7/3} + D_s^{7/3}$$

D_m ; diameter of mother vessel, D_l ; large daughter vessel, D_s ; small daughter vessel, WSS; wall shear stress, OSI; high oscillatory shear index.



Distribution of Plaques at Bifurcation



Why is Bifurcation different?

Pre

Isch

pre

Du

Eva

Pro

/

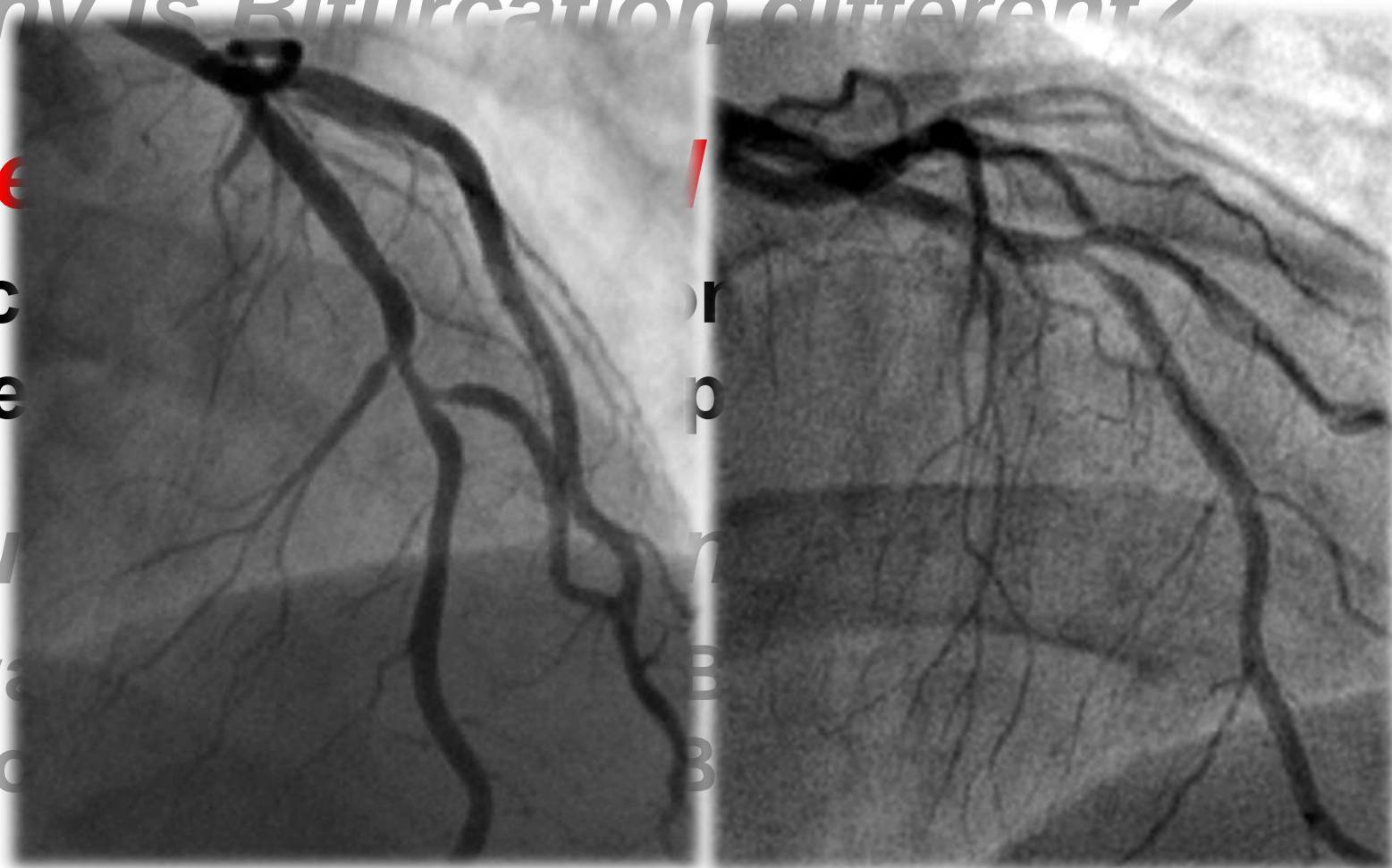
or

p

n

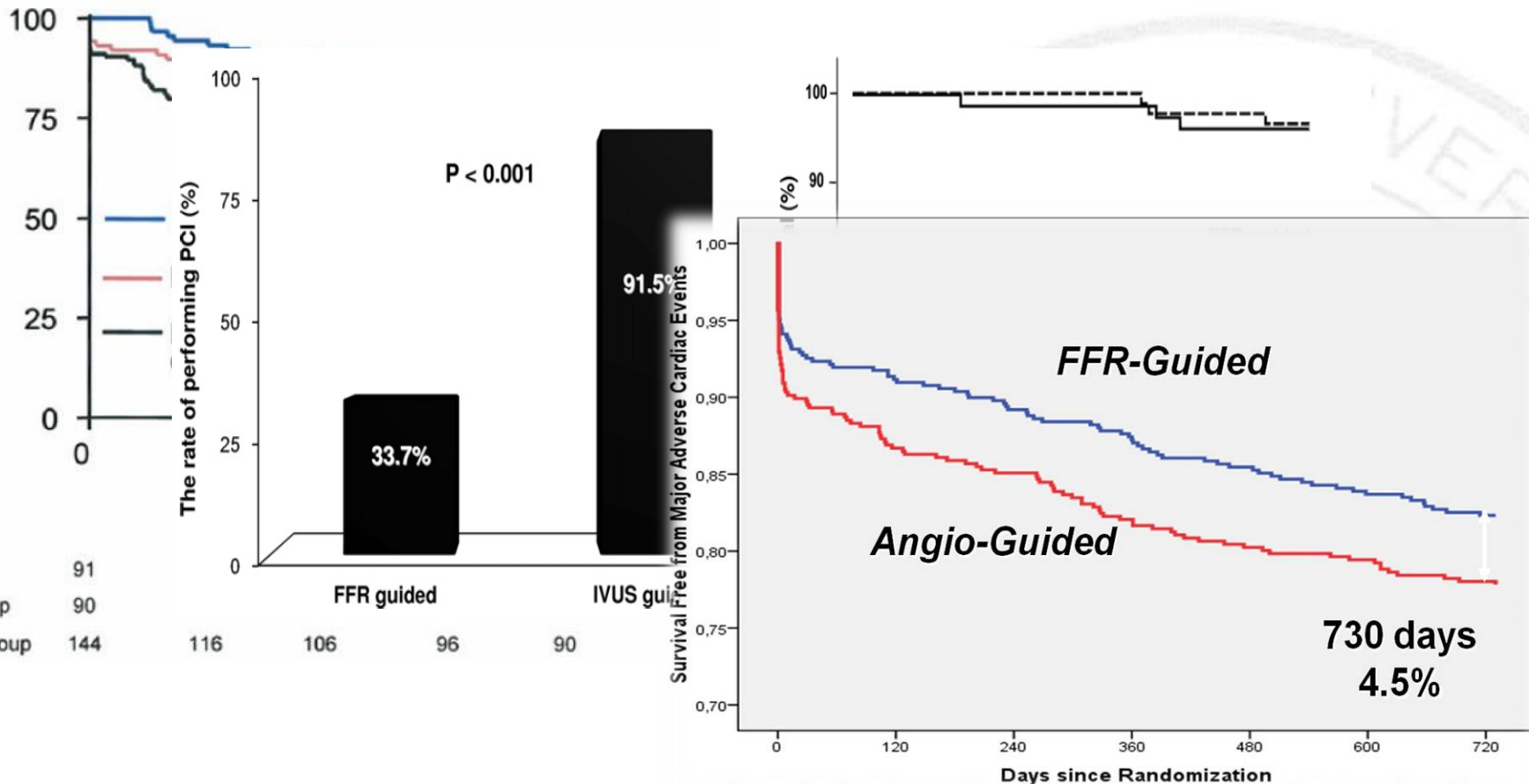
B

B



Physiologic Insight in CAD

Event-free Survival (%)



Safety & Efficacy issues for Defer

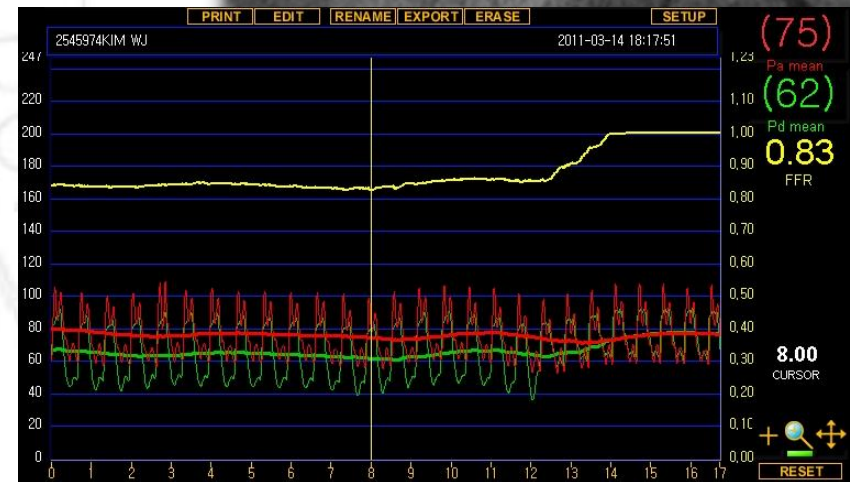
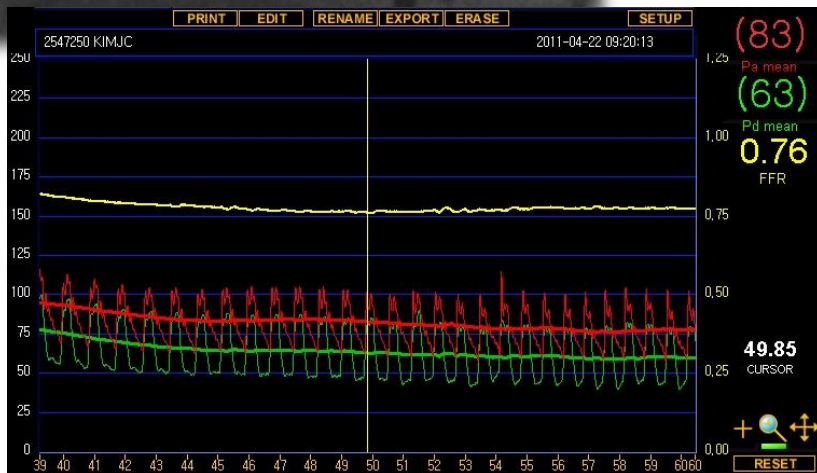
Pijls NH. JACC 2007;49:2105

Nam CW. JACC interv 2010;3:812

Pijl NH. JACC 2010;56:177

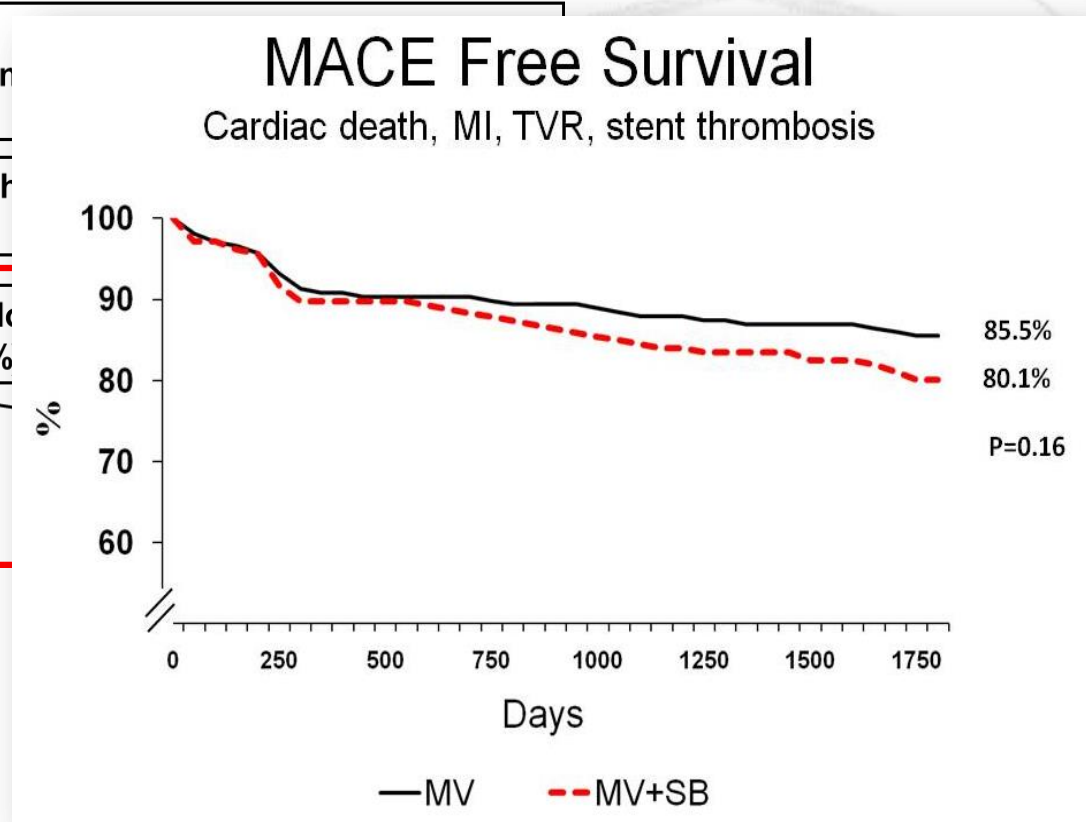
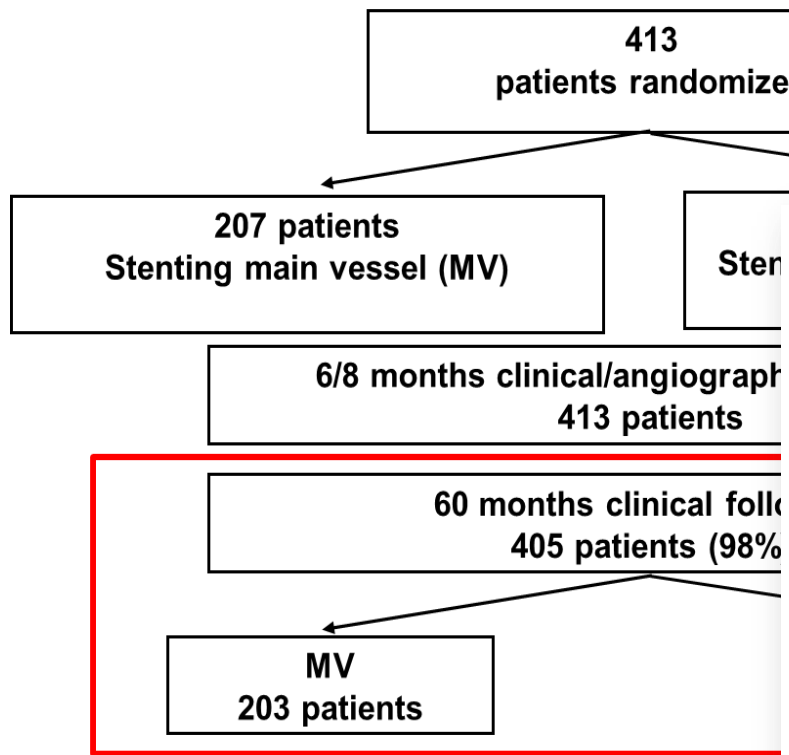
When you make a decision...

*Side branch in bifurcation,
Treat or not?*

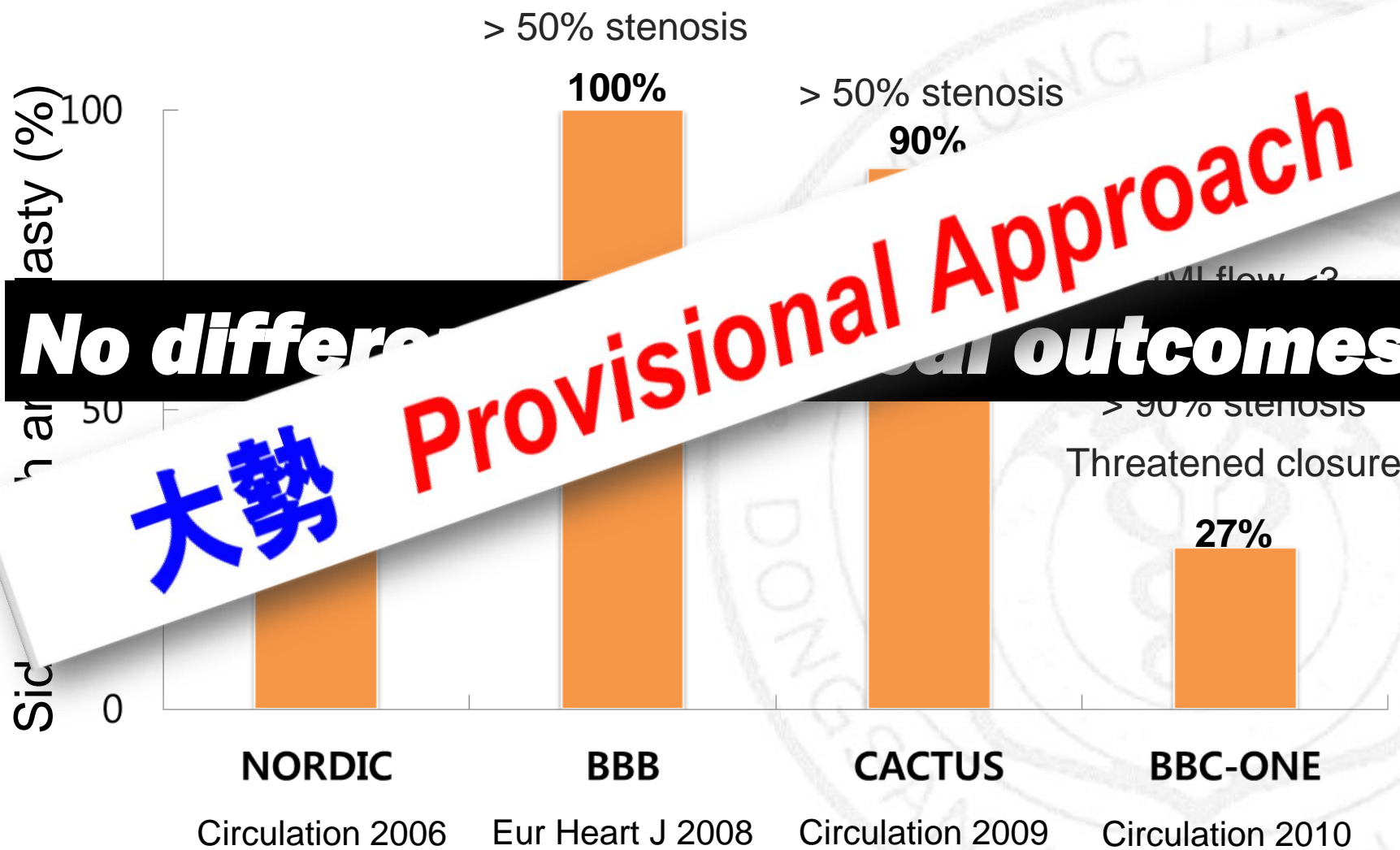


Nordic Bifurcation Study

Randomized Study on Simple vs. Complex Stenting of Coronary Artery Bifurcation

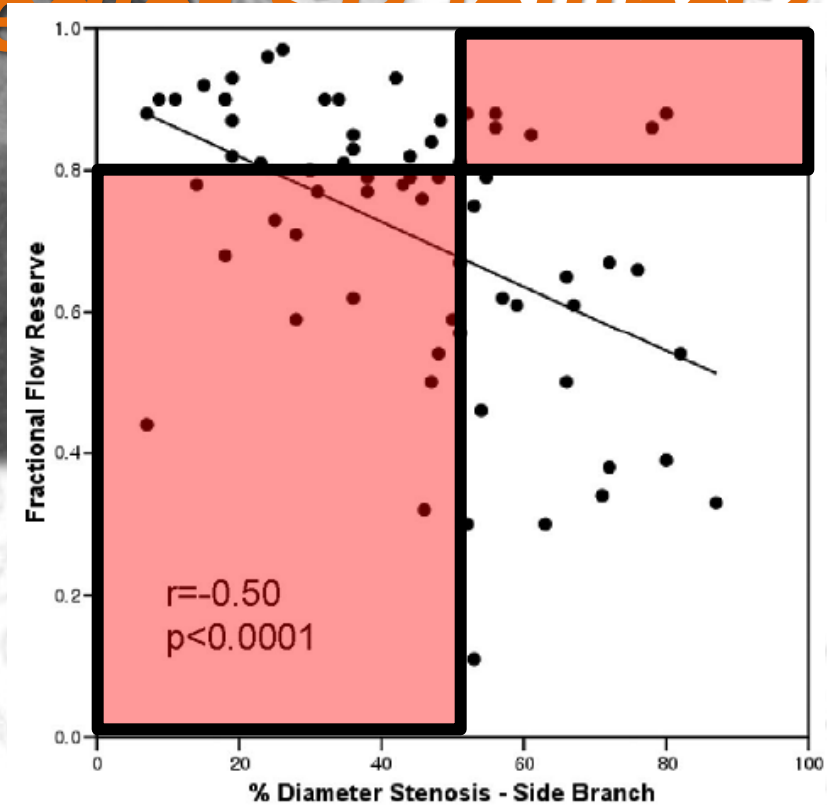
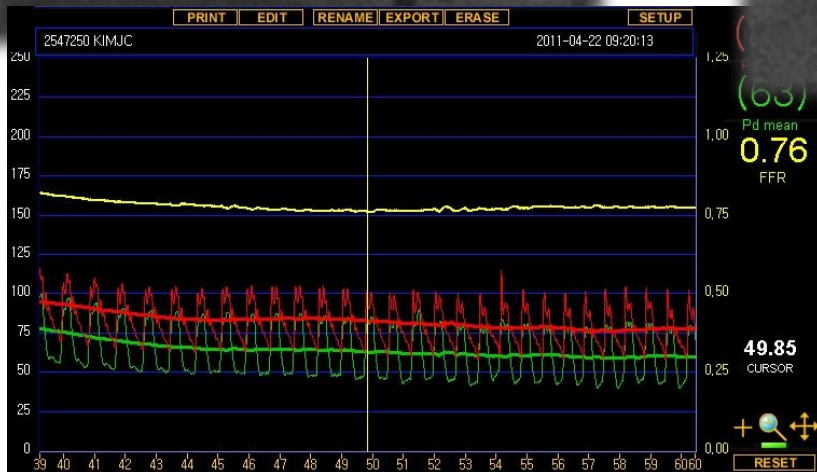


Different criteria from different studies

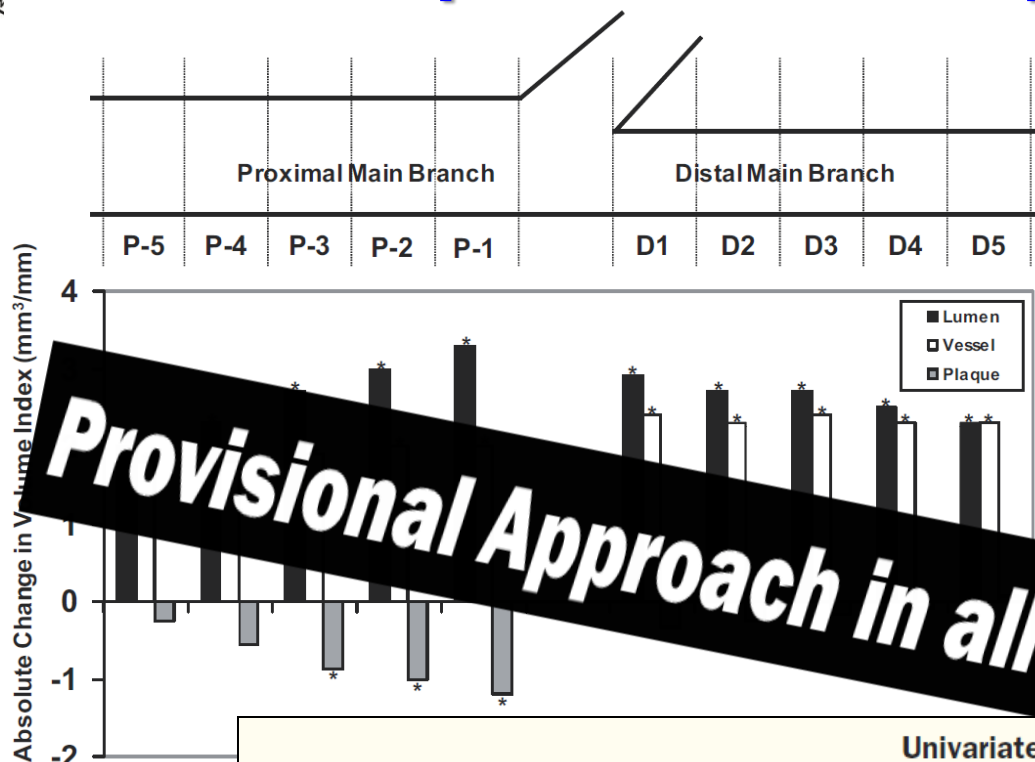


Provisional SB approach

Can we predict SB colling?



Can we predict SB compromise by FFR?



No

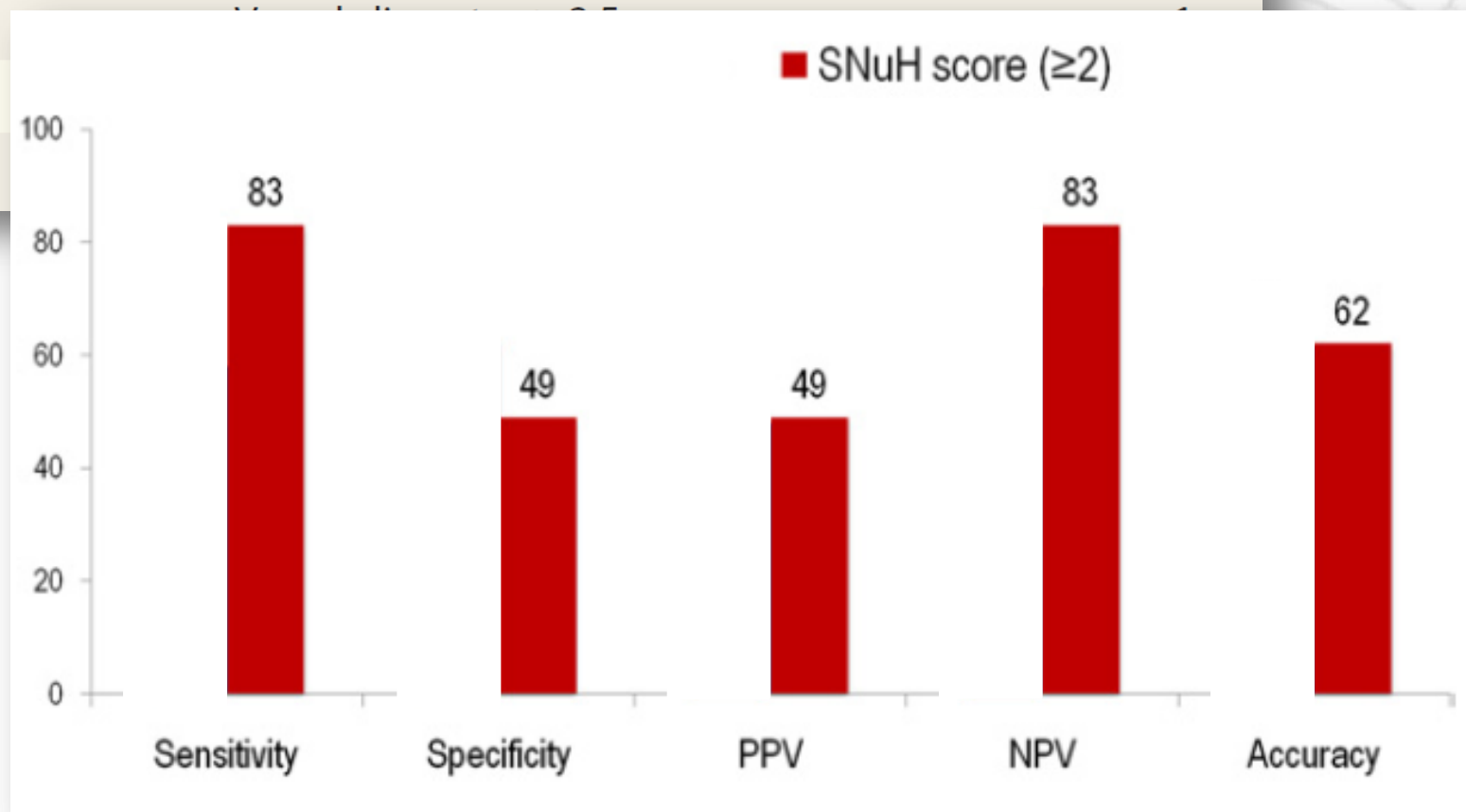
Provisional Approach in all Bifurcation lesions?

	Univariate Analysis					
	Odds Ratio	95% CI	p Value	Odds Ratio	95% CI	p Value
Diameter stenosis of SB, %	1.04	1.02–1.06	0.001	1.04	1.02–1.06	0.001
Reference diameter of SB, mm	0.42	0.17–1.03	0.057	0.28	0.10–0.77	0.014
Maximal balloon pressure, atm	1.09	1.00–1.17	0.027	1.07	0.99–1.16	0.089
Minimal lumen diameter of SB, mm	0.23	0.11–0.51	<0.001			
Lesion length of SB, mm	1.08	1.01–1.16	0.02			
True bifurcation	2.93	1.45–5.92	0.003			

Which SB is important?

Table 1. A Diagonal Branch Scoring System (SNUH Score)

Variables	Description	Score
Size (S)		
Number (Nu)		
Highest (H)		





Why is Bifurcation different?

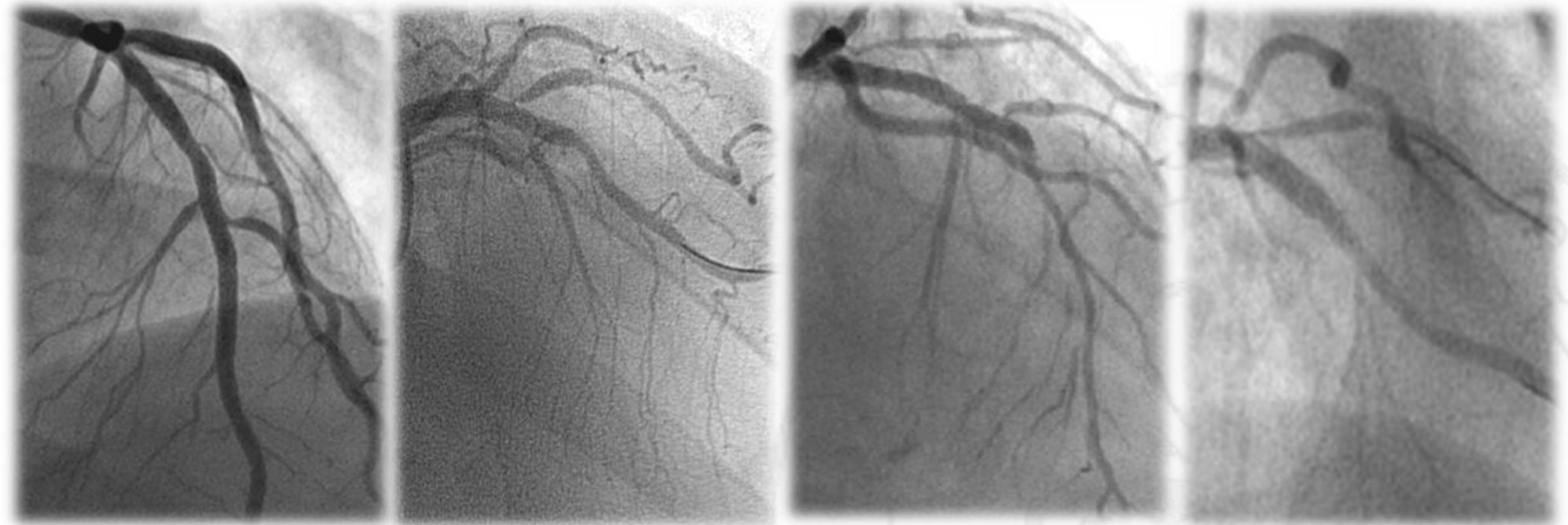
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Jailed Side Branch

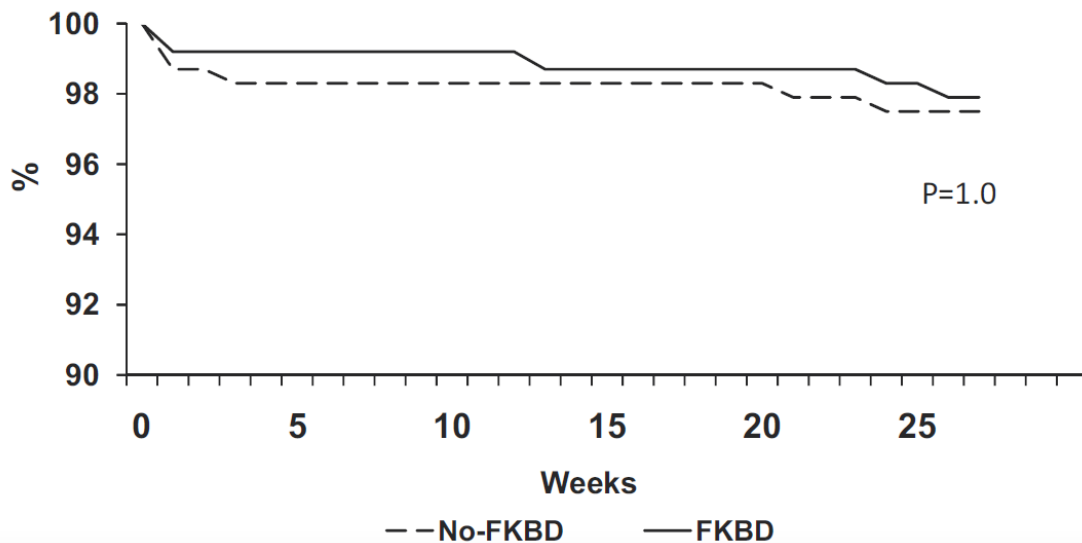
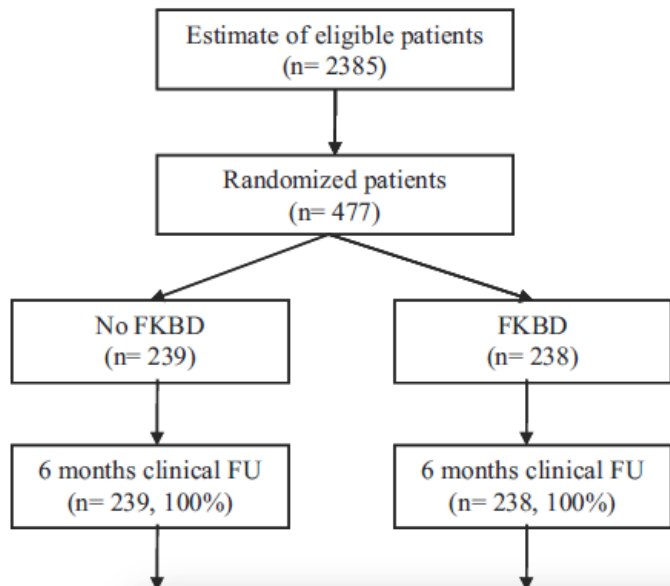


Treat or not ?



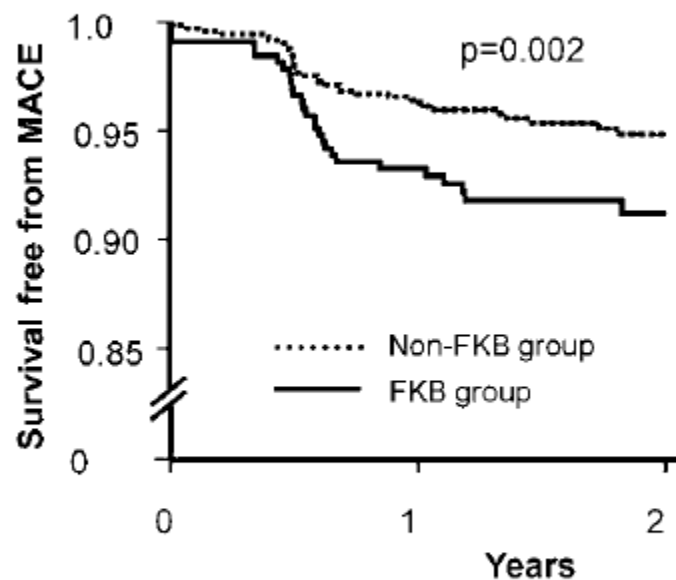
Randomized Comparison of Final Kissing Balloon Dilatation Versus No Final Kissing Balloon Dilatation in Patients With Coronary Bifurcation Lesions Treated With Main Vessel Stenting

The Nordic-Baltic Bifurcation Study III

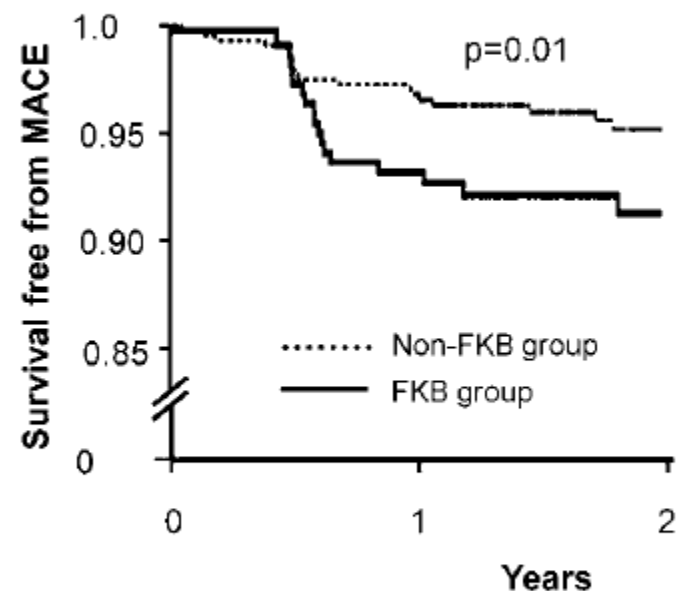


Variable	<u>True Bifurcation Subgroup</u>			Nontrue Bifurcation Subgroup		
	FKBD (n=92)	No FKBD (n=80)	P	FKBD (n=72)	No FKBD (n=82)	P
In-segment MV						
DS, %	22±15	22±15	0.85	22±14	21±12	0.90
≥50% DS, n (%)	3 (3.8)	2 (2.2)	0.67	3 (4.2)	1 (1.2)	0.34
Ostial 5 mm of the SB						
MLD, mm	1.71±0.42	1.50±0.53	0.005	1.79±0.54	1.77±0.61	0.79
DS, %	25±14	32±21	0.009	23±15	27±19	0.21
≥50% DS, n (%)	7 (7.6)	16 (20)	0.024	6 (8.3)	9 (11)	0.79

A Total population



B Propensity score-matched population

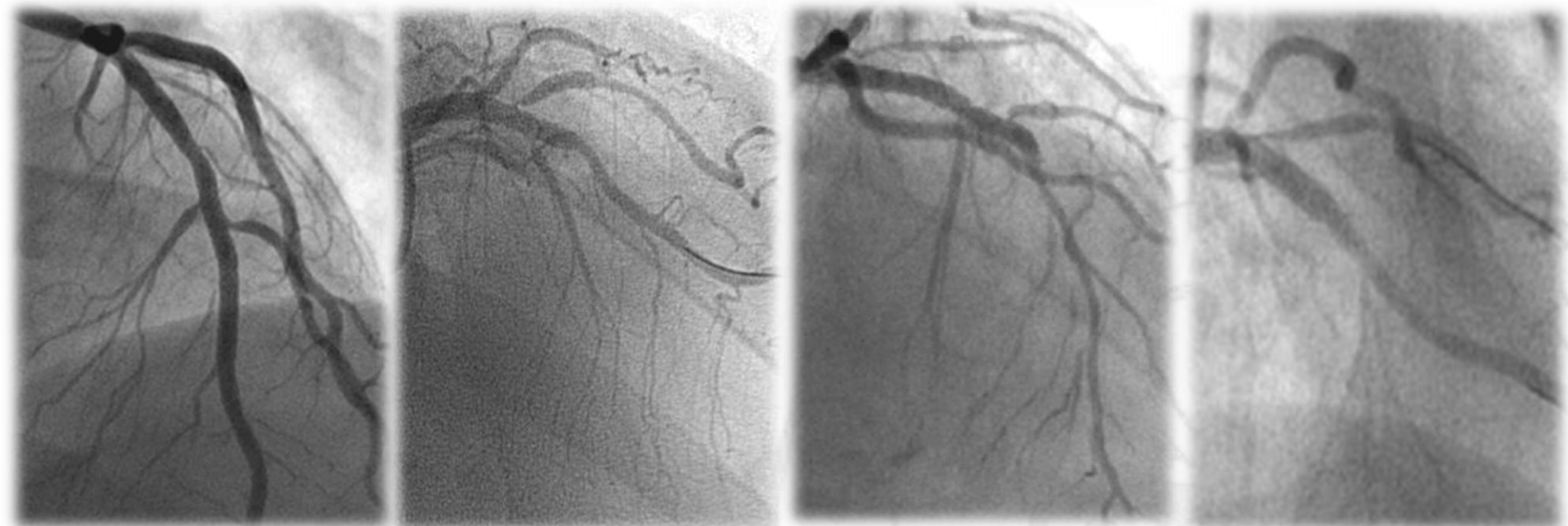


No. at Risk		Years		
	0	1	2	
Non-FKB group	736	693	322	
FKB group	329	300	144	

No. at Risk		Years		
	0	1	2	
Non-FKB group	444	421	211	
FKB group	222	201	102	

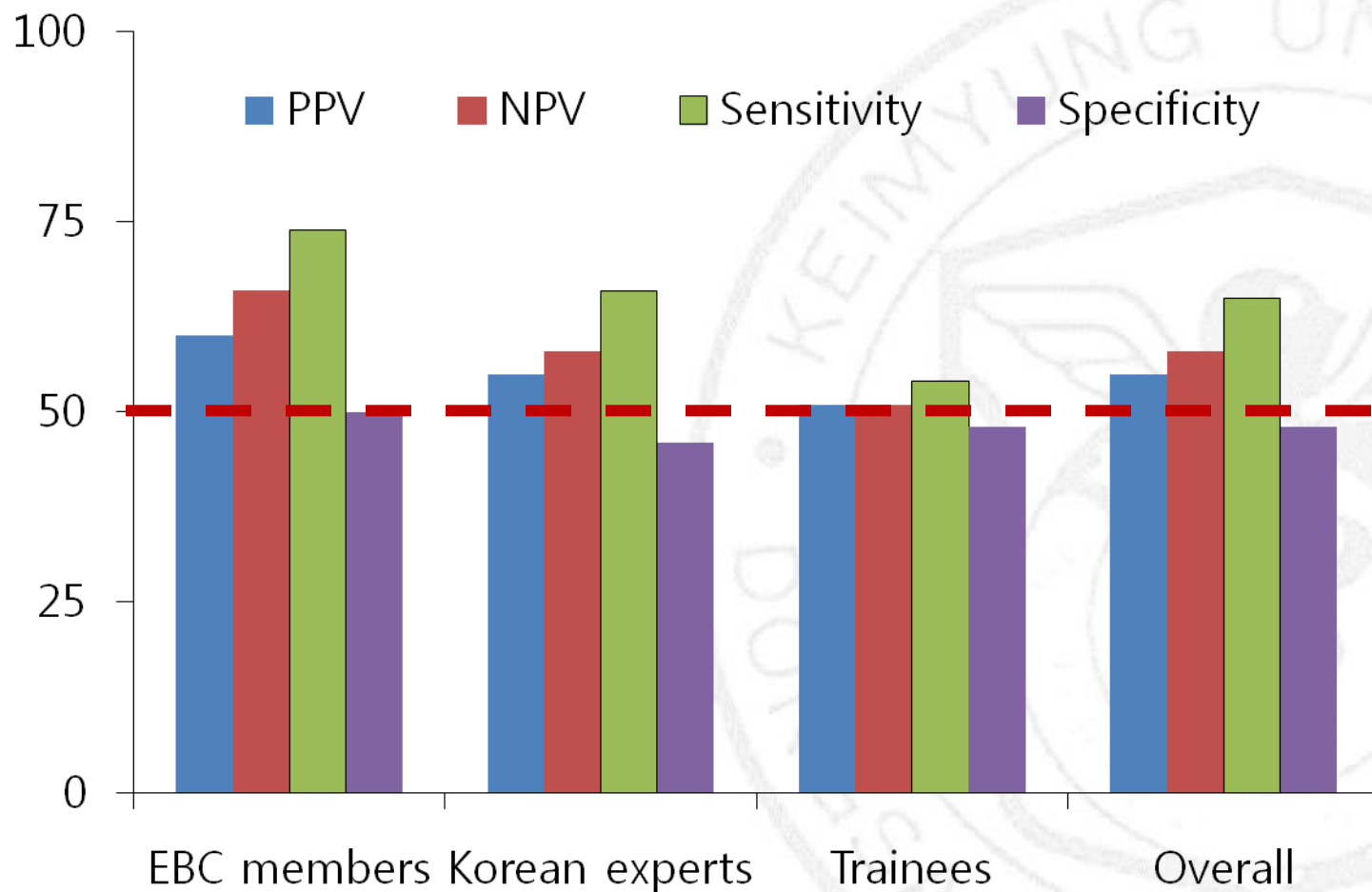
FKB increased the long-term risk of MACE, primarily due to increased TLR in the main vessel.

Jailed Side Branch



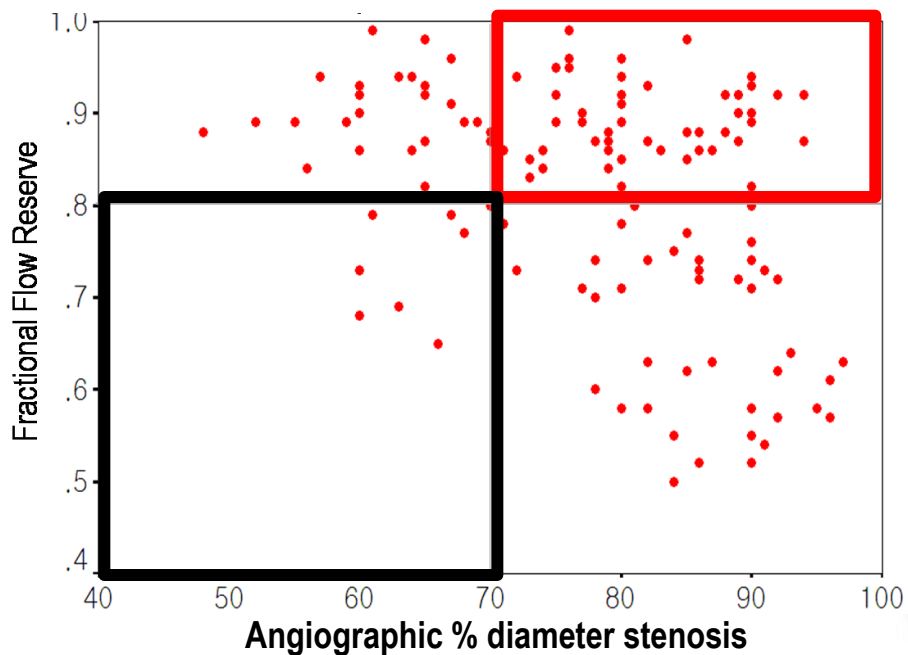
Which SB are jailed functionally?

Estimation of “functional significance” in 20 jailed SB lesions



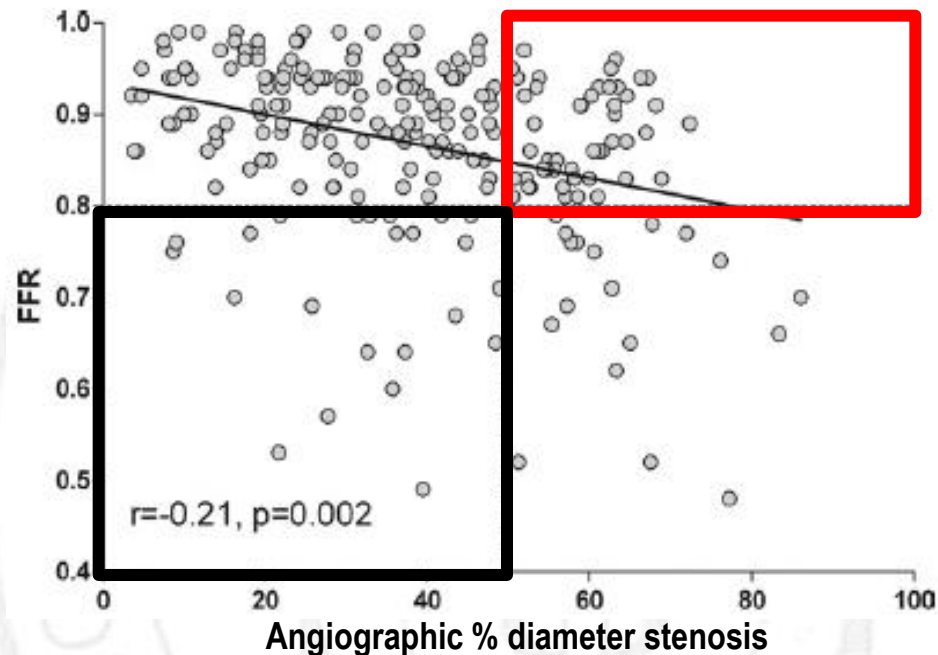
FFR vs. % diameter stenosis in jailed SB

Reverse mismatching



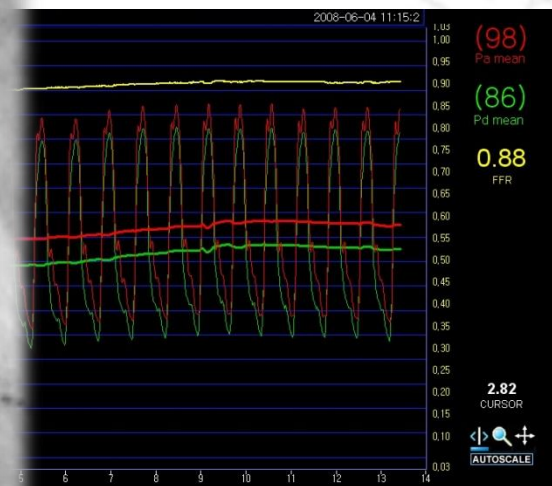
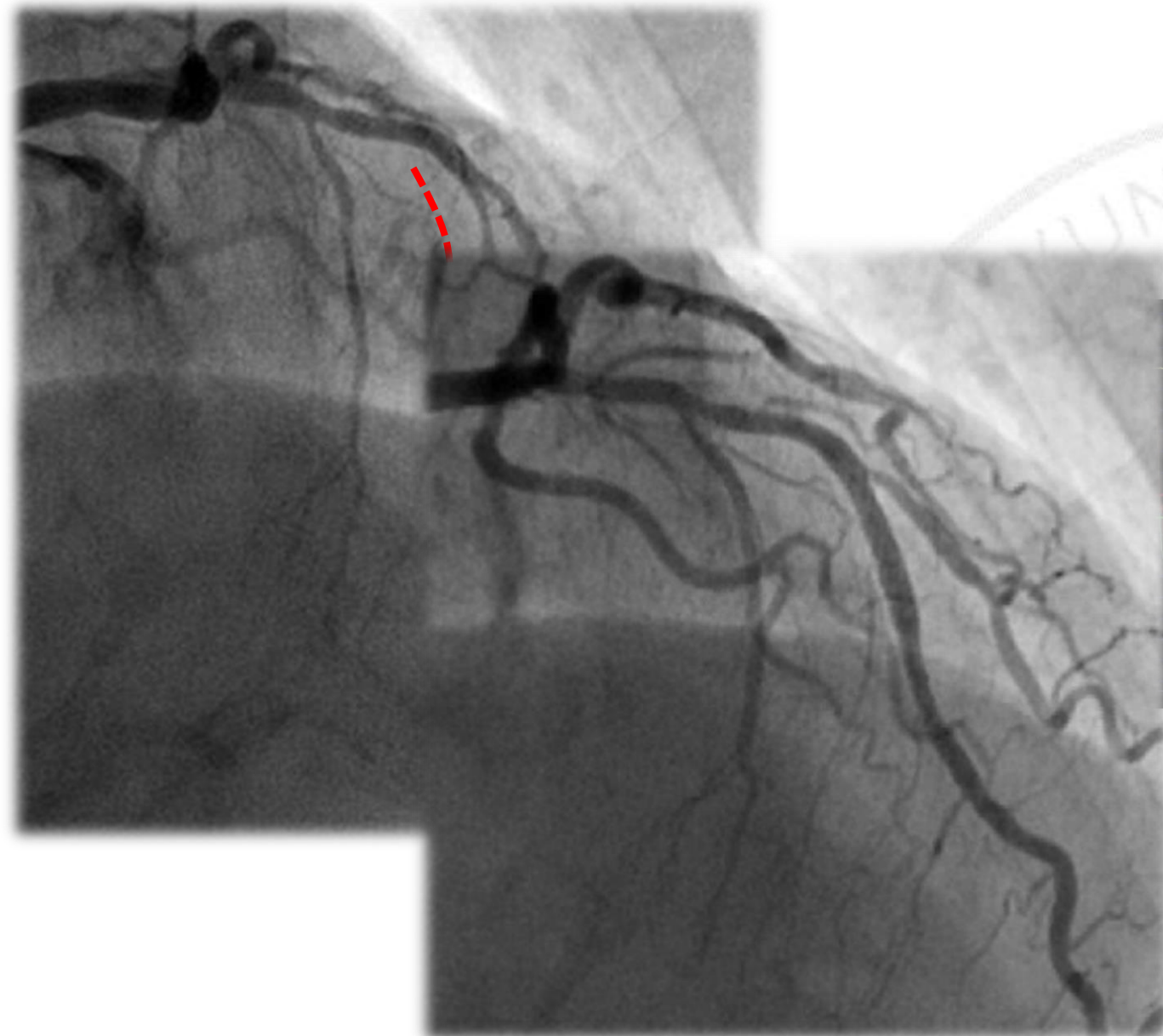
**Koo BK, et al.
JACC 2005, EHJ 2008, Circ CVI 2010**

Mismatching

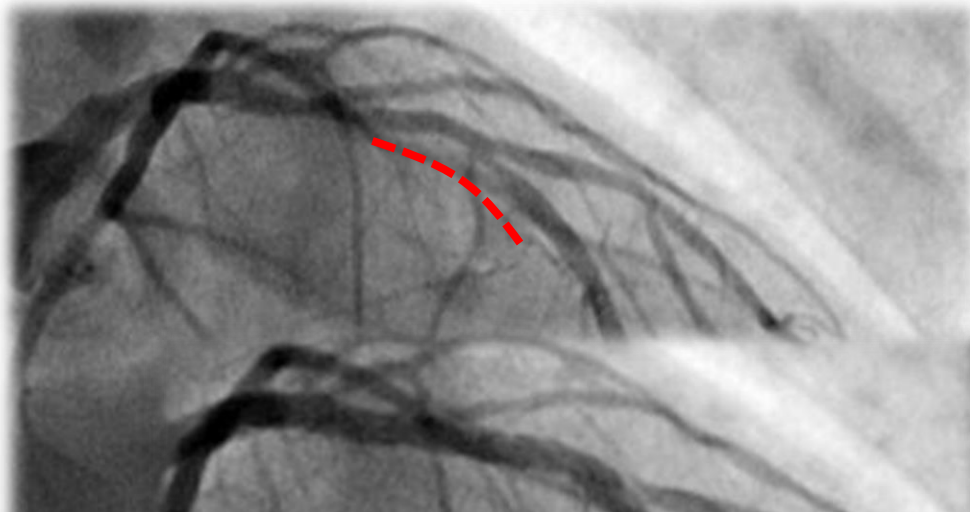


**Ahn JM, et al.
JACC intv 2012**

FFR-guided PCI in Jailed SB



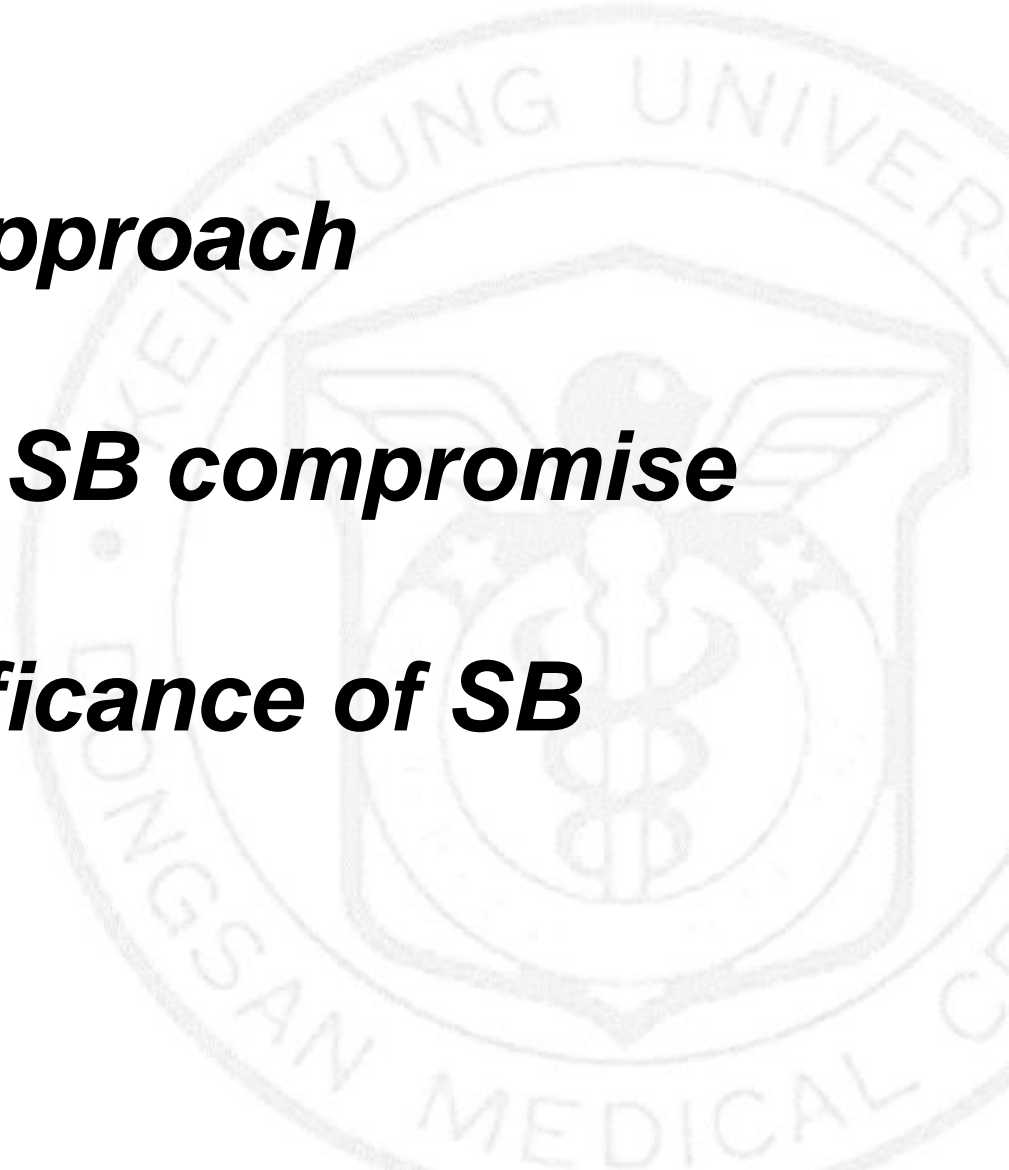
FFR-guided PCI in Jailed SB





Keep in mind...

- ***Provisional approach***
- ***Possibility of SB compromise***
- ***Clinical significance of SB***





Why is Bifurcation different?

Pre-interventional evaluation

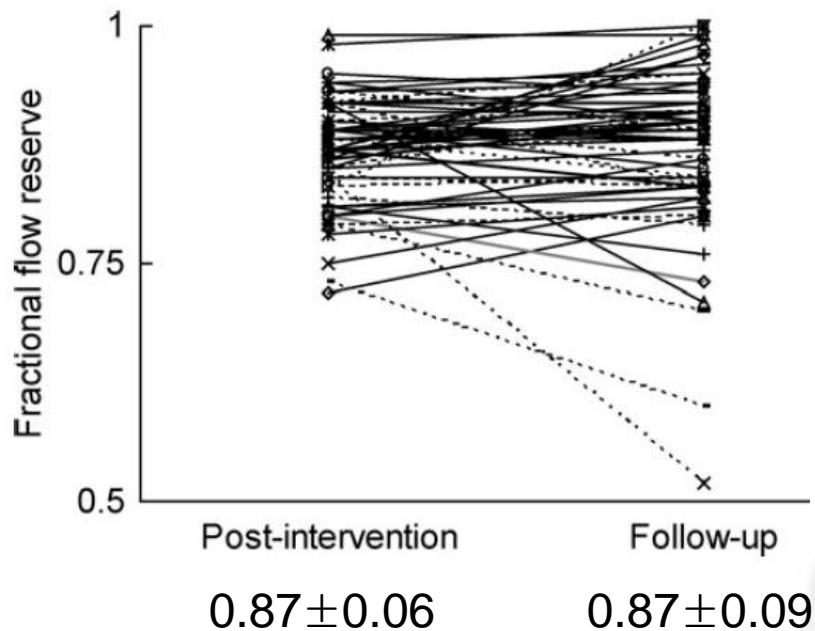
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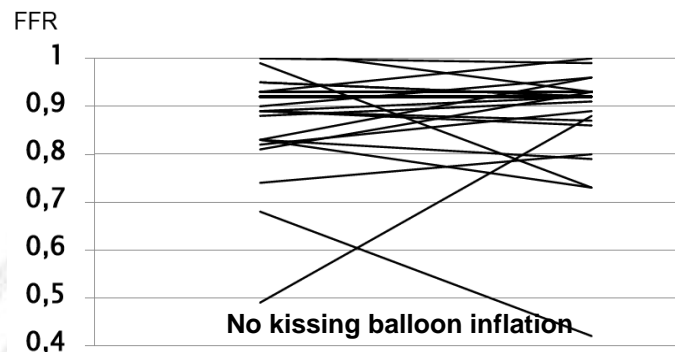
Functional outcome of Jailed SB



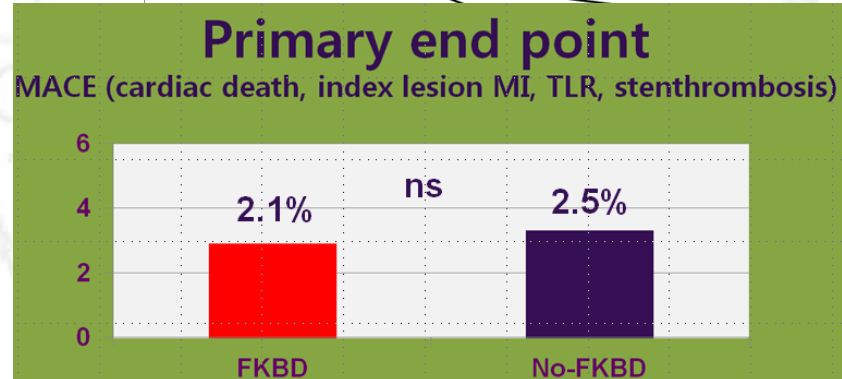
Koo BK. et al, Eur Heart J 2008;29:726

	FFR group, n = 108 ^a	Conventional group, n = 108 ^b	P-value ^c
Cardiac death	0	0	1
Myocardial infarction	0	0	1
Target vessel revascularization, n (%)	5 (4.6)	4 (3.7)	0.7

SB FFR substudy Nordic Baltic Bifurcation III

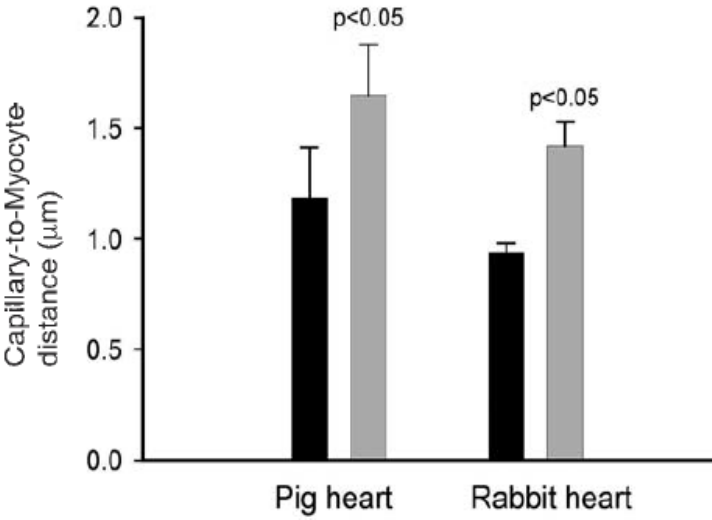
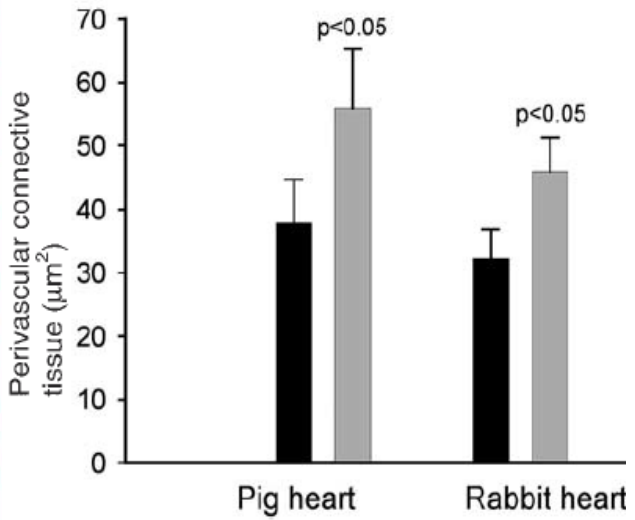
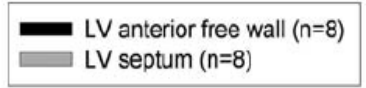
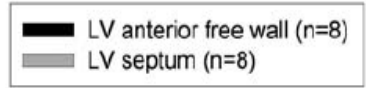
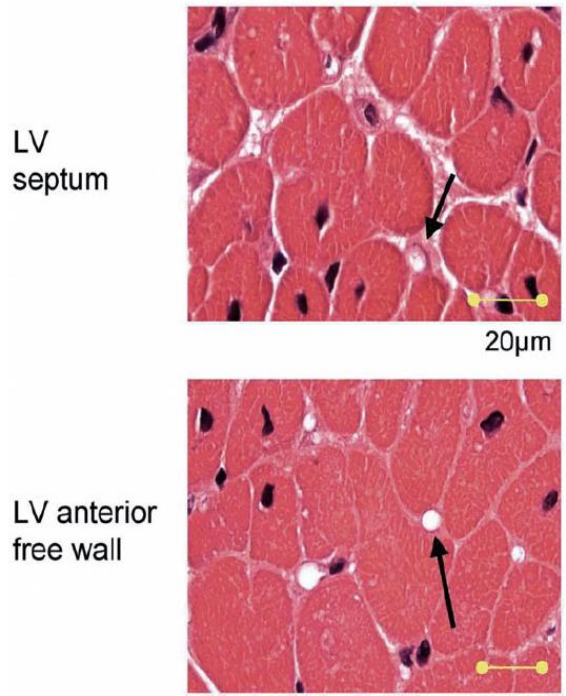
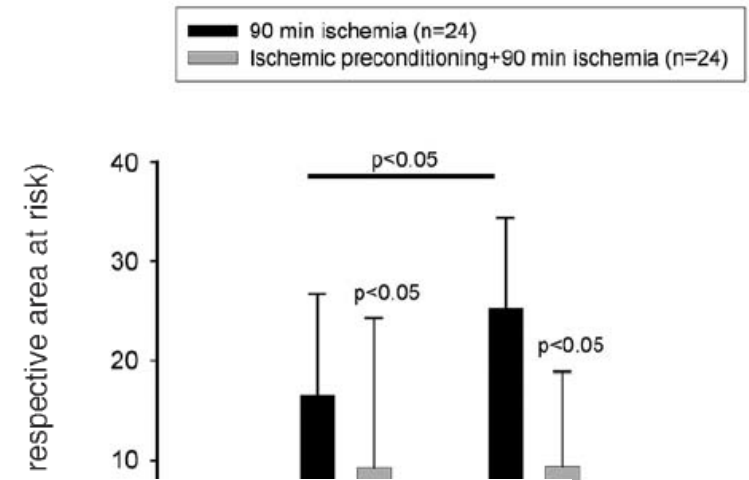
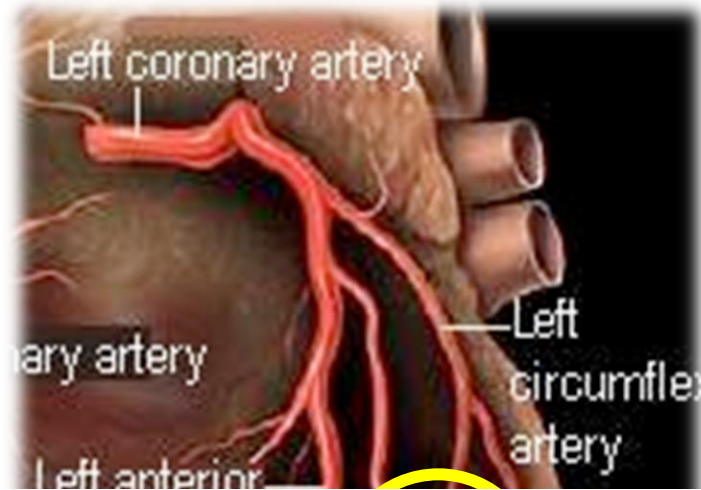


After PCI		Follow-up	
After PCI	n=21	Mean	
Follow-up	n=21	0,87	p=0,911



Kumsars I, et al. EuroIntervention 2012;7:1155
Circulation. 2011;123:79-86

Why are they no Different?





Why is Bifurcation different?

Pre-interventional evaluation

**Ischemia in bifurcation
predictors of SB compromise**

During and post intervention

**Evaluation of jailed SB
Prognosis of jailed SB**

Take Home Message

- **Physiology for understanding of anatomy**
- **Safety & efficacy of FFR-guided defer**
- **Limitations of FFR-guided PCI**
- **Unique benefit of FFR in jailed SB lesions**
- **Physiology is just one part of bifurcation**

경청해주셔서 감사 드립니다

