4th Imaging and Physiology Summit
October 30th, 2010
Seoul, Korea

Integrated Decision-Making in Bifurcation Lesions (FFR *and* IVUS)

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Disclosure Statement of Financial Interest

I, William Fearon, DO NOT have a financial interest/arrangement or affiliation with one or more organizations that could be perceived as a real or apparent conflict of interest in the context of the subject of this presentation.

Stanford receives research support from St. Jude Medical.

Overview:

- What causes sidebranch “jailing” after PCI?
- How does FFR help us address bifurcation disease?
- How does IVUS help us address bifurcation disease?

What have we learned about PCI and Bifurcation Lesions?

Anatomic and Functional Evaluation of Bifurcation Lesions Undergoing Percutaneous Coronary Intervention

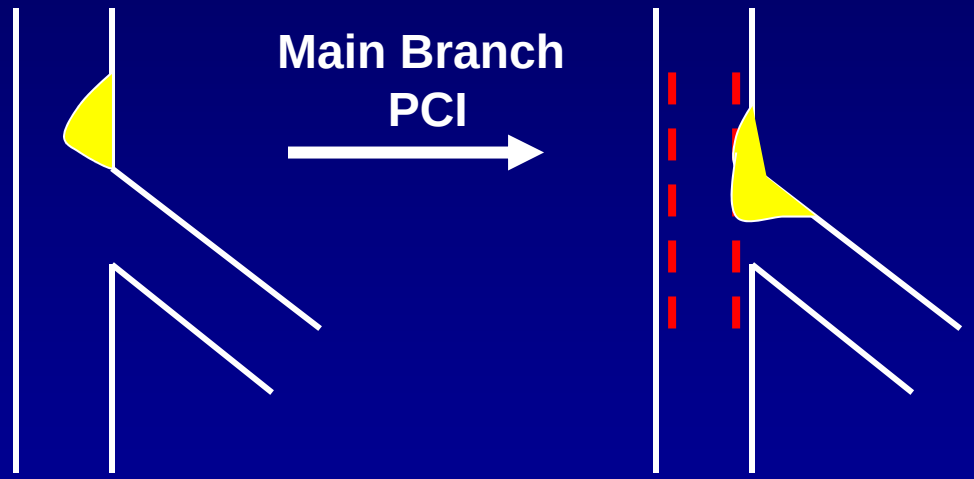
Bon-Kwon Koo, MD, PhD; Katsuhisa Waseda, MD, PhD; Hyun-Jae Kang, MD, PhD; Hyo-Soo Kim, MD, PhD; Chang-Wook Nam, MD, PhD; Seung-Ho Hur, MD, PhD; Jung-Sun Kim, MD, PhD; Donghoon Choi, MD, PhD; Yangsoo Jang, MD, PhD; Joo-Yong Hahn, MD, PhD; Hyeon-Cheol Gwon, MD, PhD; Myeong-Ho Yoon, MD, PhD; Seung-Jea Tahk, MD, PhD; Woo-Young Chung, MD, PhD; Young-Seok Cho, MD, PhD; Dong-Ju Choi, MD, PhD; Takao Hasegawa, MD; Toru Kataoka, MD; Sung Jin Oh, MD; Yasuhiro Honda, MD; Peter J. Fitzgerald, MD, PhD; William F. Fearon, MD

77 patients with bifurcation disease had IVUS of the main branch before and after PCI, and FFR of the "jailed" sidebranch

Circ Cardiovasc Interv 2010;3:113-119

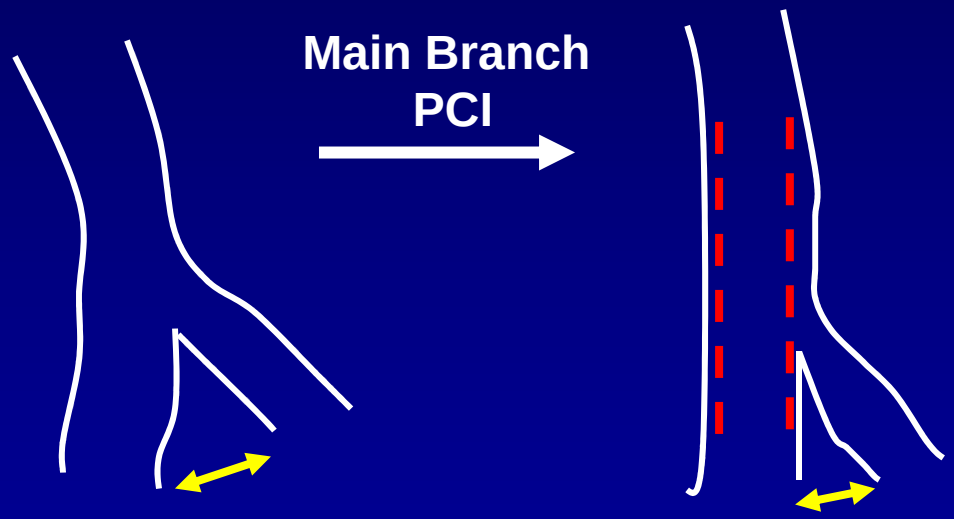
Causes of Sidebranch “Jailing”

- Plaque shift



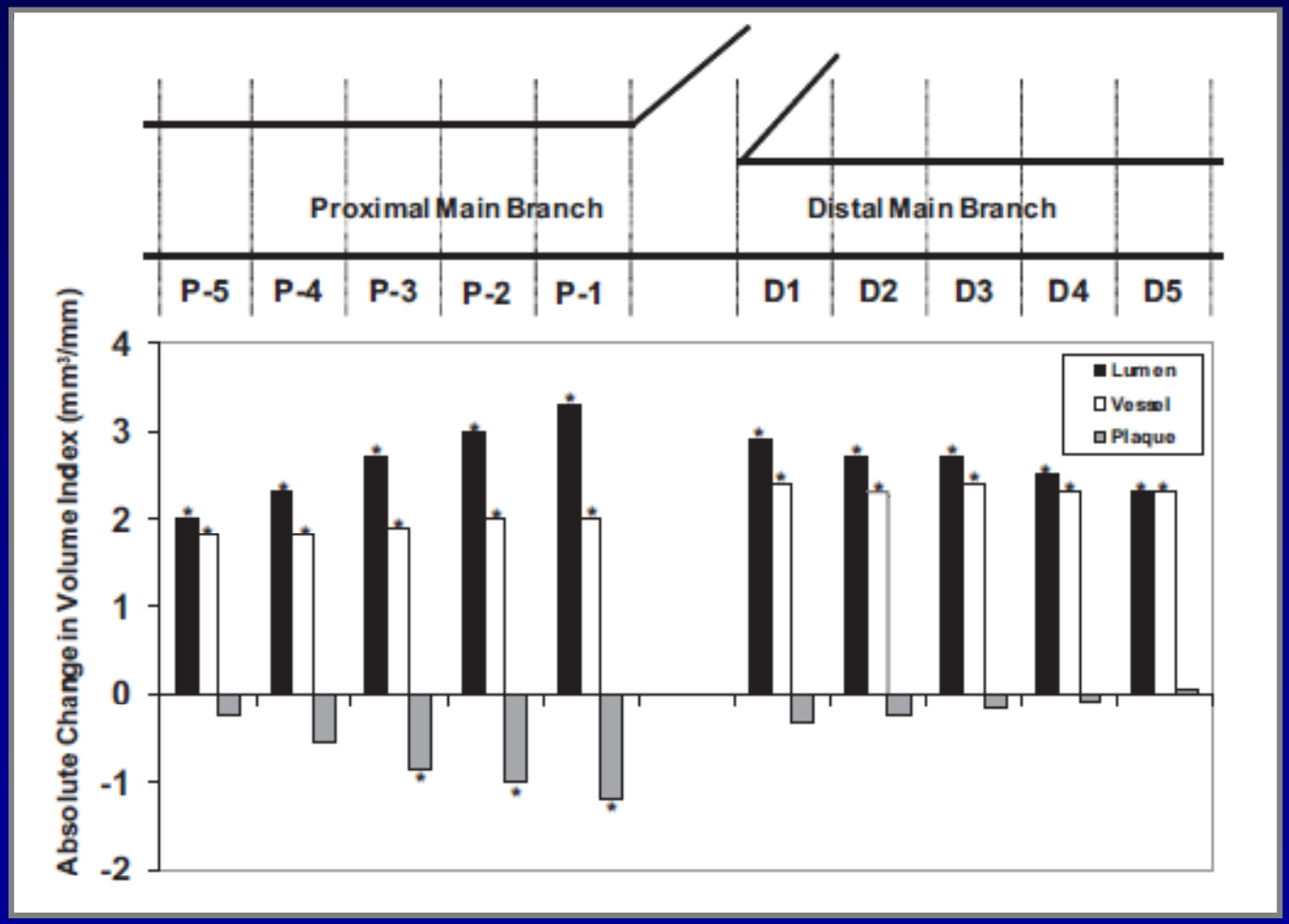
Causes of Sidebranch “Jailing”

- Carina Shift



Anatomic Changes in Main Branch after PCI

IVUS performed before and after PCI in 77 bifurcation lesions



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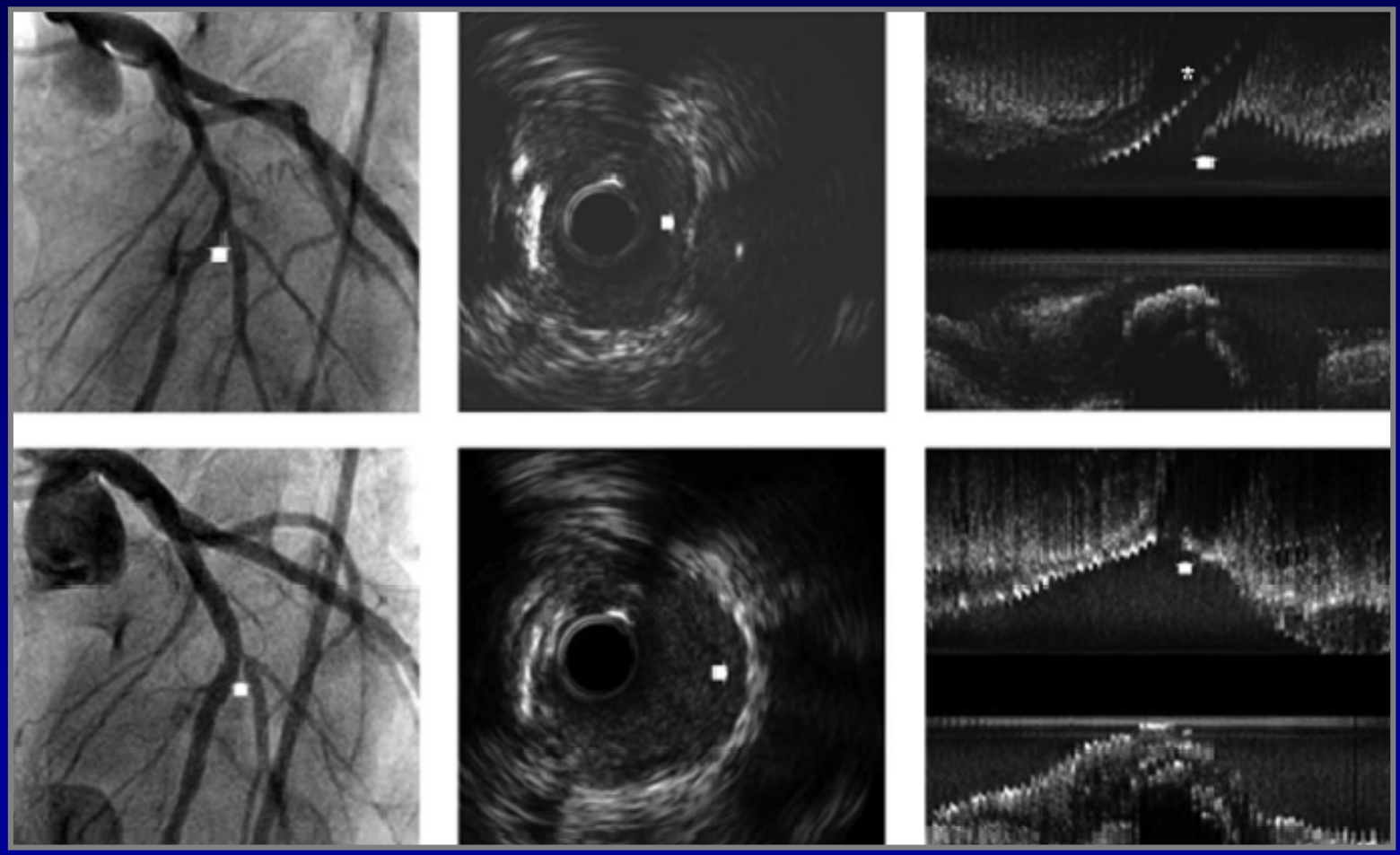
Anatomic Changes in Main Branch after PCI

Side Branch "jailing" can occur due to both plaque and carina shift

Pre-PCI

Post-PCI



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IVUS Correlates of Significant Sidebranch "jailing"

Pre-intervention plaque burden (plaque shift) and lumen volume (carina shift) were associated with significant sidebranch "jailing"

IVUS parameters	FFR<0.75 (N=22)	FFR≥0.75 (N=30)	*P*
Proximal MB			
Lumen volume index, mm^3/mm	2.6±1.1	3.4±1.5	0.08
Vessel volume index, mm^3/mm	13.2±3.5	12.7±3.5	0.67
Plaque volume index, mm^3/mm	10.6±3.1	9.4±3.1	0.21
Plaque burden, %	80±8	73±10	0.03
Distal MB			
Lumen volume index, mm^3/mm	2.3±1.1	3.6±1.8	0.01
Vessel volume index, mm^3/mm	8.3±2.0	9.4±2.7	0.14
Plaque volume index, mm^3/mm	6.0±1.5	5.8±2.0	0.69
Plaque burden, %	73±10	61±12	0.002

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Angiographic Predictors of Sidebranch "jailing"

Pre-intervention sidebranch stenosis and distal lesion location predicted significant sidebranch "jailing"

	Odds Ratio	95% CI	*P*
MB reference diameter	1.10	0.29 to 4.23	0.89
MB % diameter stenosis	1.00	0.95 to 1.05	0.99
MB lesion length	1.02	0.96 to 1.08	0.50
SB reference diameter	0.27	0.06 to 1.31	0.11
SB % diameter stenosis	1.05	1.01 to 1.09	0.01
SB lesion length	1.06	0.89 to 1.25	0.53
Bifurcation angle (≥70 degrees)	3.62	0.23 to 58.14	0.37
MLD location (type B vs type A)	3.86	1.03 to 14.43	0.05

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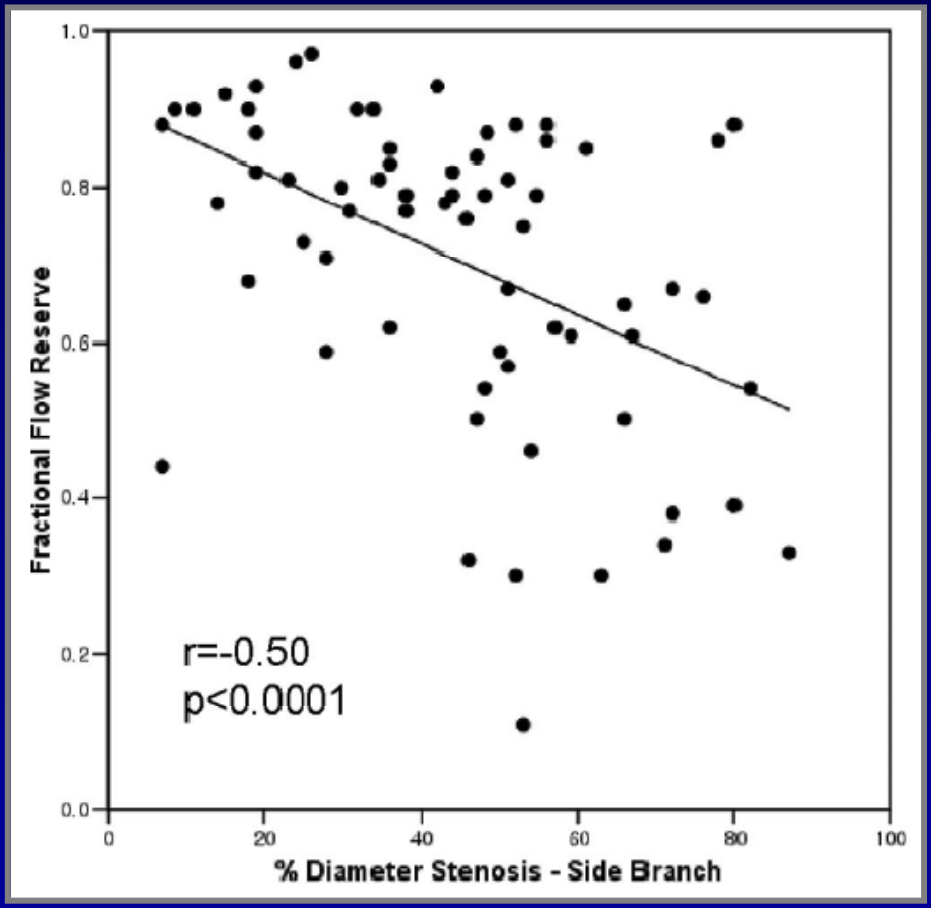
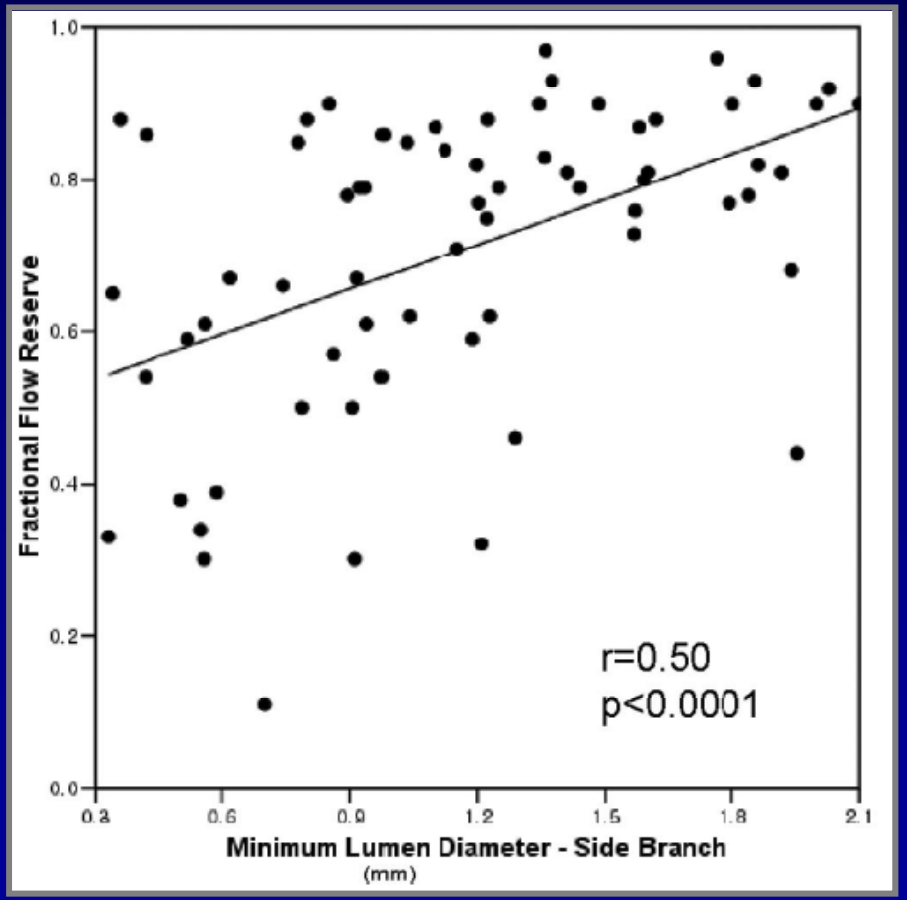
Angiographic Correlates of Sidebranch “jailing”

Correlation between % diameter stenosis and sidebranch FFR



Correlation between minimum lumen diameter and sidebranch FFR



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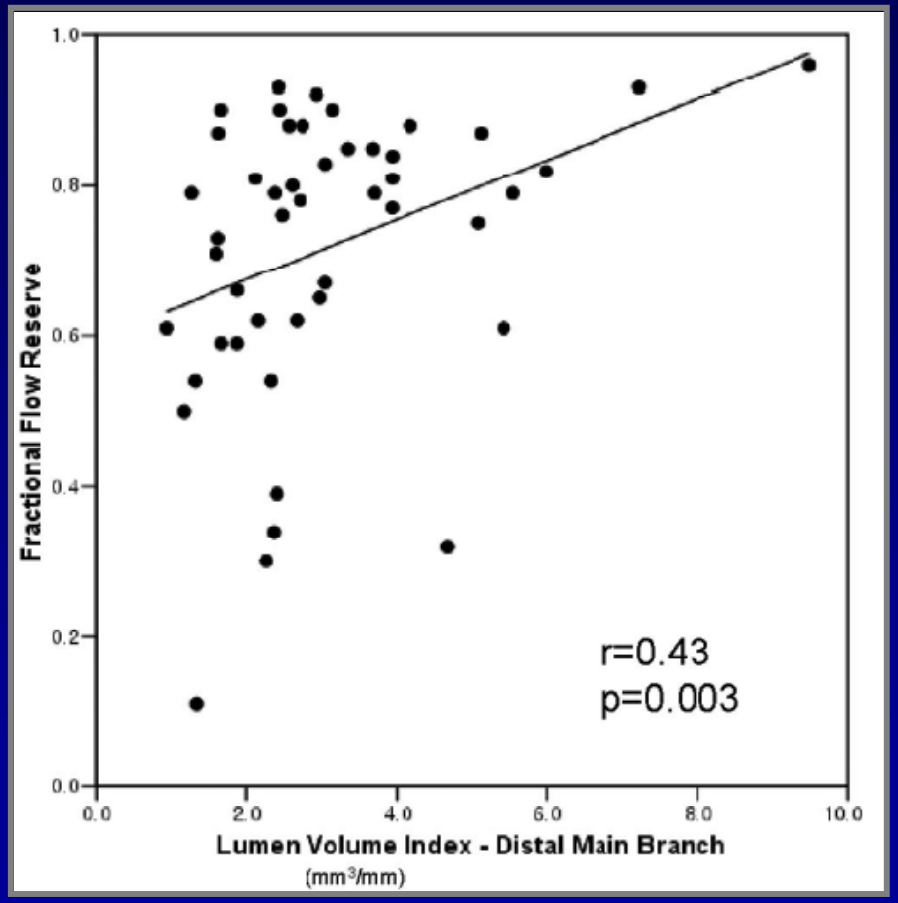
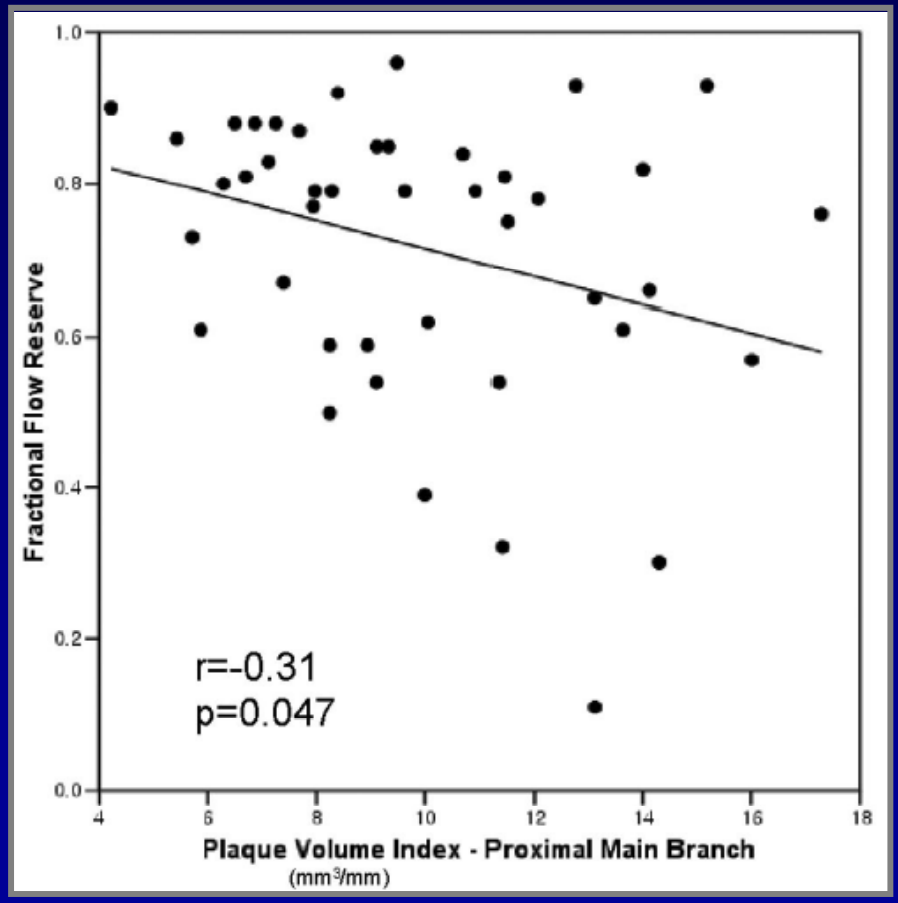
IVUS Correlates of Sidebranch “jailing”

Correlation between distal lumen volume and sidebranch FFR



Correlation between proximal plaque burden and sidebranch FFR



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What we have learned about PCI and sidebranch “jailing”?

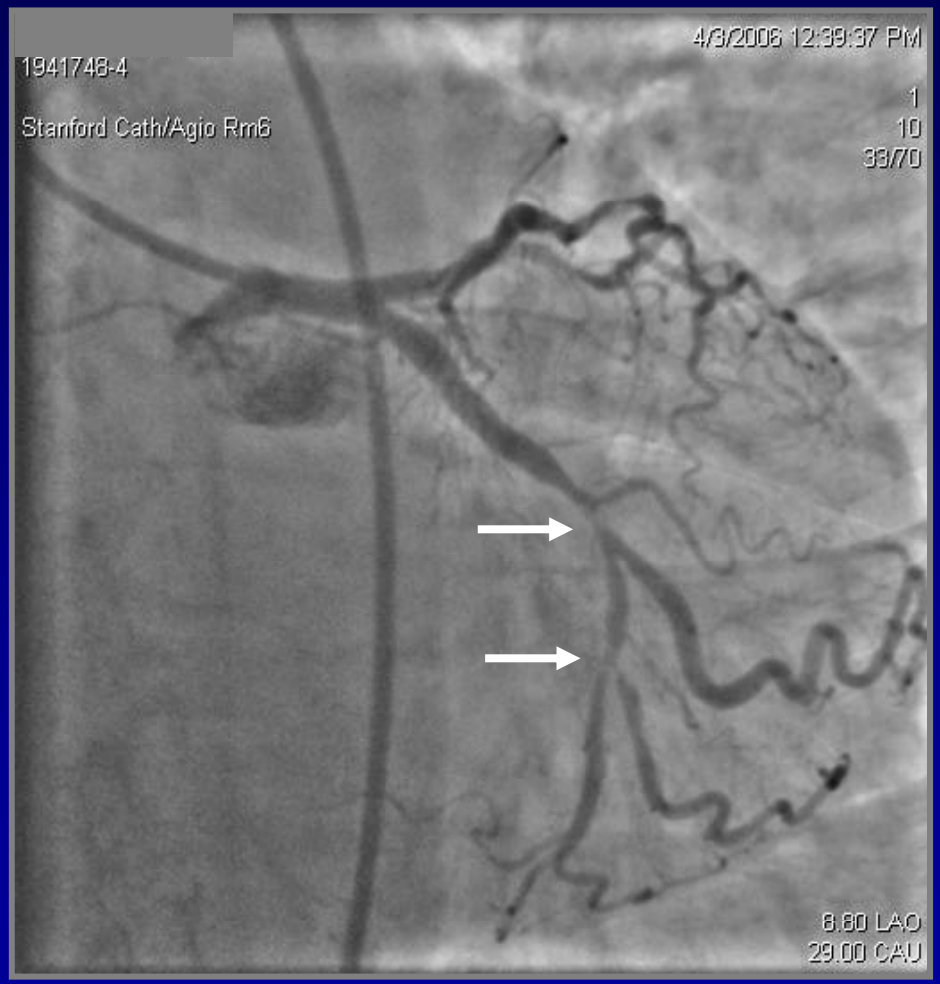
- Both plaque shift and carina shift contribute to sidebranch “jailing” after main branch PCI.
- Unfortunately, anatomic evaluation does not reliably predict the functional significance of sidebranch “jailing”.

Overview:

- What causes sidebranch “jailing” after PCI?
- How does FFR help us address bifurcation disease?
- How does IVUS help us address bifurcation disease?

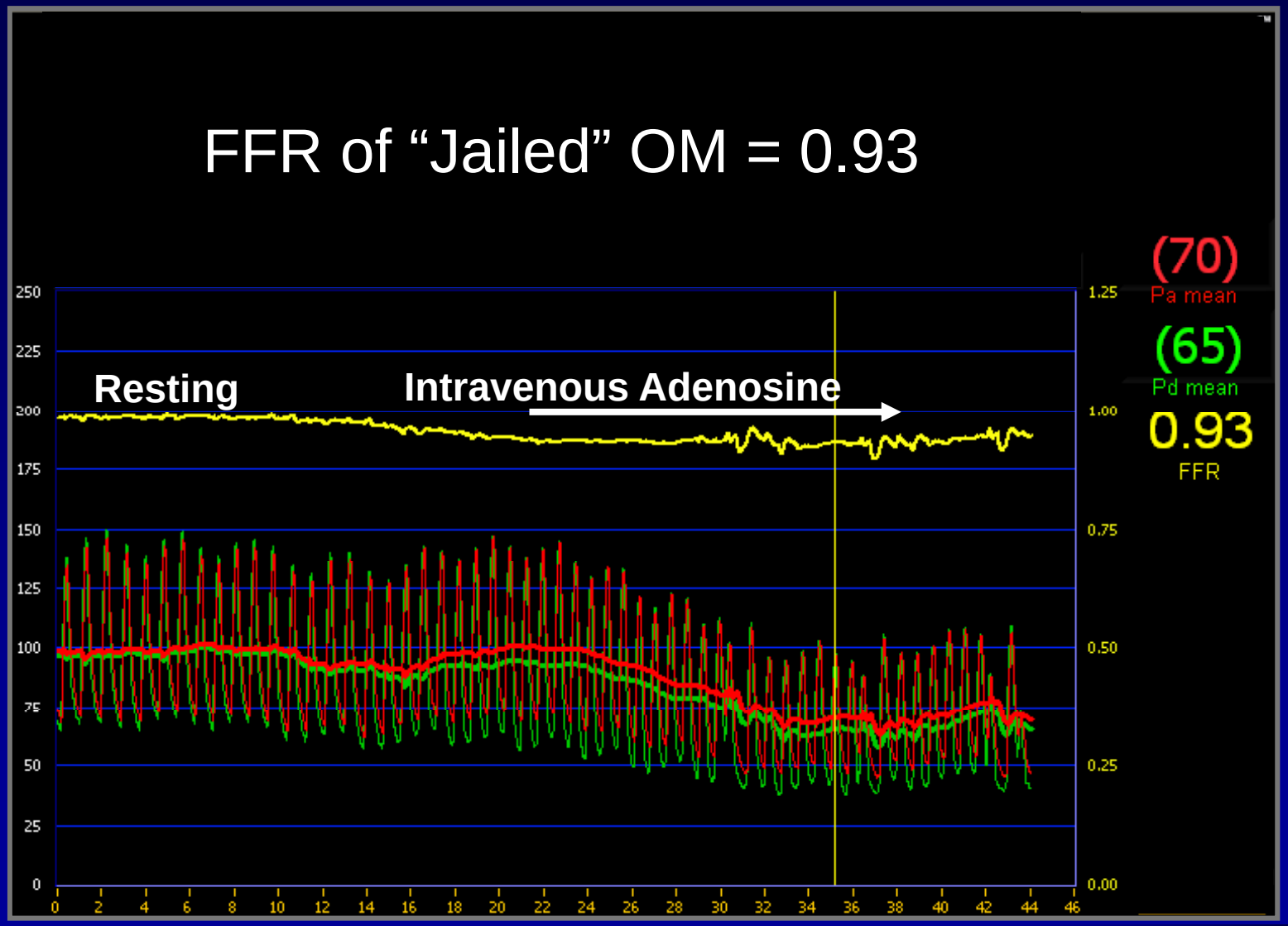
FFR and Bifurcation Disease

Before PCI



After PCI

FFR and Bifurcation Disease



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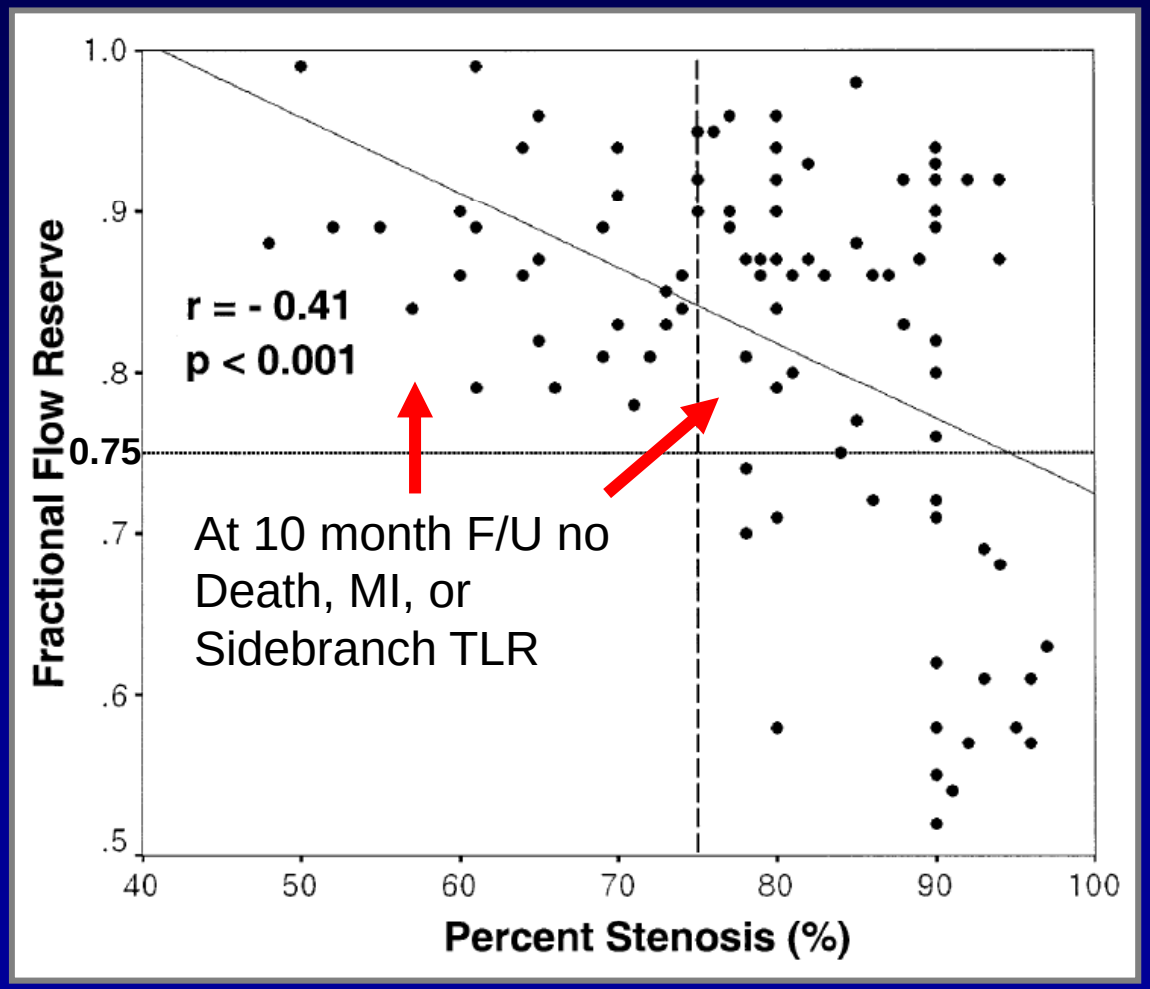
Jailed Side Branches and FFR

FFR in 97 "Jailed" Side Branches



Koo et al. J Am Coll Cardiol 2005;46:633-7.

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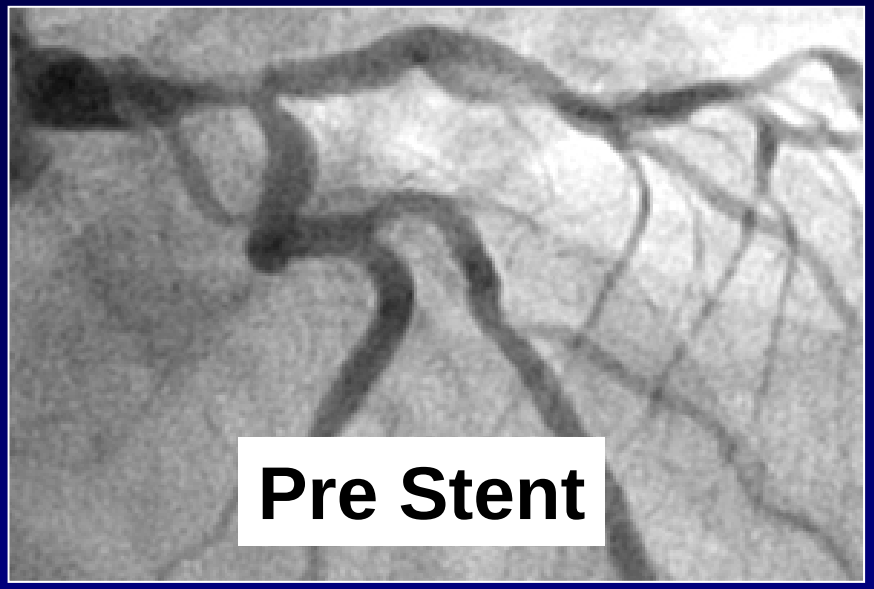
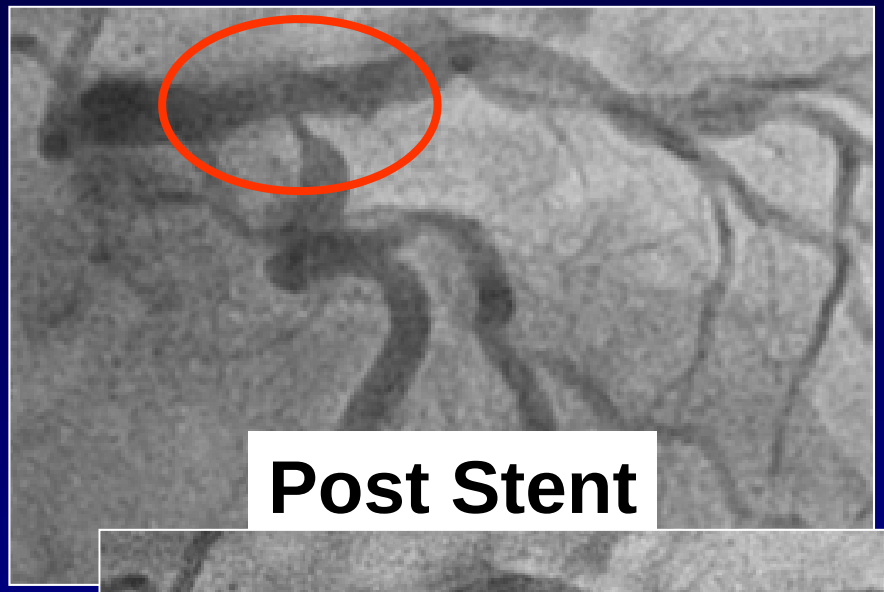
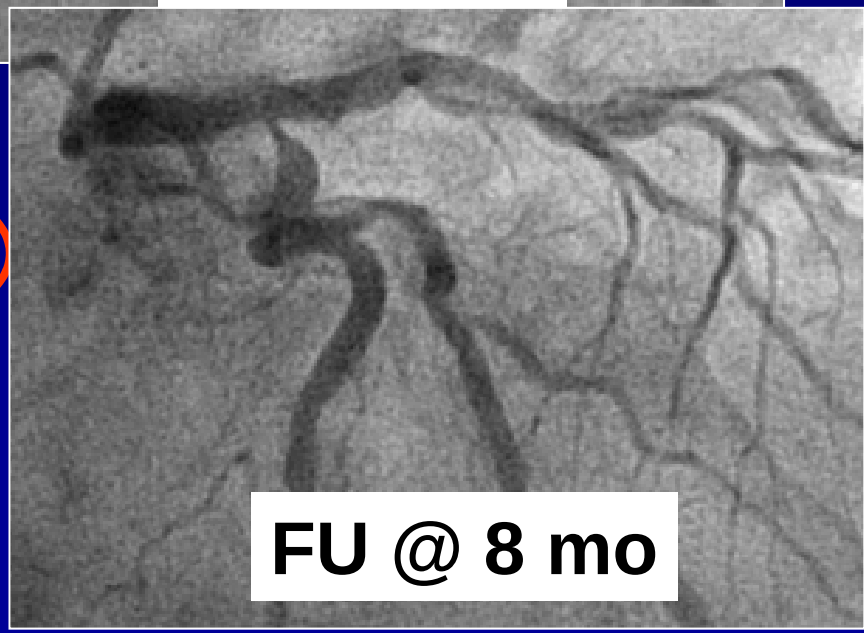
FFR of “jailed” Circumflex







Courtesy of Chang-Wook Nam, MD

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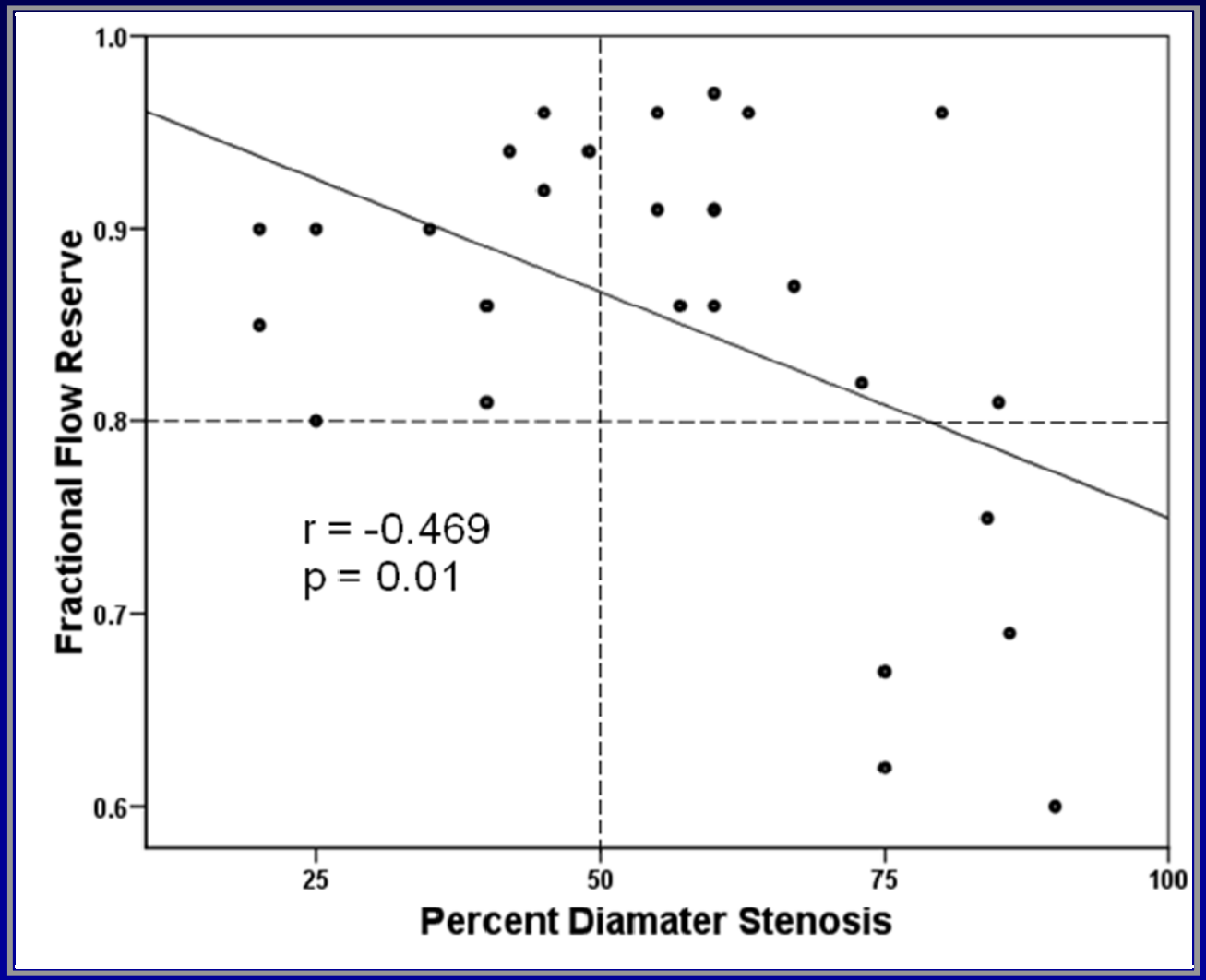
FFR of “jailed” Circumflex

FFR measured down “jailed” circumflex in 29 patients after LM PCI



Nam CW, et al. Korean Circulation J 2011; (in press).

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FFR of “jailed” Circumflex

	Defer group n = 24	PCI group n = 5
Death, n	0	1
Myocardial Infarction, n	0	0
TLR, n	3	1
Stent Thrombosis, n	0	0
Total Events, n	3	2

Nam CW, et al. Korean Circulation J 2011; (in press).

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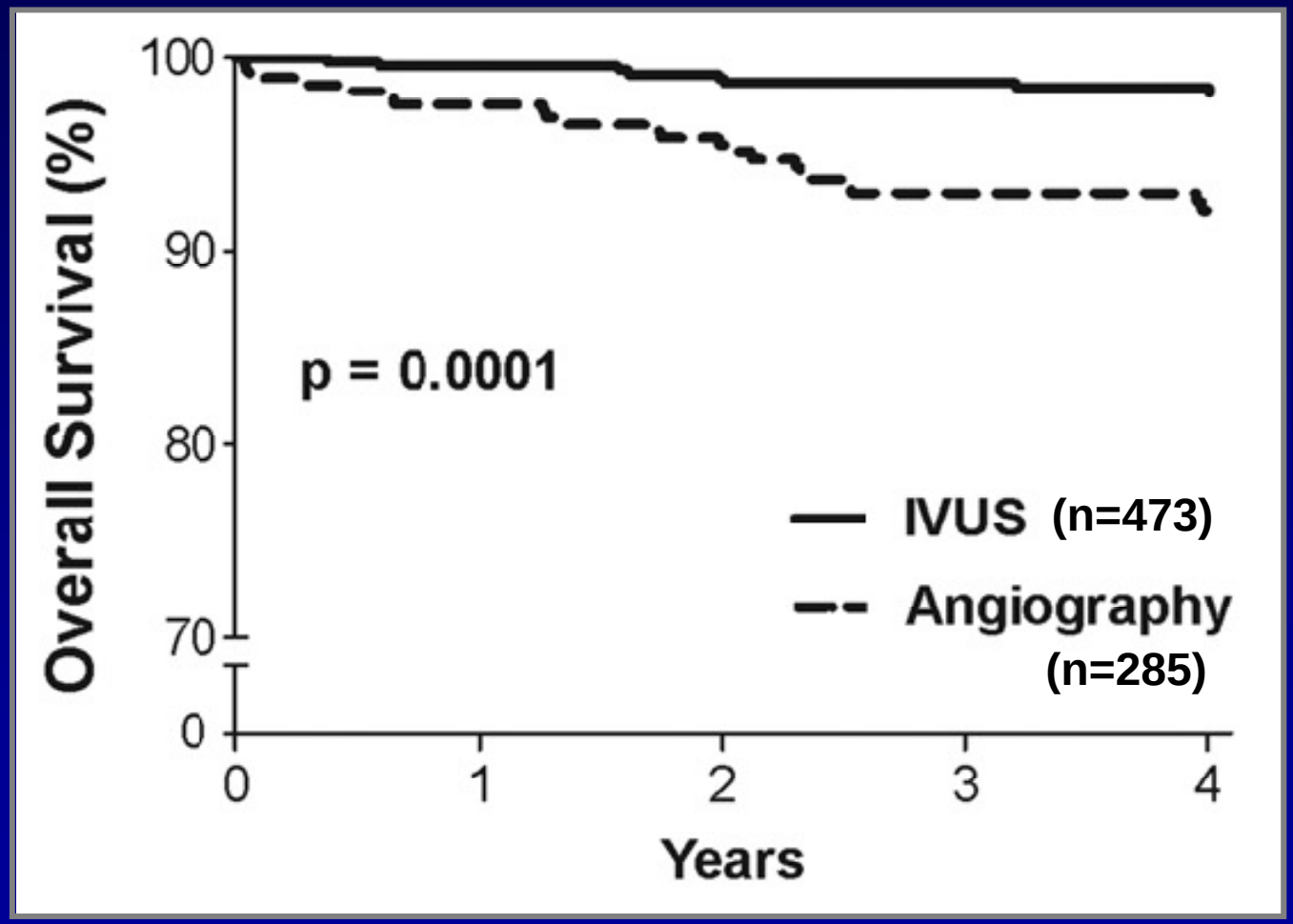
Overview:

- What causes sidebranch “jailing” after PCI?
- How does FFR help us address bifurcation disease?
- How does IVUS help us address bifurcation disease?

IVUS Guidance and Bifurcation Lesions

758 non-Left Main bifurcation lesions treated at Asan Medical Center



Kim, et al. Am J Cardiol 2010;106:612-18

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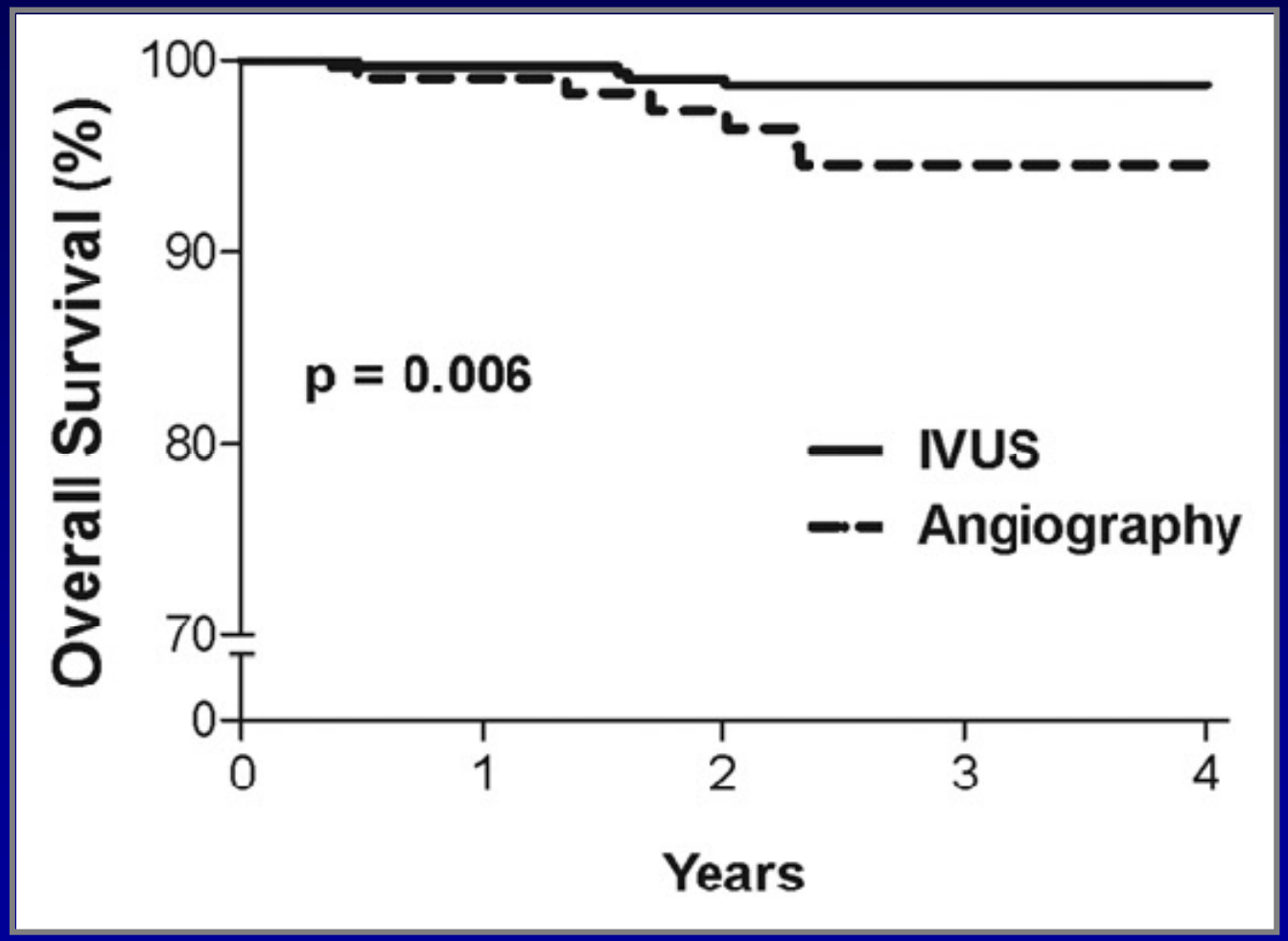
IVUS Guidance and Bifurcation Lesions

*420 non-Left Main bifurcation lesions treated with **DES** at Asan Medical Center*



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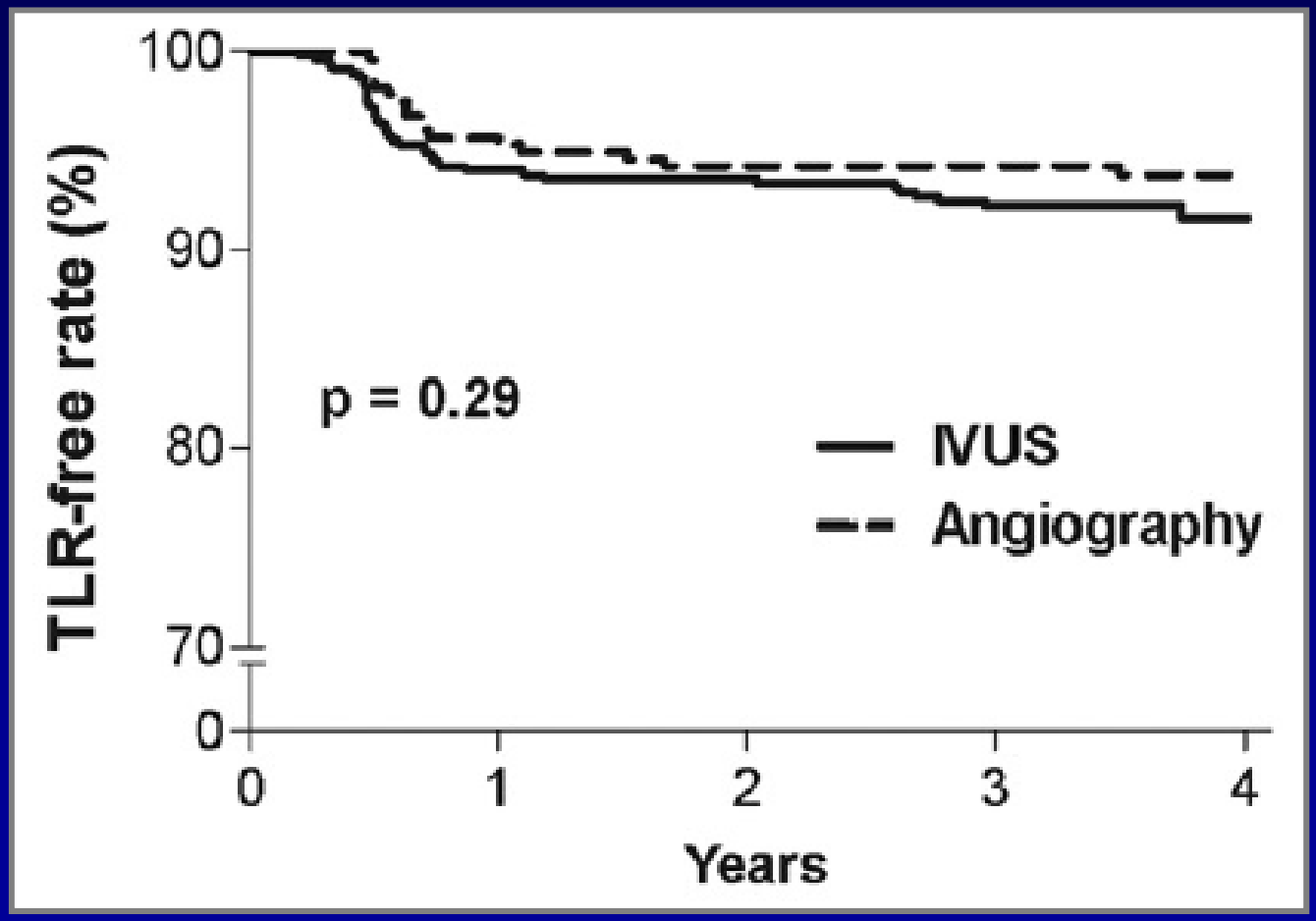

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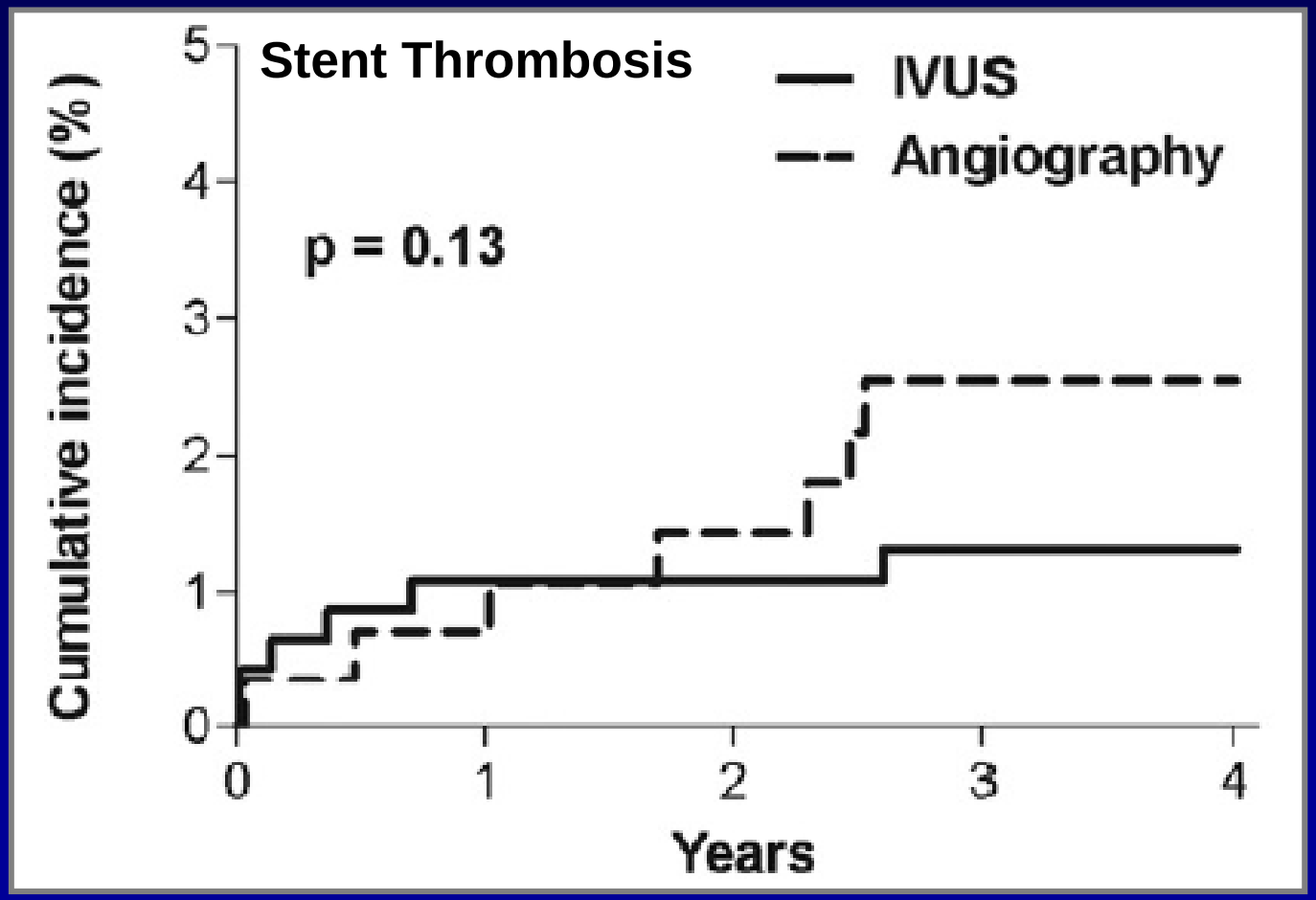

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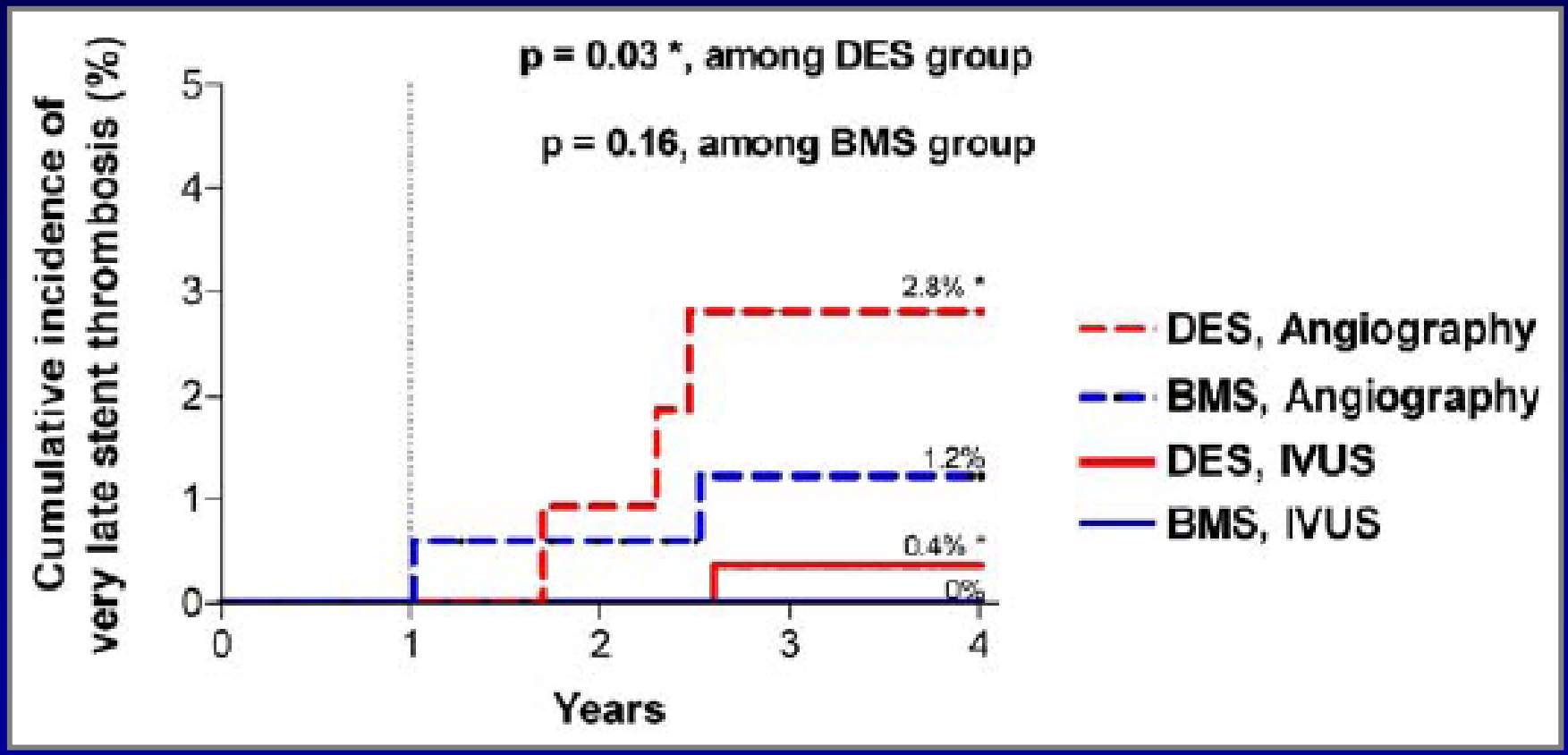
IVUS Guidance and Bifurcation Lesions

758 non-Left Main bifurcation lesions treated at Asan Medical Center



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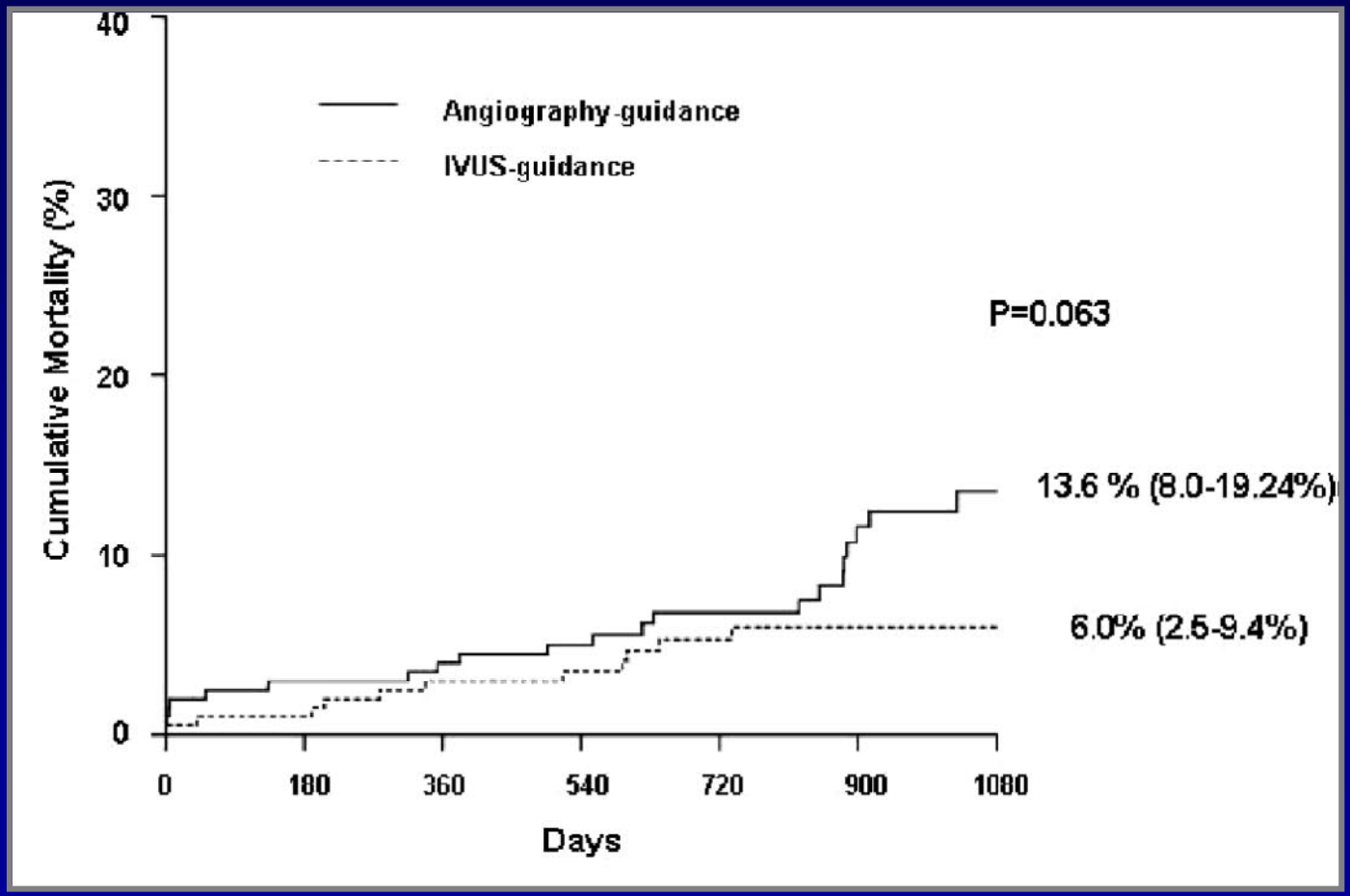
IVUS Guidance and Bifurcation Lesions

201 propensity matched Left Main lesions treated at Asan Medical Center (>50% were bifurcation lesions)



Park, et al. Circ Cardiovasc Interv 2009;2:167-177

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Summary:

- Sidebranch “jailing” occurs because of both plaque shift and carina shift.
- Anatomic assessment does not accurately predict which sidebranch lesions are functionally significant.
- FFR measurement identifies functionally insignificant “jailed” sidebranches which do not require further treatment.

Summary:

- Intravascular ultrasound guidance during bifurcation PCI appears to improve outcomes by optimizing stent deployment.

Functional Angioplasty

FFR-Guided Decision Making,
IVUS-Guided Optimization