Left Main and Bifurcation Summit

Plaque vs. Carina Shift Identification and Clinical Impact

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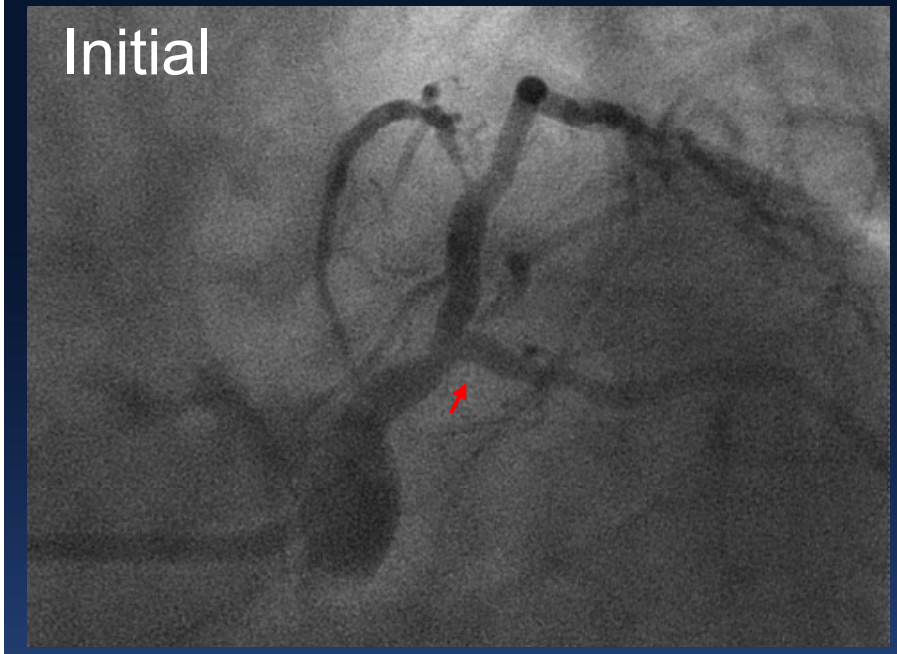
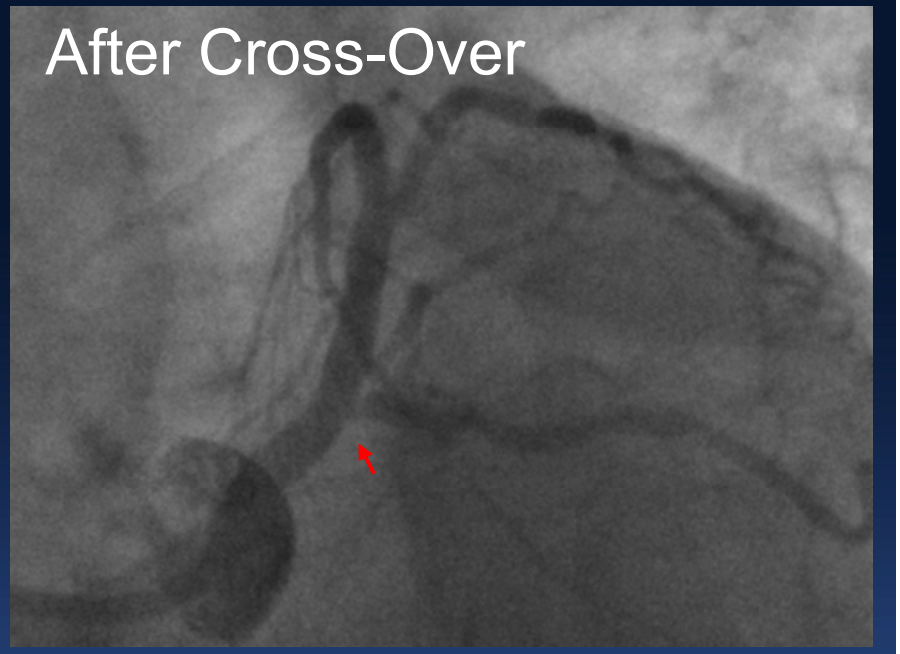
Disclosure

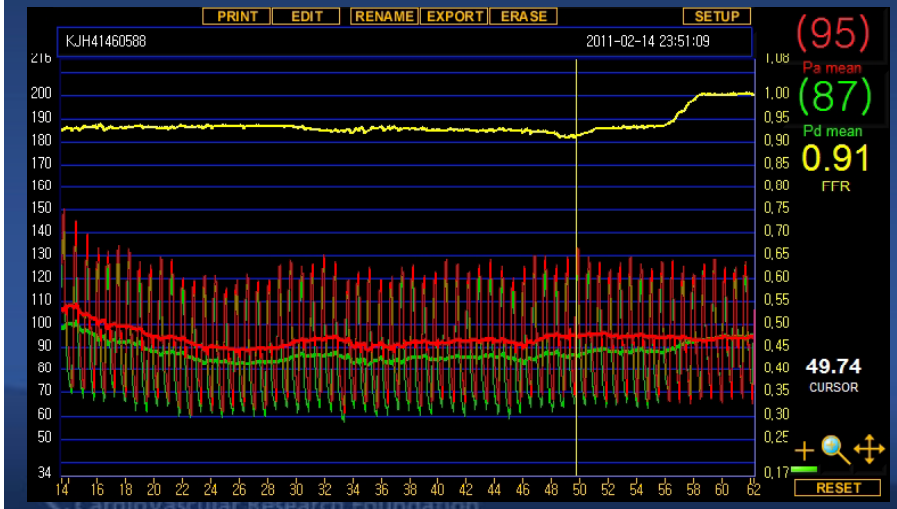
I have nothing to disclose

Mechanisms of Angiographic SB Jailing

Carina Shift

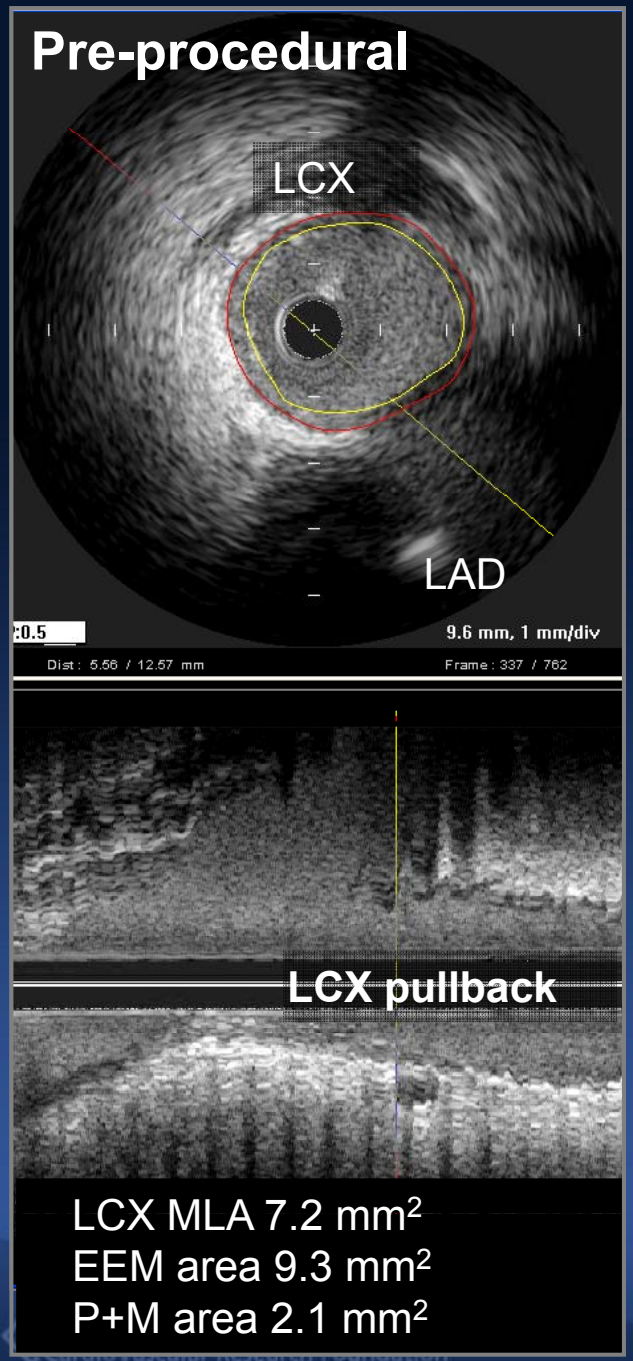






LCX FFR 0.91

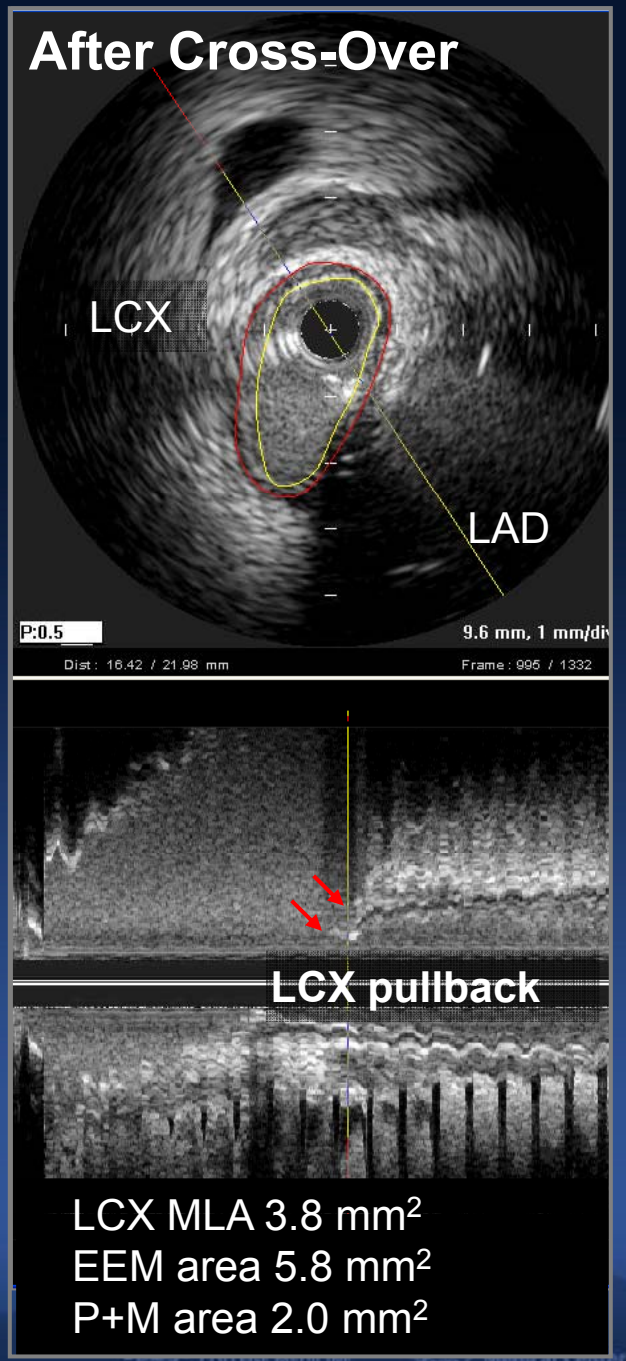
Post-stenting



Carina Shift

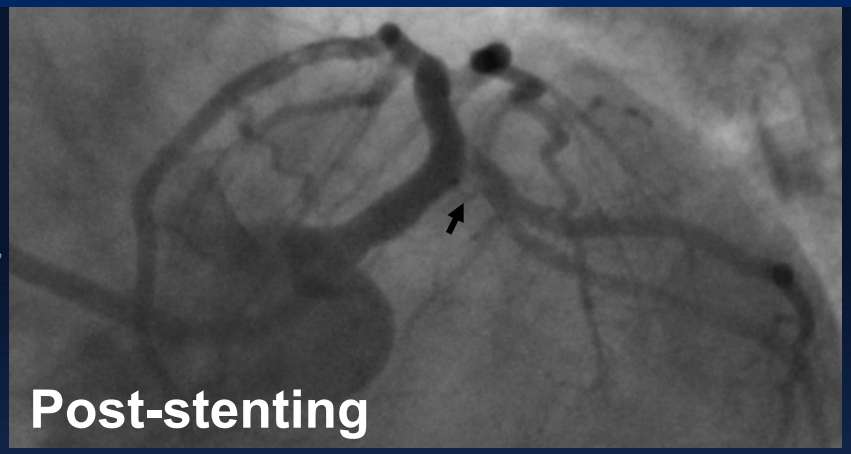
After cross-over

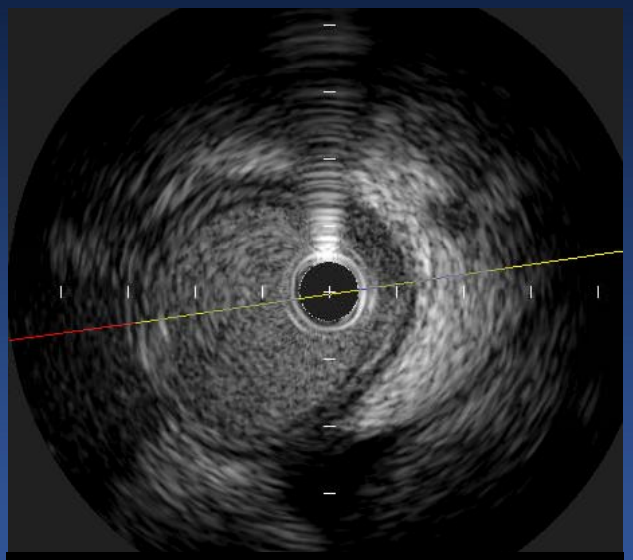
Area Change	
ΔLumen	-3.4 mm²
ΔVessel	-3.5 mm²
ΔPlaque	-0.1 mm²



Mechanisms of Angiographic SB Jailing

Plaque Shift

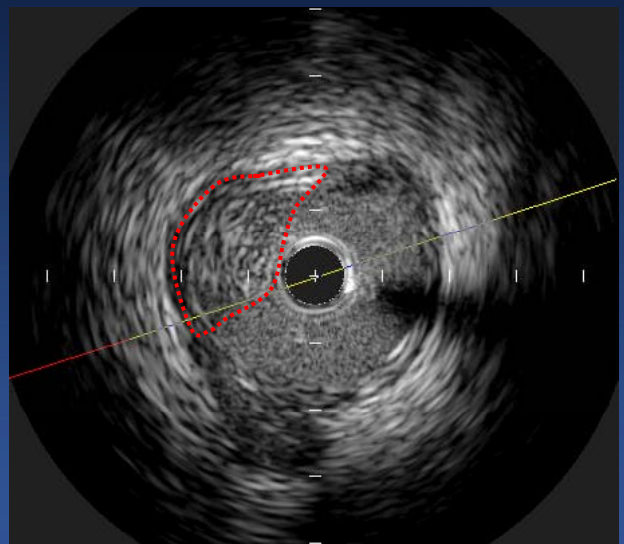




LCX MLA 6.9mm^2
EEM area 9.1mm^2
P+M 2.2 mm^2

After cross-over

Area Change	
ΔLumen	-1.9mm^2
ΔVessel	-0.4mm^2
ΔPlaque	**+1.5mm^2**



LCX MLA 5.0mm^2
EEM area 8.7mm^2
P+M 3.7 mm^2

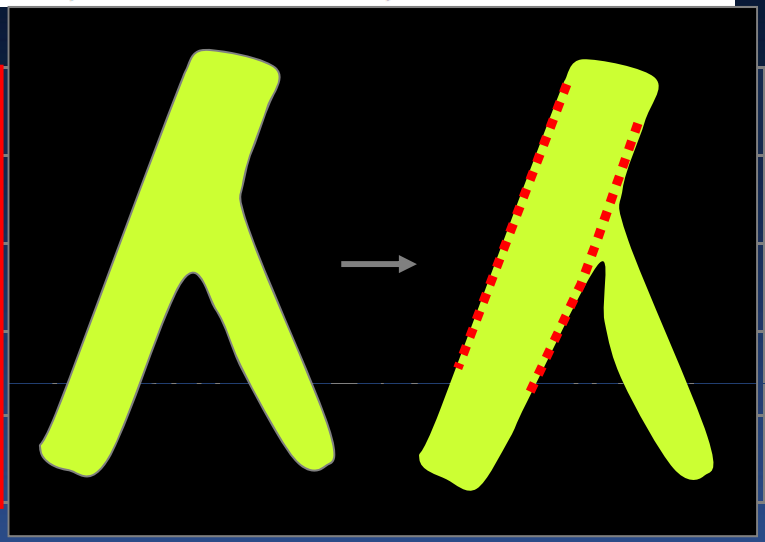
Plaque Shift vs. Carina Shift

- Mechanisms of SB Compromise
- Impact on SB Luminal Loss
- Impact on Functional Significance

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

	Distal MB segment		
	Pre	Post	p
Lumen VI	3.5±1.5	6.1±2.1	<0.001
Plaque VI	**5.4±1.8**	**5.3±1.7**	**0.227**
Vessel VI	**9.0±2.5**	**11.3±3.1**	**<0.001**

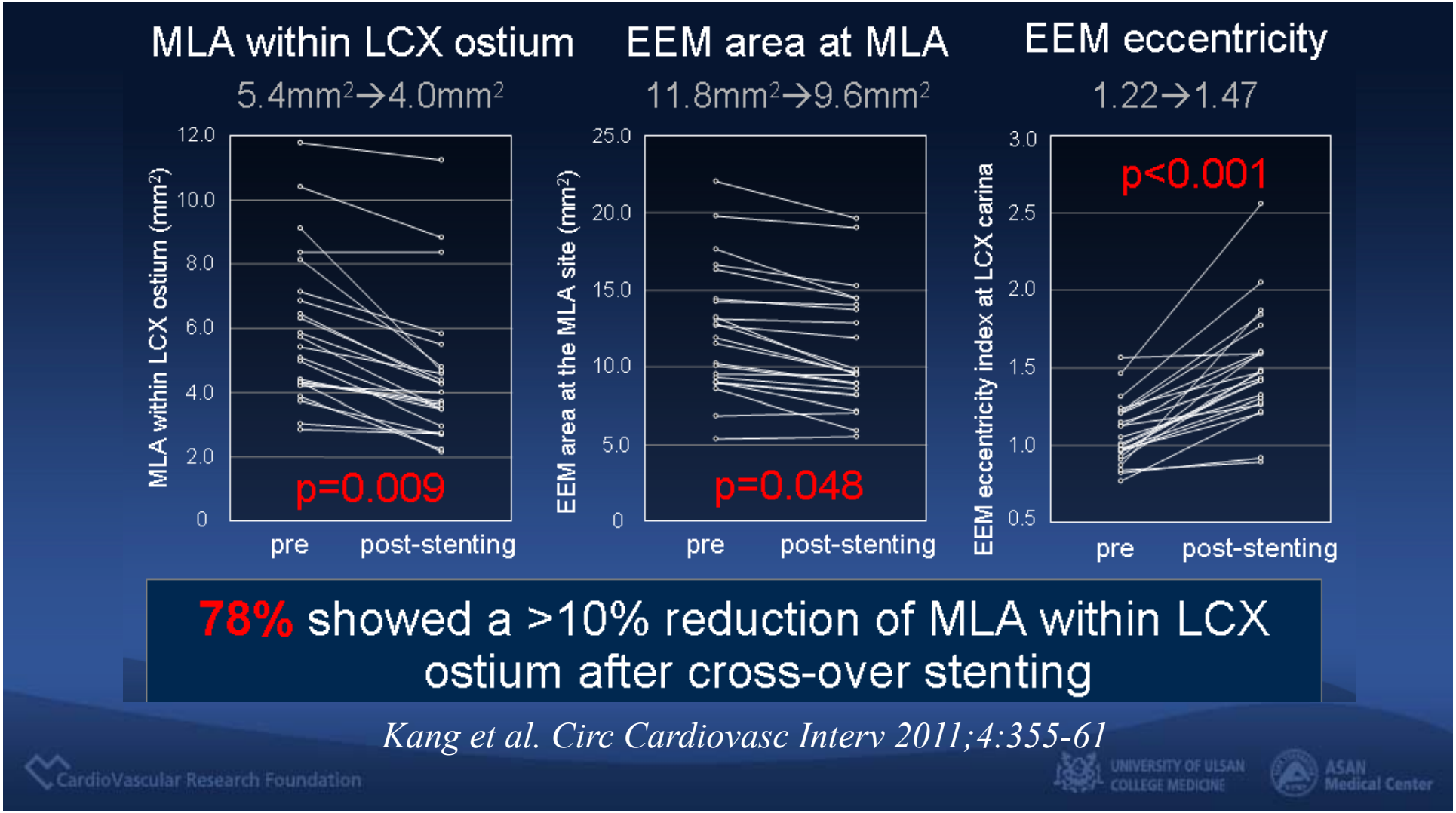


Luminal gain is not caused by plaque shift but by EEM expansion, leading to carina shift and SB compromise

Koo et al. Circ Cardiovasc Interv 2010;3:113-9

Changes in Left Main Bifurcation Geometry After a Single-Stent Crossover Technique

An Intravascular Ultrasound Study Using Direct Imaging of Both the Left Anterior Descending and the Left Circumflex Coronary Arteries Before and After Intervention **(n=23 LM bifurcation lesions)**



Kang et al. Circ Cardiovasc Interv 2011;4:355-61

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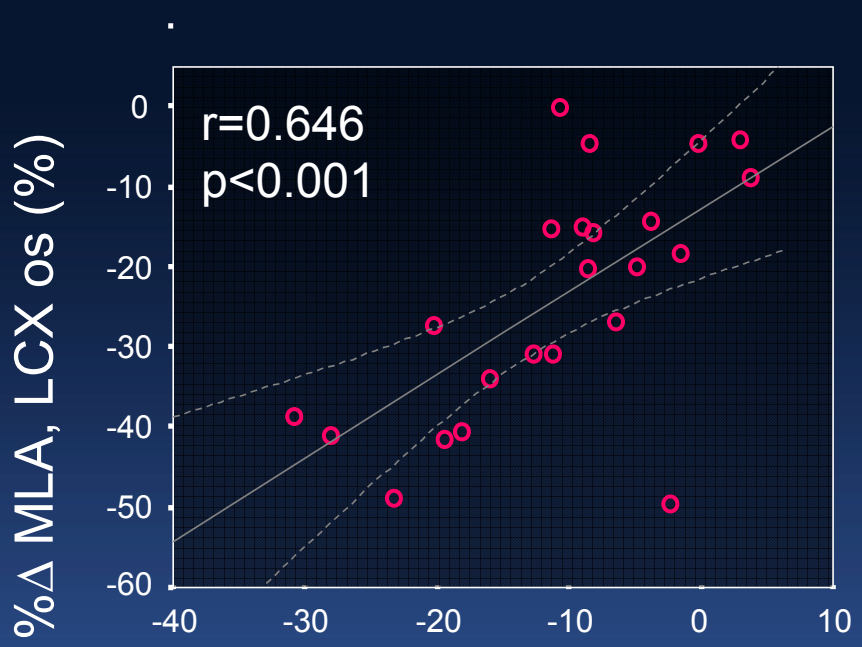
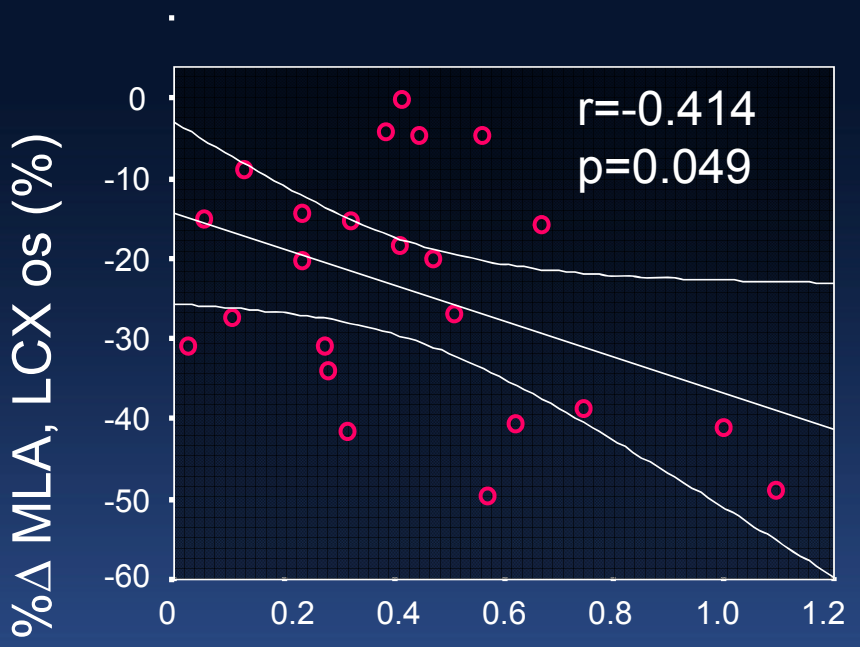
Carina Shift

Primary Mechanism of SB Compromise



%Δ EEM area at MLA site(%)

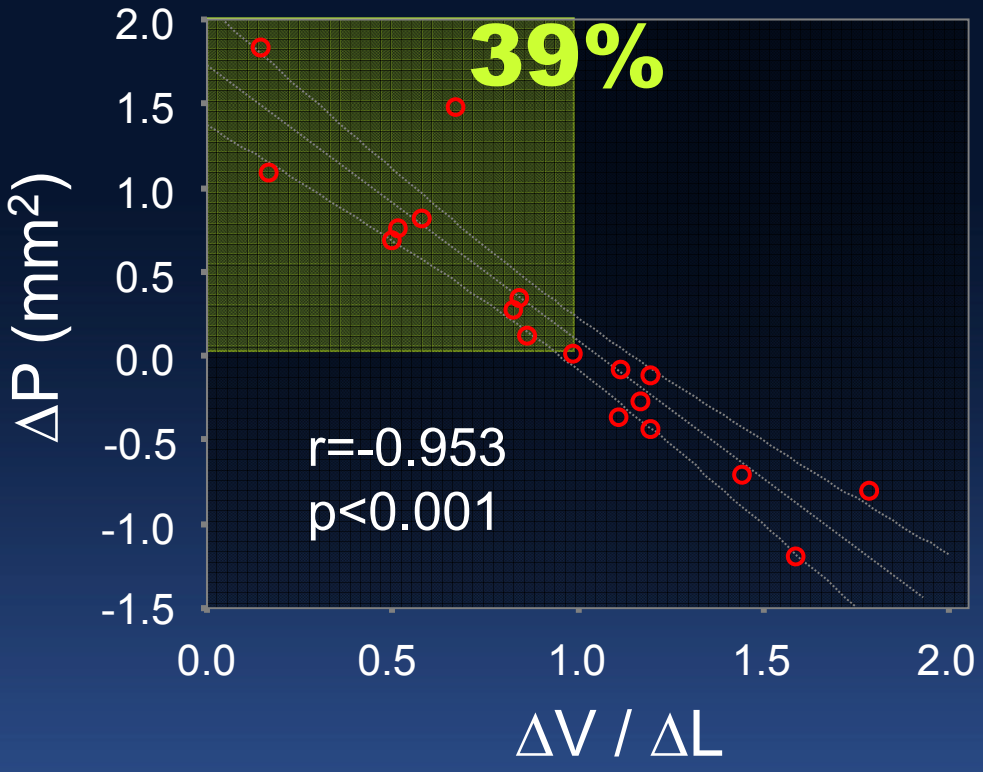


Change in EEM eccentricity

Kang et al. Circ Cariovasc Interv 2011 Accepted

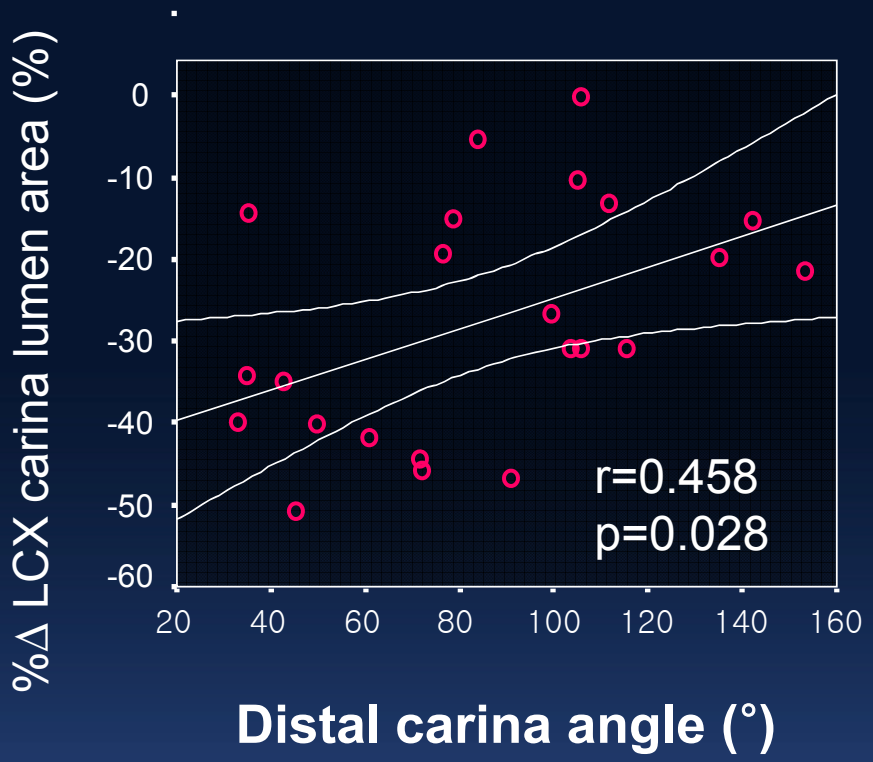
Plaque Redistribution

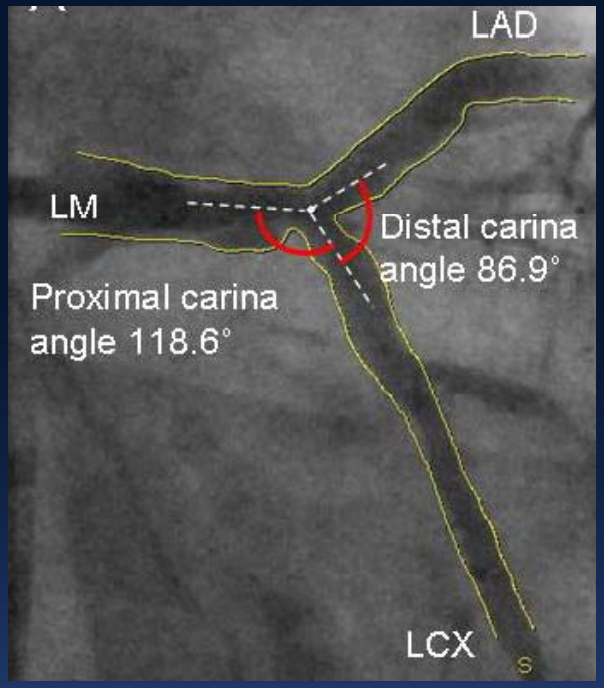
Second Mechanism of SB Compromise



In 39%, plaque redistribution may be superimposed on carina shift to contribute to further lumen loss

Kang et al. Circ Cariovasc Interv 2011 Accepted





A narrow distal carina angle predicts **a greater reduction in MLA and EEM area** at the LCX ostium

Kang et al. Circ Cariovasc Interv 2011 Accepted

Plaque Shift vs. Carina Shift

- Mechanisms of SB Compromise
- Impact on SB Luminal Loss
- Impact on Functional Significance

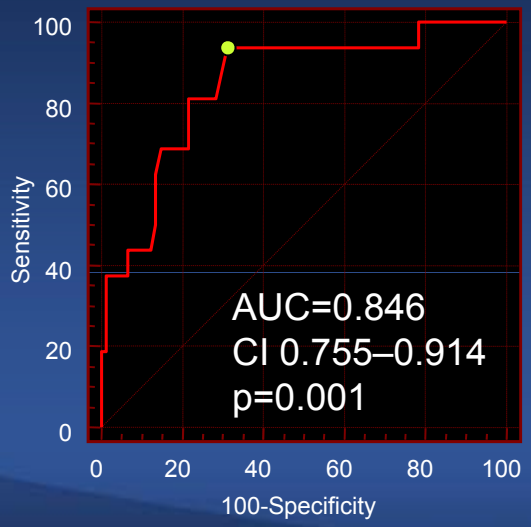
Preintervention Angiographic and Intravascular Ultrasound Predictors for Side Branch Compromise After a Single-Stent Crossover Technique

Soo-Jin Kang, MD, PhD[a], Gary S. Mintz, MD[b], Won-Jang Kim, MD[a], Jong-Young Lee, MD[a], Duk-Woo Park, MD, PhD[a], Seung-Whan Lee, MD, PhD[a], Young-Hak Kim, MD, PhD[a], Cheol Whan Lee, MD, PhD[a], Seong-Wook Park, MD, PhD[a], and Seung-Jung Park, MD, PhD[a,*]

Post-stenting SB FFR <0.80: 18%

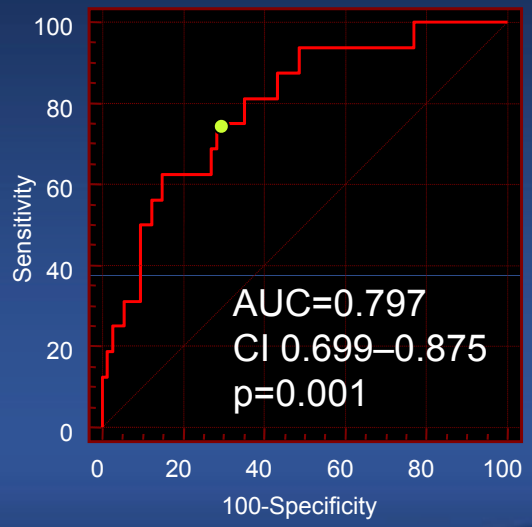
SB FFR <0.75: 9%

SB MLA 2.4mm²



Sensitivity 94%
Specificity 68%
PPV 40%
NPV 98%

Plaque burden 50%



Sensitivity 75%
Specificity 71%
PPV 36%
NPV 93%

Kang et al. Am J Cardiol 2011;107:1787-93

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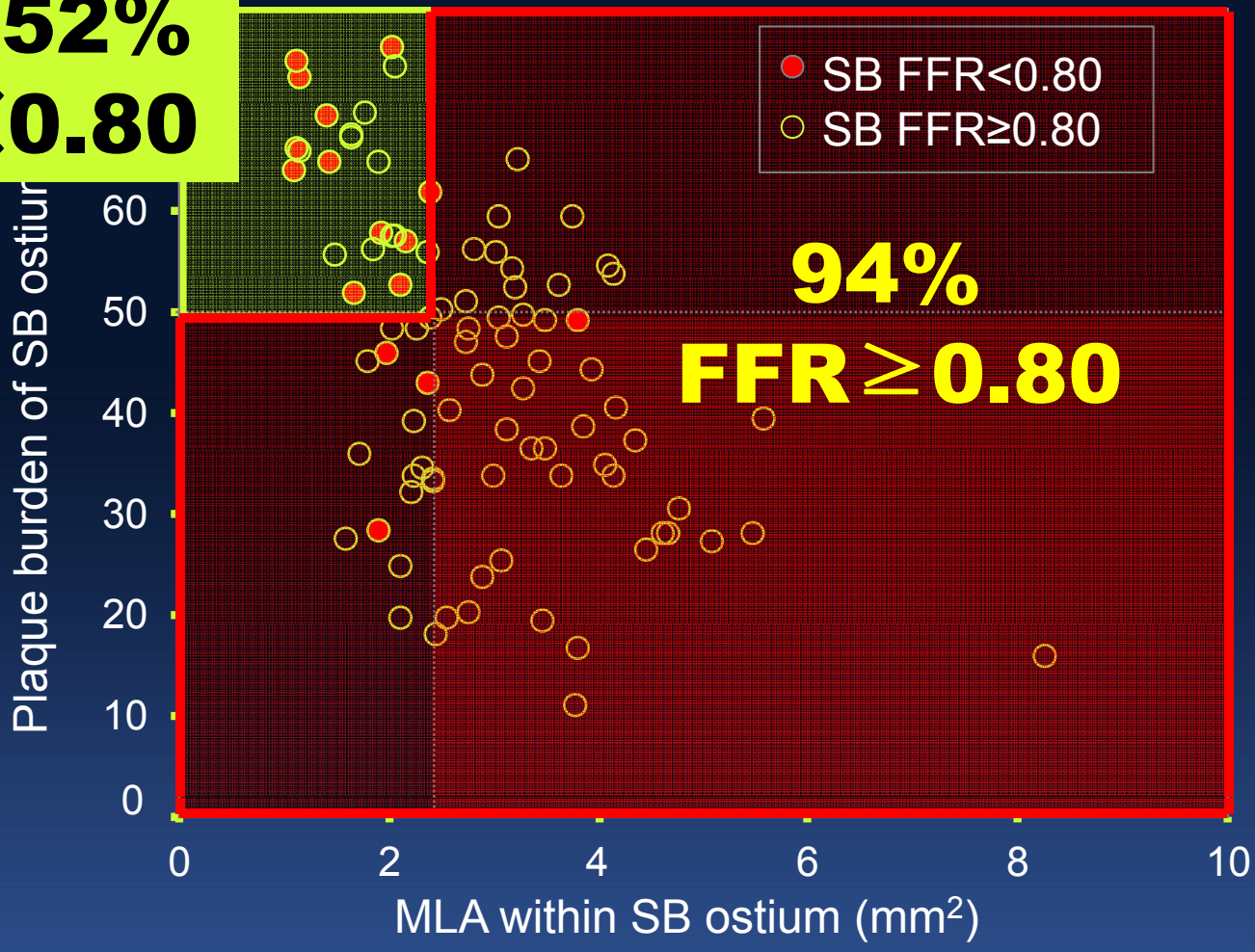
Only 52% FFR<0.80



No suggestion for role of mechanisms of SB change lack of post-stenting SB IVUS

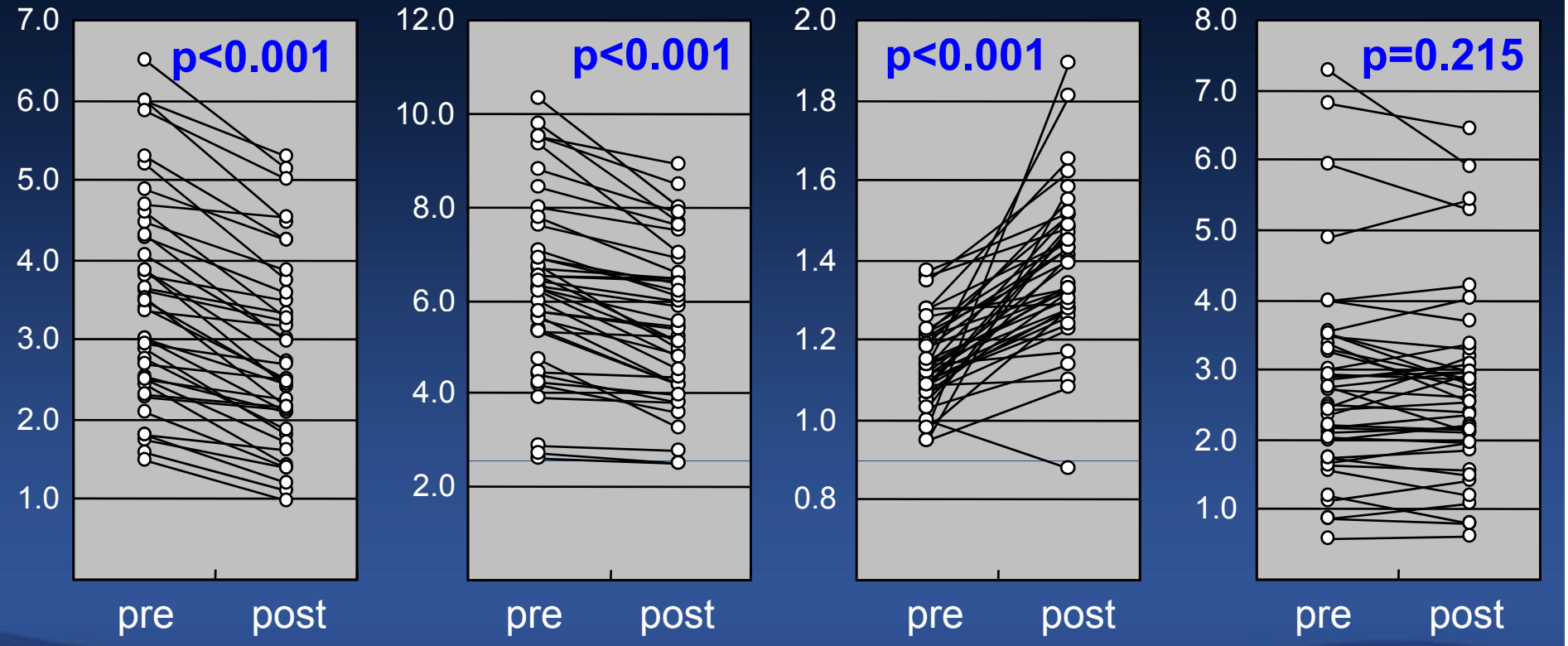
Kang et al. Am J Cardiol 2011;107:1787-93

Impact of Changes in SB Geometry

After MB Stenting in 40 Non-LM Bifurcations

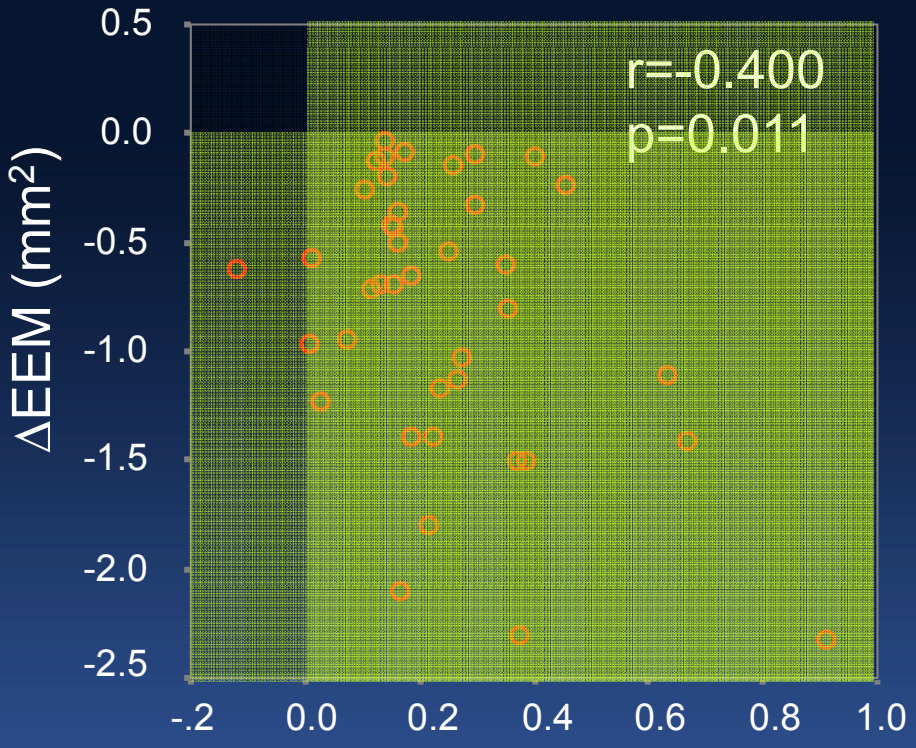
A decrease in SB MLA >10% was found in 78% (31/40)

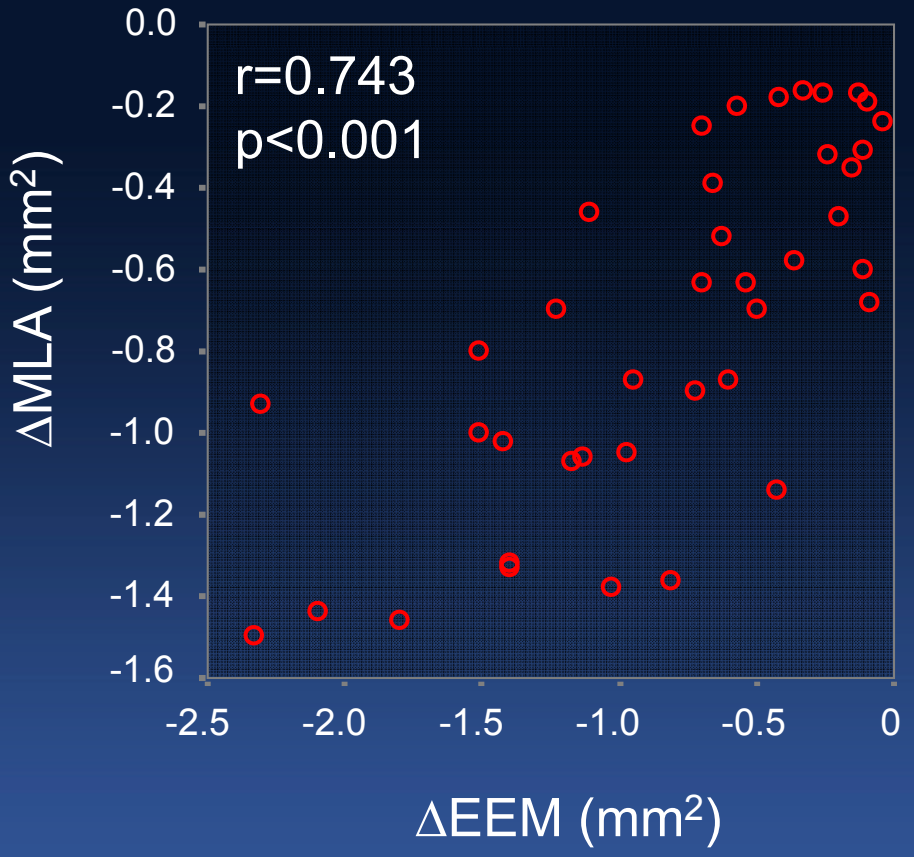
SB MLA (mm^2)	**EEM** (mm^2)	**Eccentricity**	**P+M** (mm^2)
3.5±1.3→2.8±1.2	6.3±1.9→5.5±1.7	1.1±1.1→1.4±0.2	2.8±1.5→2.7±1.3



AMC Preliminary

Eccentricity↑ EEM↓
"Carina Shift"

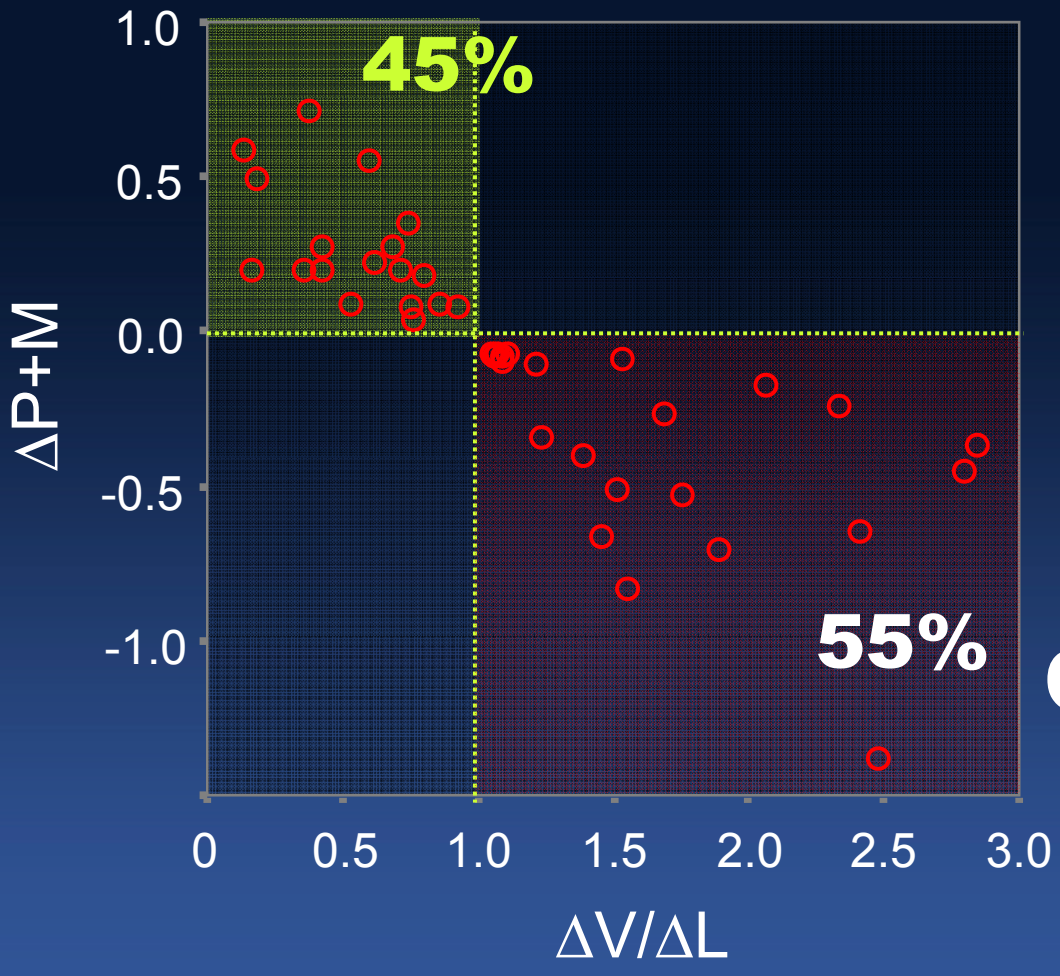




Variable degree of carina shift characterized by Eccentricity↑EEM↓ was associated in almost all lesions

AMC Preliminary

Plaque Shift + Carina Shift



Isolated
Carina Shift

AMC Preliminary

Impact of Mechanisms on FFR

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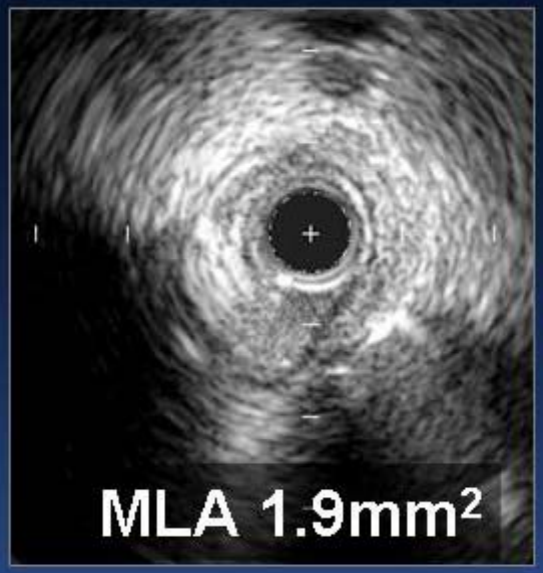

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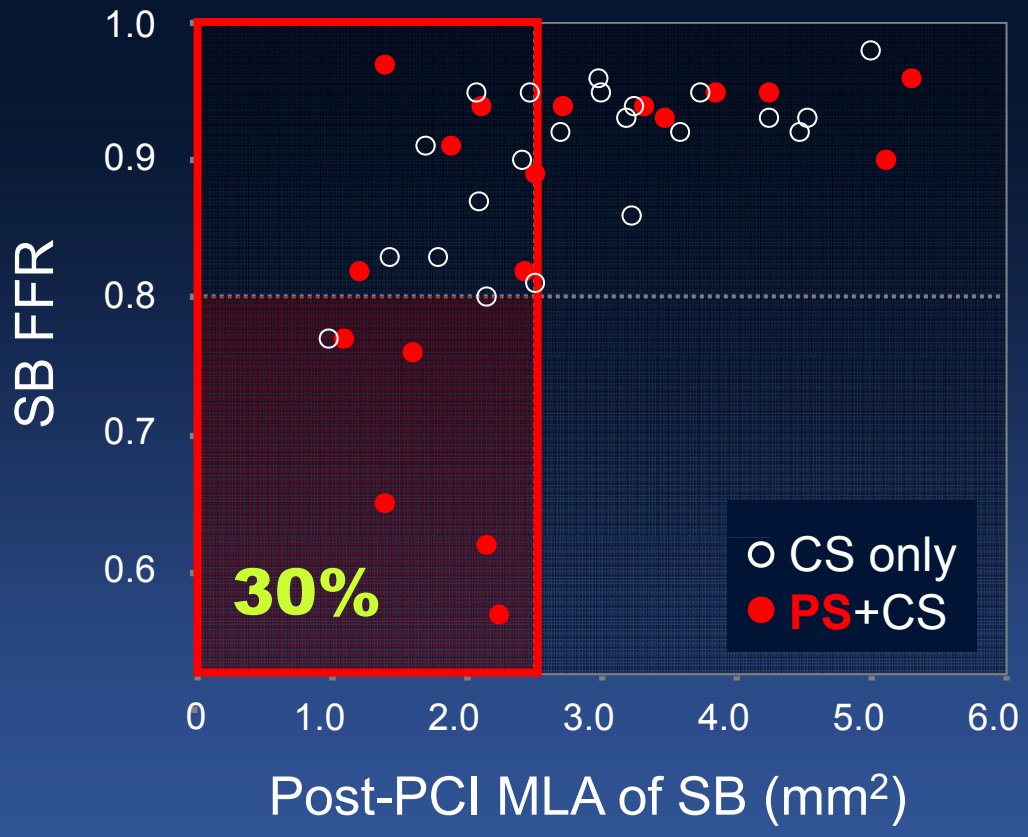
Post-stenting SB MLA poorly predicts functional significance of SB

SB FFR measurement

Relationship Between MLA–FFR

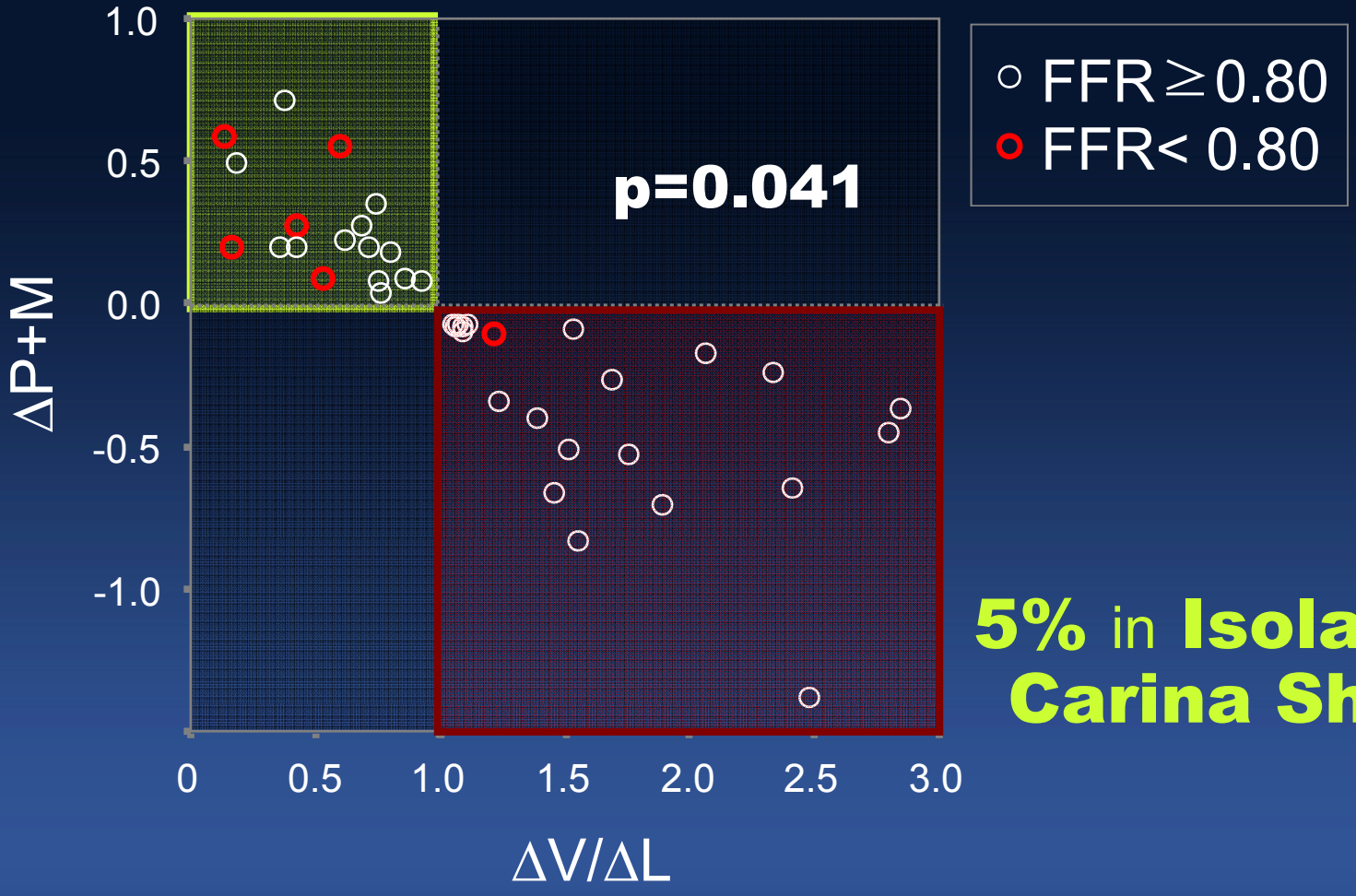
Overall, 15% (6/40) showed FFR<0.80



AMC Preliminary

Impact of Mechanisms on FFR

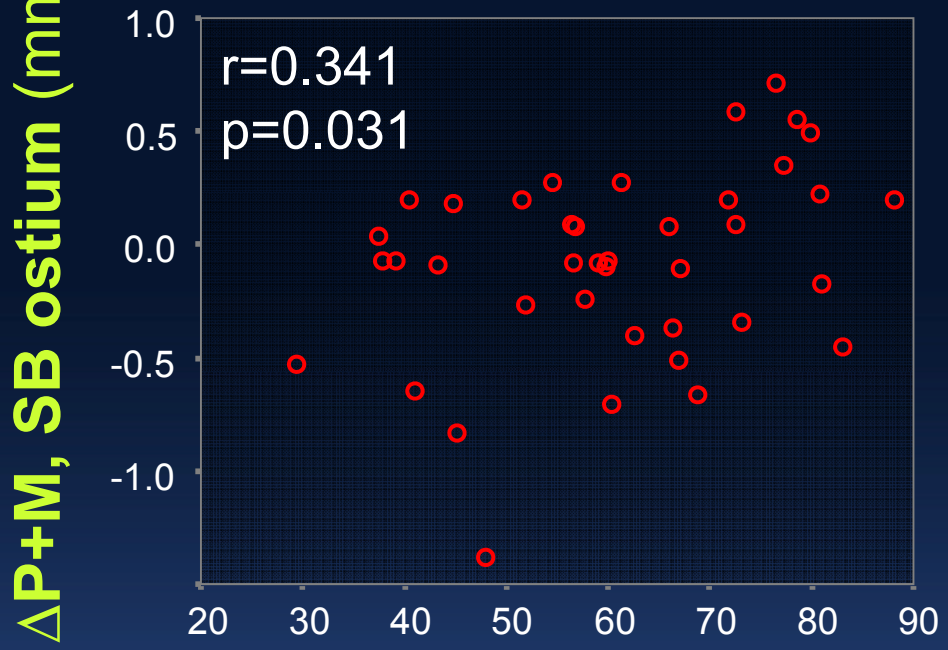
28% in the presence of **Plaque Shift**

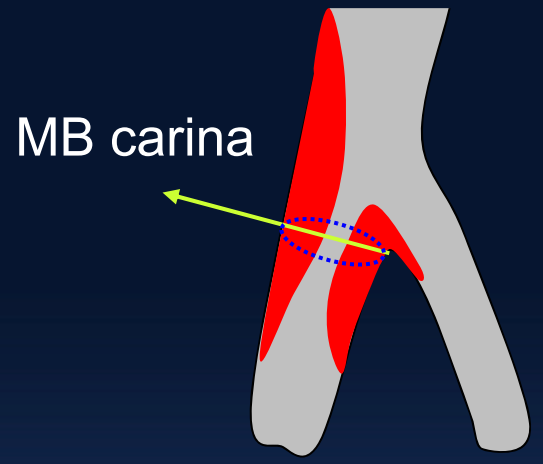


5% in **Isolated Carina Shift**

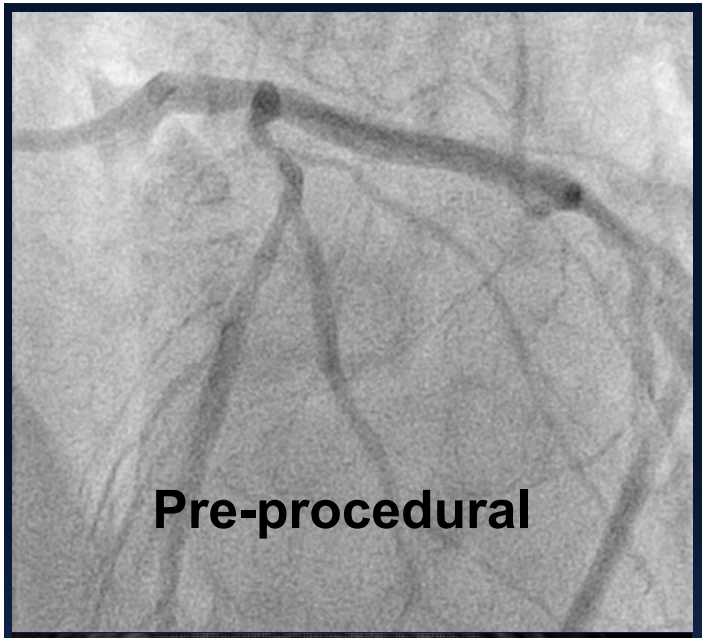
AMC Preliminary

Predictor for Plaque Shift



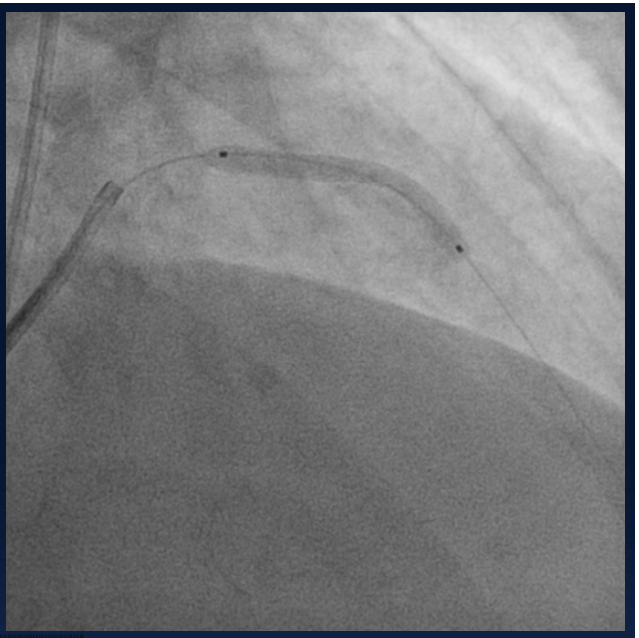


	r	p
Lumen area, MB carina	-0.137	0.399
Plaque burden, MB carina	**0.341**	**0.031**
Plaque burden, distal MB	0.299	0.061
Plaque burden, proximal MB	-0.039	0.813
Plaque burden, SB ostium	-0.218	0.176

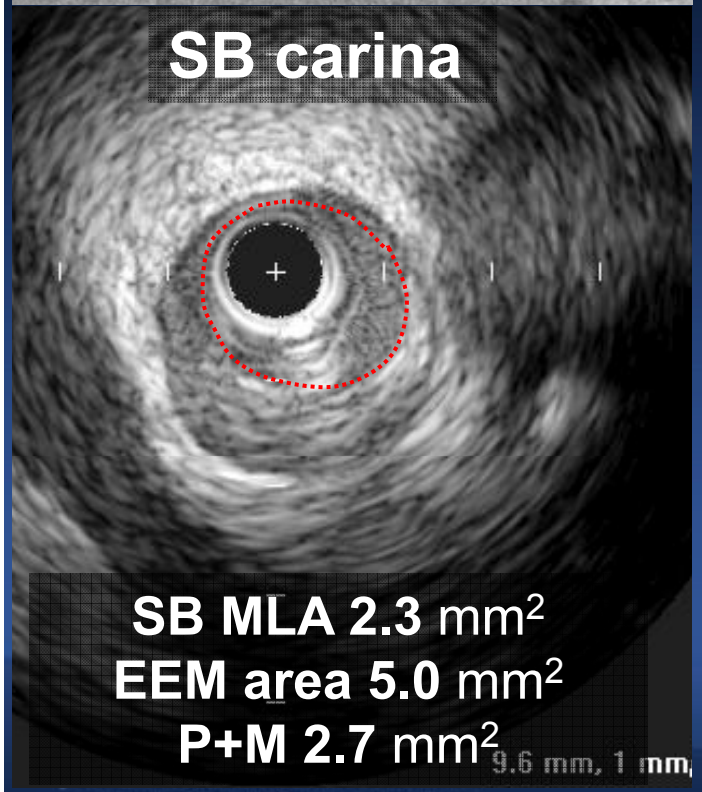


Pre-procedural

MB Cross-over

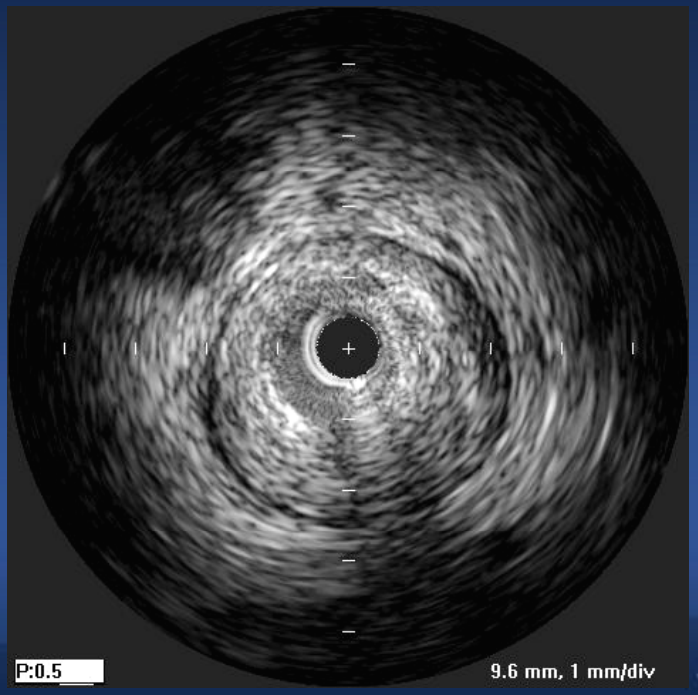


SB carina



SB MLA 2.3 mm^2
EEM area 5.0 mm^2
P+M 2.7 mm^2

MB distal to carina



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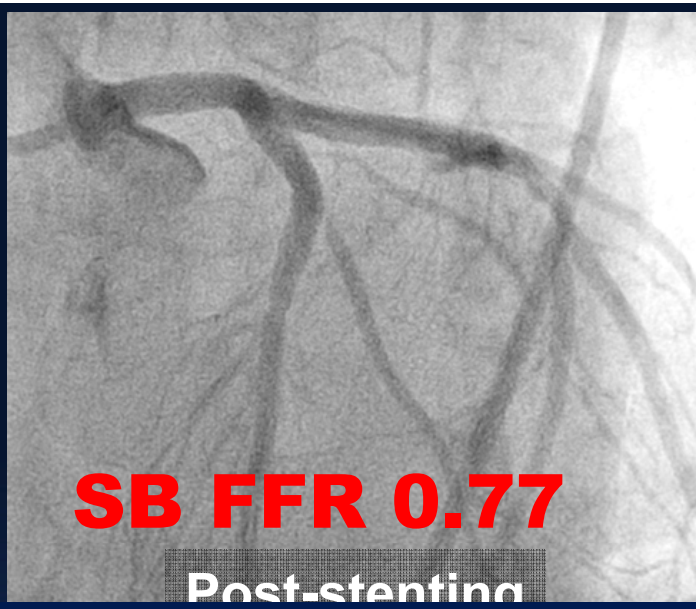
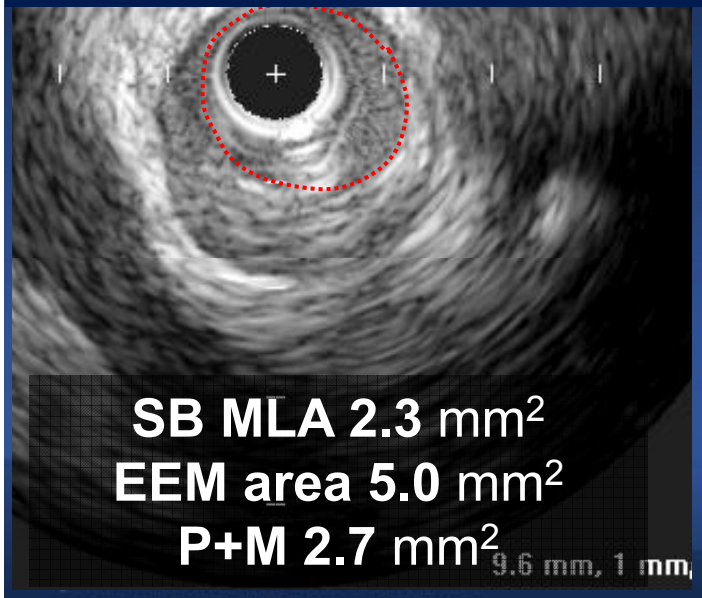
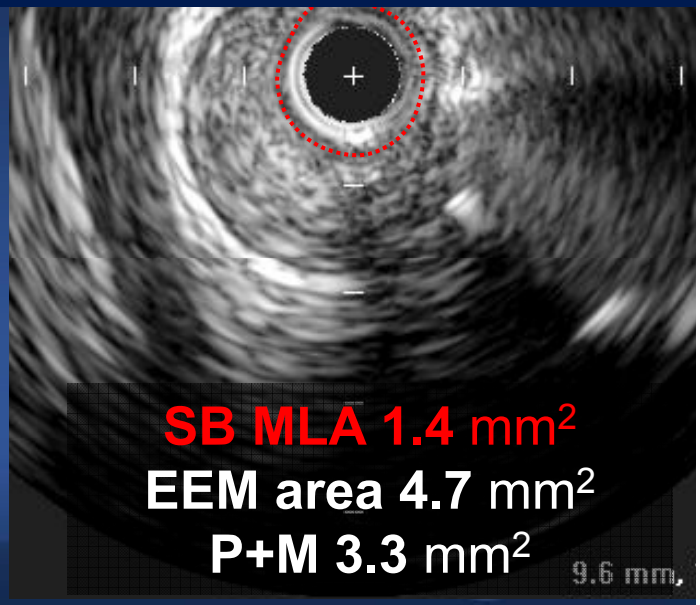
MB Cross-over



Functional SB compromise was mainly due to plaque shift which is predicted by huge PB at the MB carina



Area Change	
ΔLumen	-1.0mm²
ΔVessel	-0.3mm²
ΔPlaque	**+0.7mm²**



Summary

- Anatomical SB jail is more common than functional compromise
- Considering the frequent mismatch between MLA and FFR, functional compromise should be confirmed by post-stenting FFR
- Carina shift with variable degree is a general mechanism of SB jailing, occurs in almost all lesions
- Plaque shift is less frequent, but more aggressive mechanism for functional SB compromise