

IVUS Insights for the Treatment of Bifurcation and Left Main Lesions

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Pre-intervention Assessment



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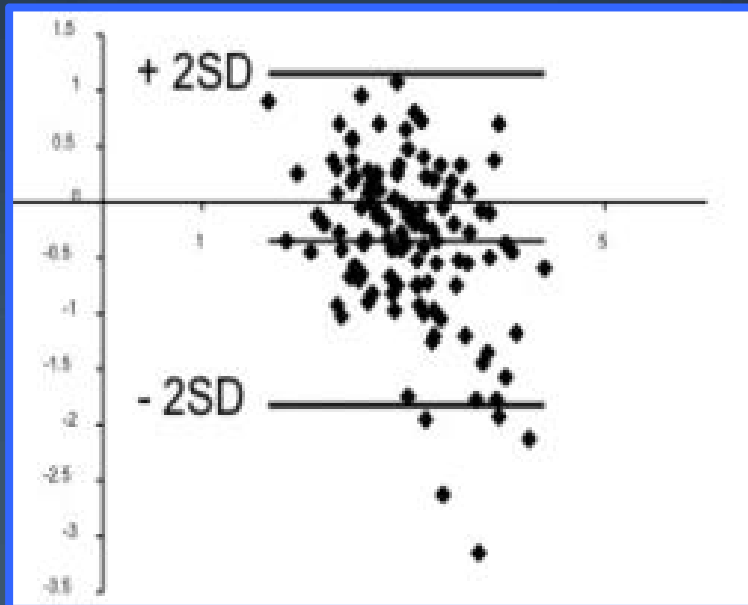


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IVUS assessment of LCX ostium from the LAD-LM (or vice versa) - MLD

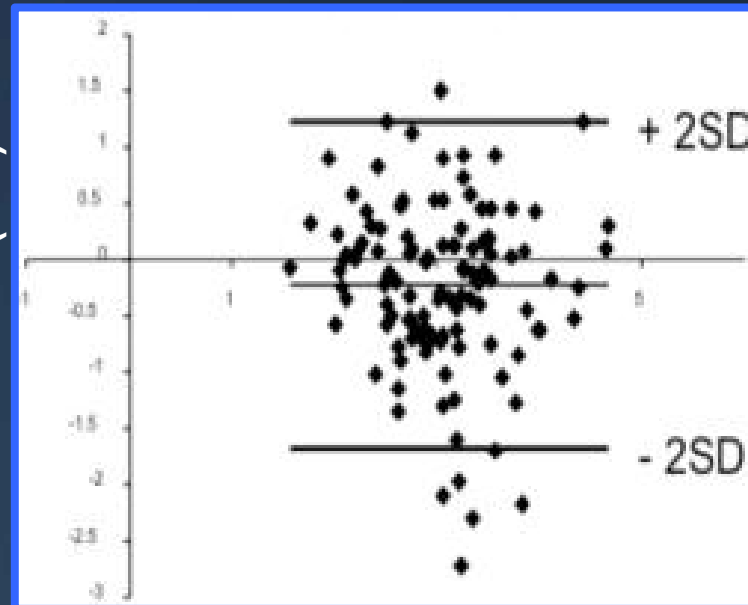
Evaluation of the LAD from the LM-LCX pullback

Difference between estimated and directly measured lumen diameters (mm)



Evaluation of the LCX from the LM-LAD pullback

Difference between estimated and directly measured lumen diameters (mm)



If you want to quantify the degree of lumen compromise, you must image the daughter branches directly.

IVUS assessment of LCX ostium from the LAD-LM (or vice versa) – plaque burden

Evaluation of the LAD from the LM-LCX pullback

	Sensitivity	Specificity
Plaque burden >40%	59%	45%
Plaque burden >70%	78%	42%

Evaluation of the LCX from the LM-LAD pullback

	Sensitivity	Specificity
Plaque burden >40%	67%	55%
Plaque burden >70%	88%	42%

If you want to quantify the plaque burden, you must image the daughter branches directly.



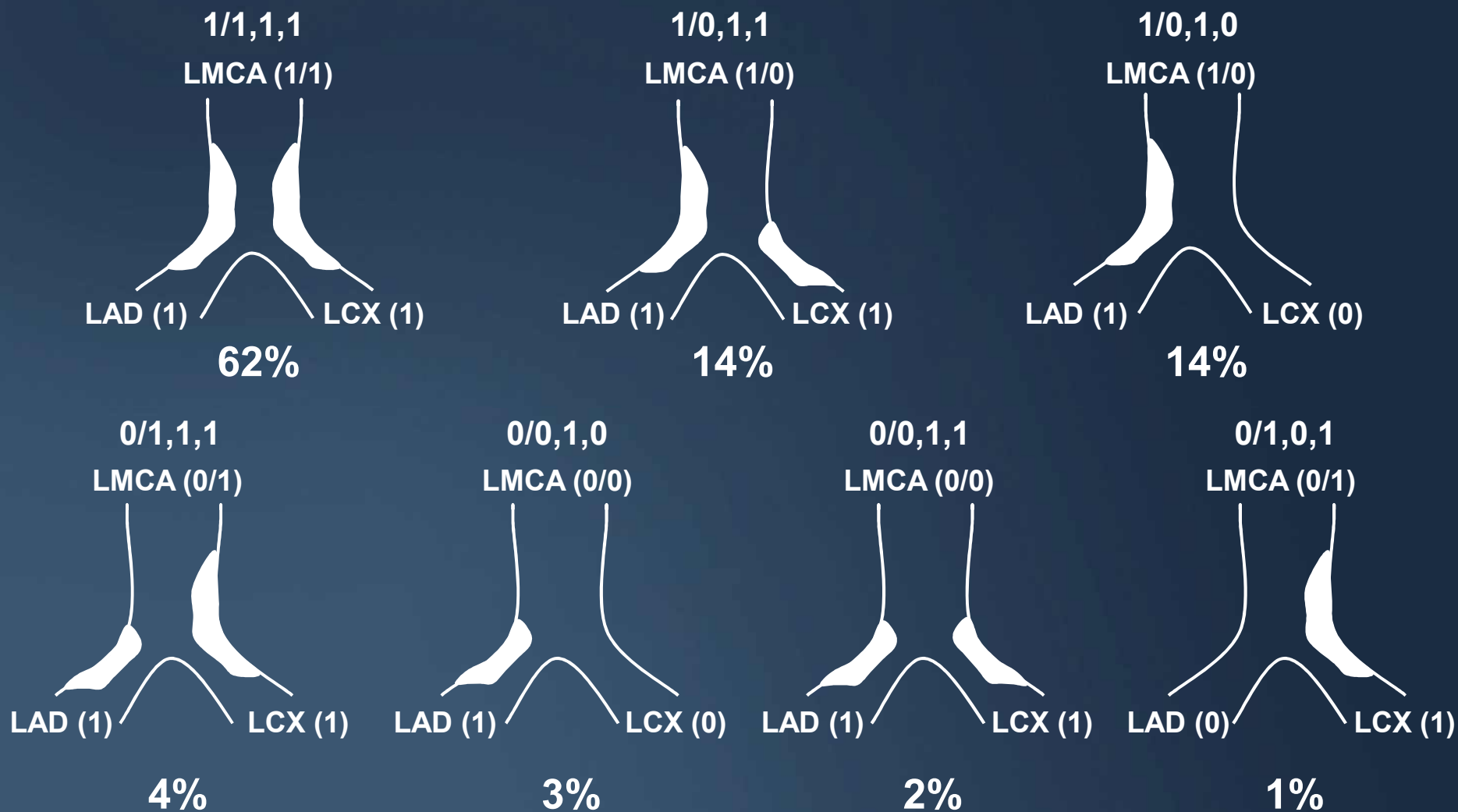
- ***In 25% of patients, the left main MLA differs by 1mm² when imaged from a pullback beginning in the LAD vs a pullback beginning in the LCX.***
- ***Since IVUS can artificially increase, but not decrease lumen dimensions, the smallest MLA is always the most accurate***



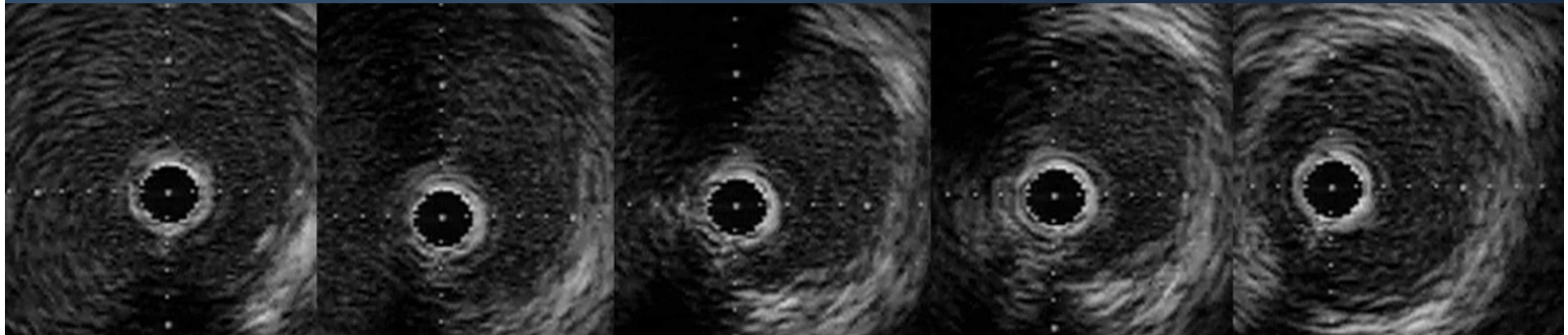
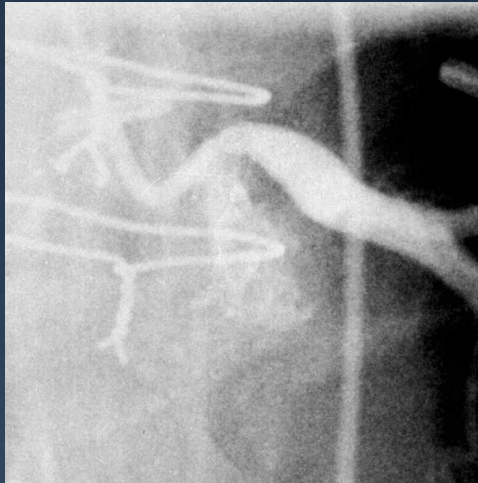
- **Plaque shifting during bifurcation intervention is a misconception. The carina is almost always free of disease; and conventional angiographic classifications are almost always misleading. Instead, the carina is deflected and “reset” and the ostium of a sidebranch (with or without a stent) is distorted.**
 - **The carina is more compliant than the eccentric plaque opposite the flow divider**
 - **Negative remodeling may contribute to this phenomenon**
- **IVUS shows more diffuse disease, especially continuous plaque from the LM into the LAD.**



IVUS plaque distribution in 140 distal LMCA bifurcation lesions

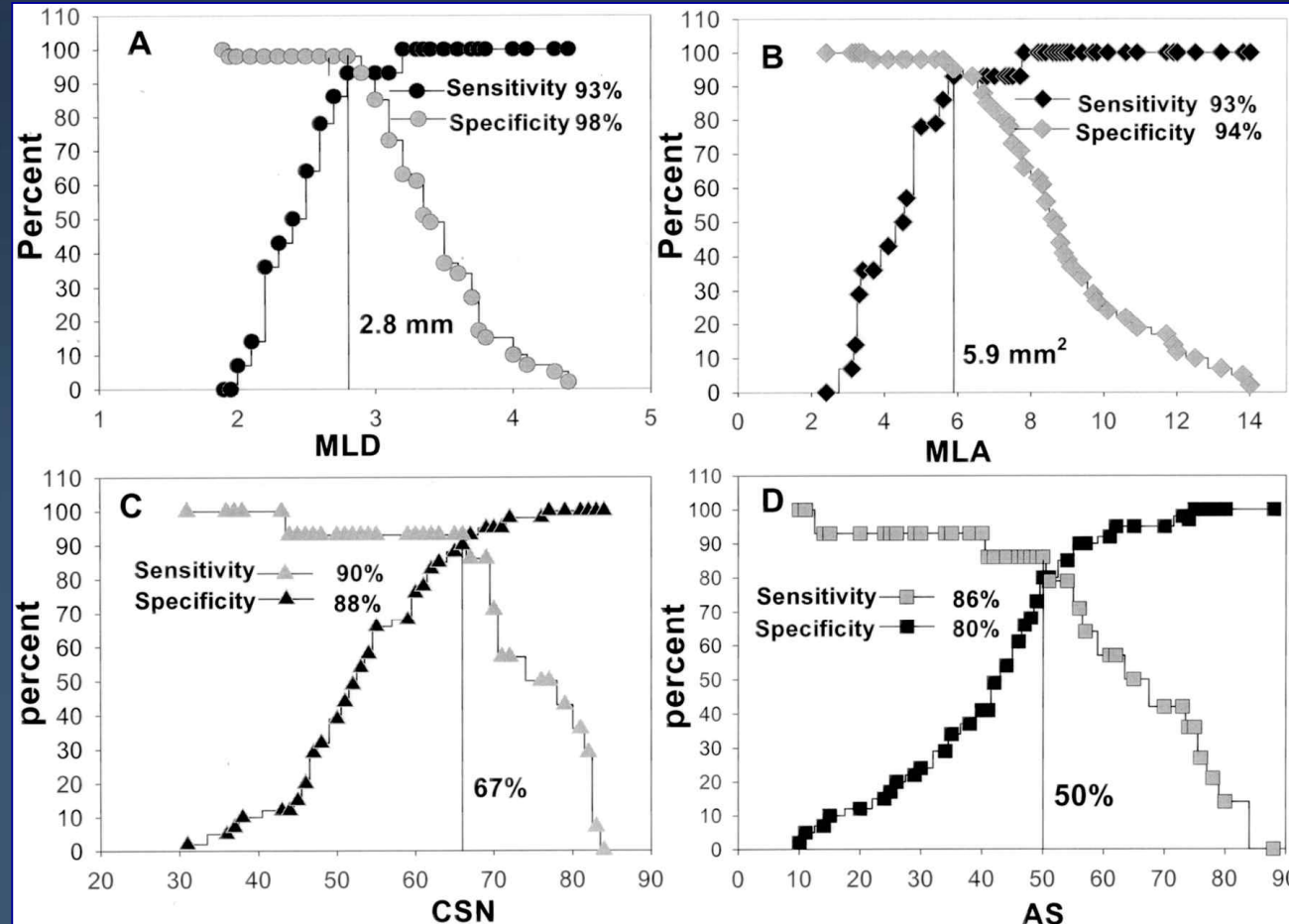






0 —————> 1.0 —————> 4.0mm

IVUS determinants of LMCA FFR <0.75



IVUS assessment of LM disease significance is based on lumen dimensions, not plaque burden



Plaque burden (P&M/EEM) = 68%
MLA=7.2mm²



Post-intervention assessment



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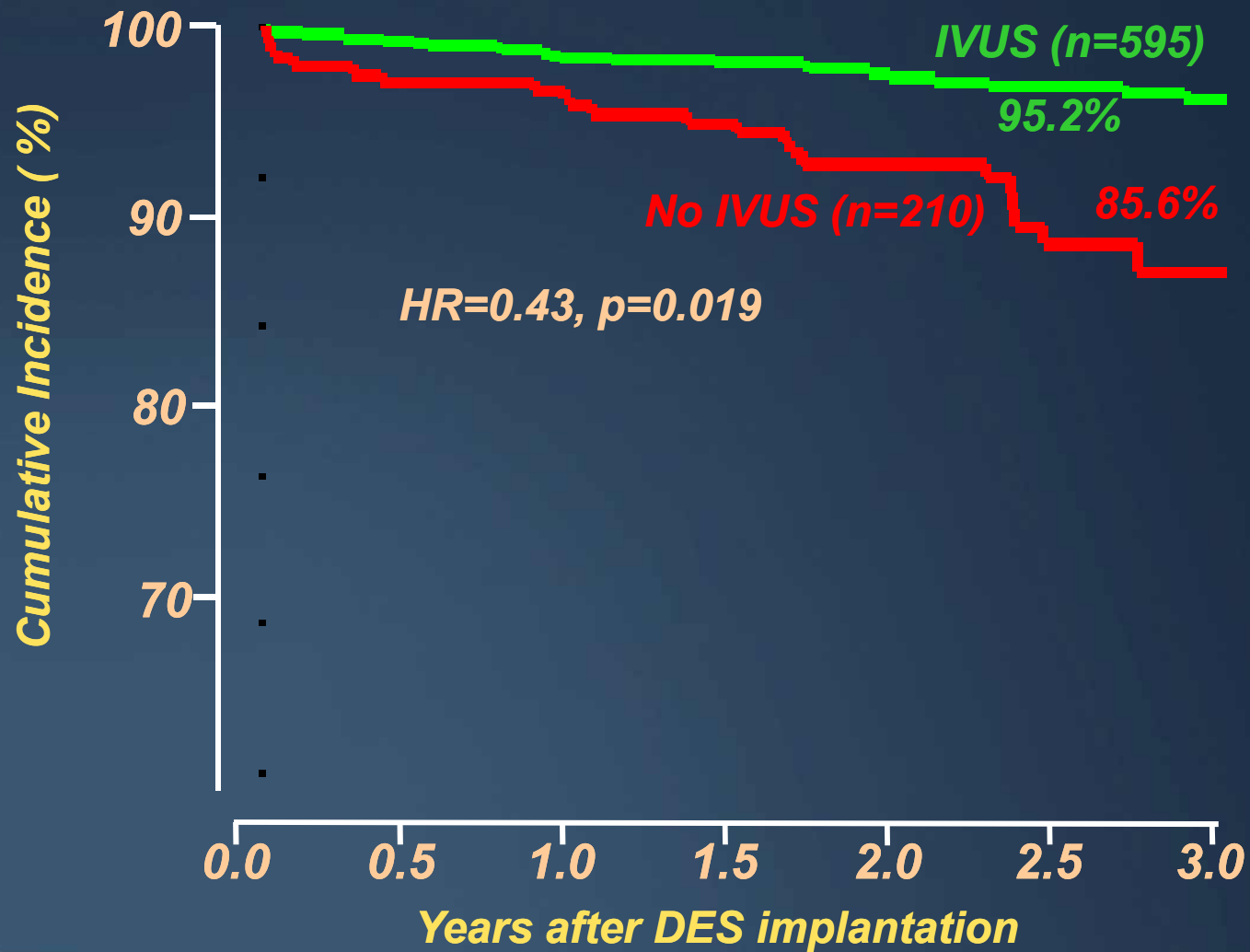
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MAIN-COMPARE Registry

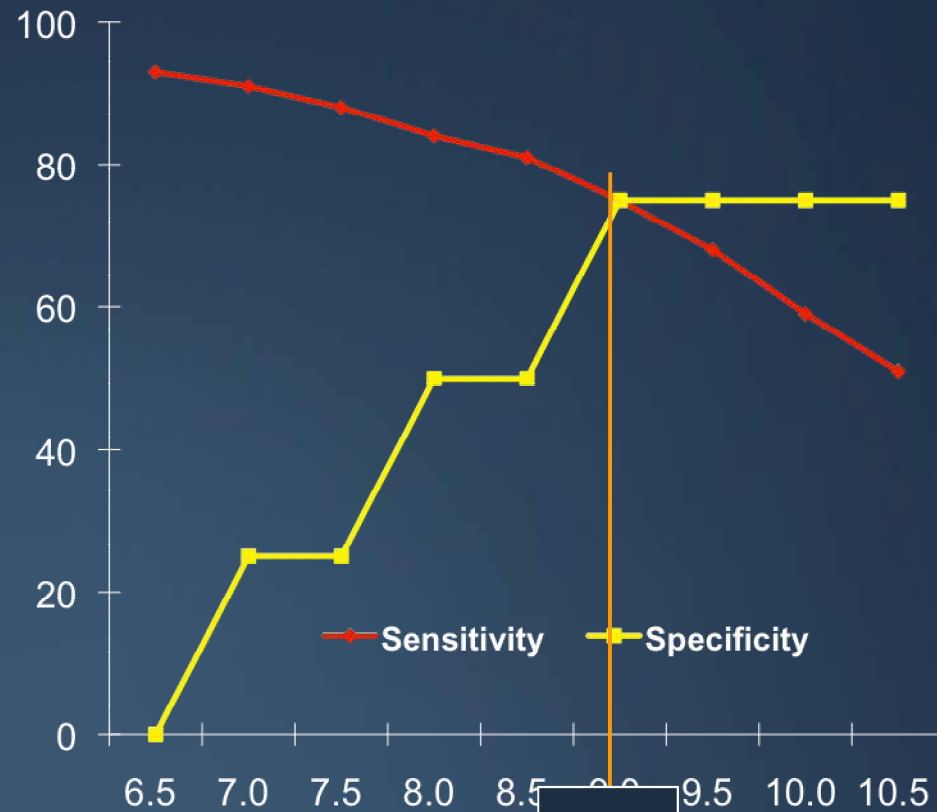
- 975 pts with unprotected LMCA stenosis underwent elective stenting under IVUS (n=756) or angiographic (n=219) guidance and were followed for 3 years
- IVUS-guidance was significantly associated with reduced death (HR=0.31 overall and HR=0.27 in DES) as compared with angiography guidance
- In 201 propensity score-matched pairs of pts in the overall cohort, there was a tendency for reduced 3-year mortality with IVUS-guidance compared with angiography guidance (6.0% vs. 13.6%, HR=0.54).
- In 145 propensity score-matched pairs of pts treated with DES, 3-year mortality was lower with IVUS-guidance as compared with angiography-guidance (4.7% vs. 16.0%, HR=0.39, p=0.048)
- However, the use of IVUS-guidance did not reduce the risk of myocardial infarction or target vessel revascularization.



Impact of IVUS Guidance on All-Cause Mortality After LMCA DES Implantation



“Optimal” MSA and TLR after LMCA DES Implantation (n=595)



Minimum stent area (mm²)

Pre-intervention

Post-intervention



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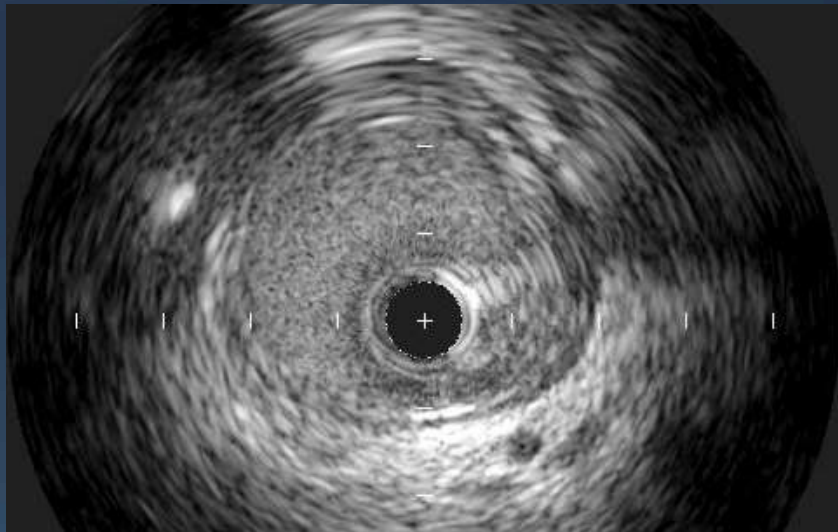


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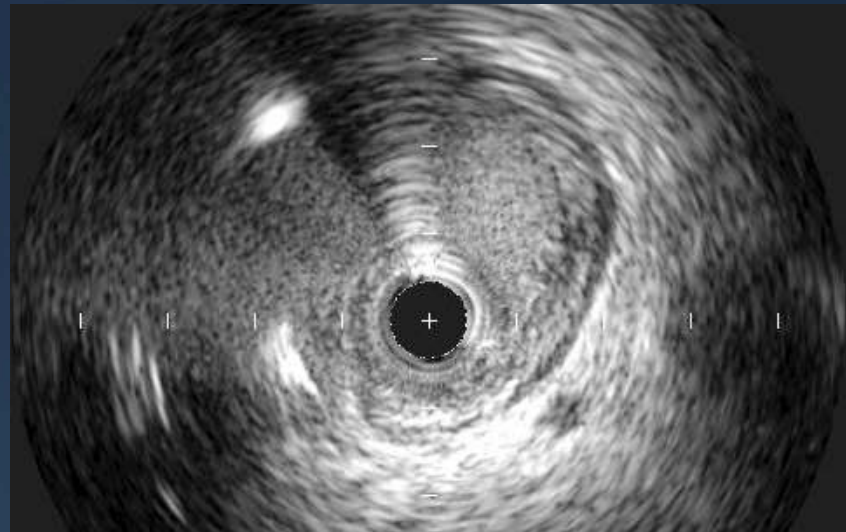


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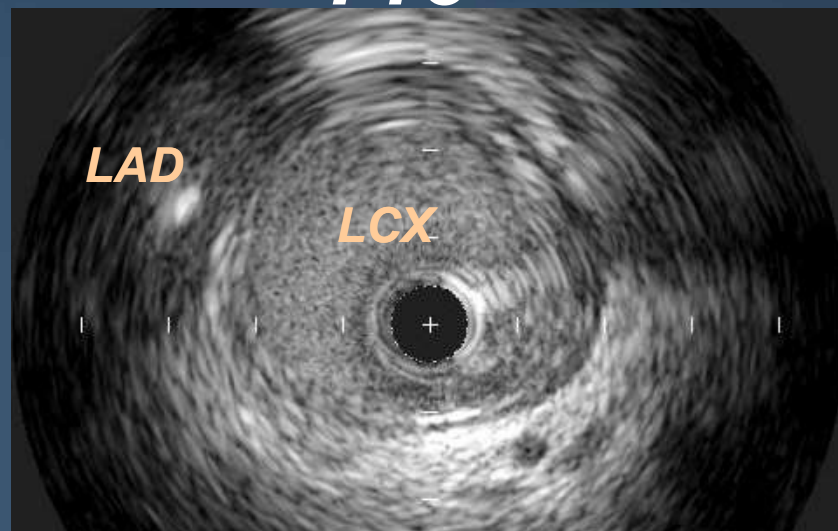
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Pre

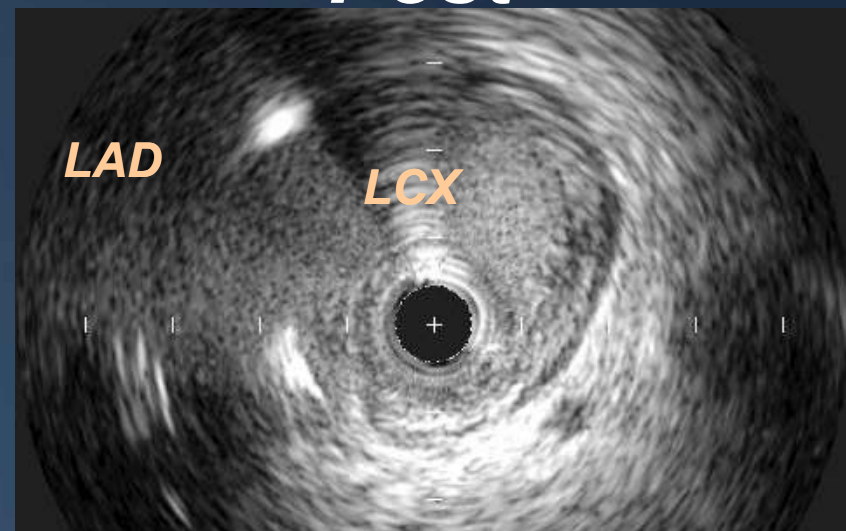


Post



LAD

LCX



LAD

LCX



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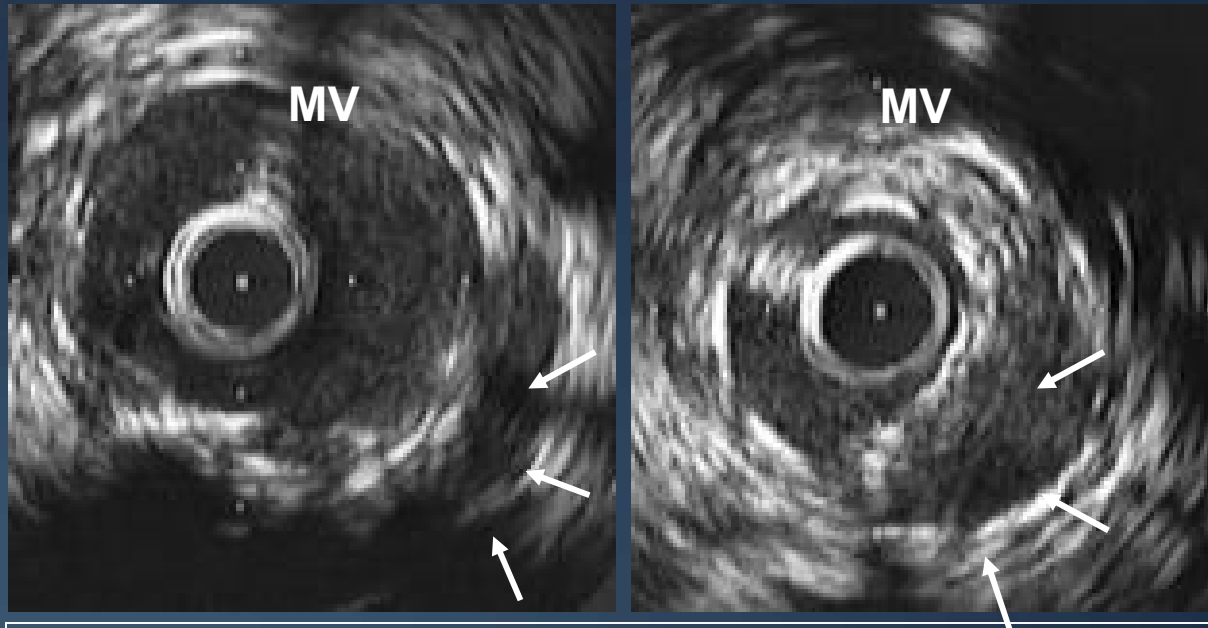
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Forty patients with bifurcation lesions underwent crush-stenting. Postintervention IVUS was performed in both branches in 25 lesions and only the main vessel in 15 lesions

- **When only the main vessel was considered, MSA was found in the crush area (rather than the proximal or distal part of the main vessel stent) in 56%.**
- **When both the MV and the SB were considered, the MSA was found at the SB ostium in 68%.**



Incomplete Crush Apposition



Incomplete crushing – incomplete apposition of the SB or MV stent struts against the MV wall proximal to the carina, found in >60% of non-LM lesions

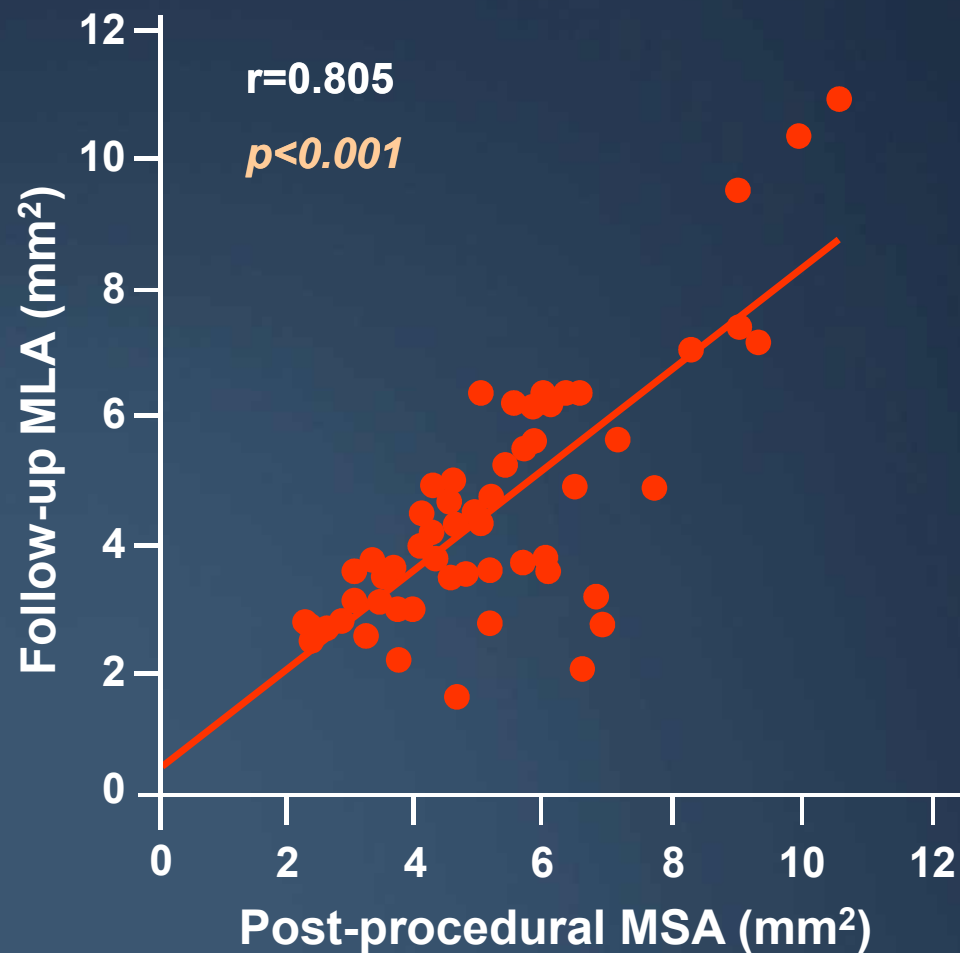


Serial IVUS (post-intervention and follow-up) analysis of the main and sidebranches in 73 bifurcation lesions treated DES T-stenting

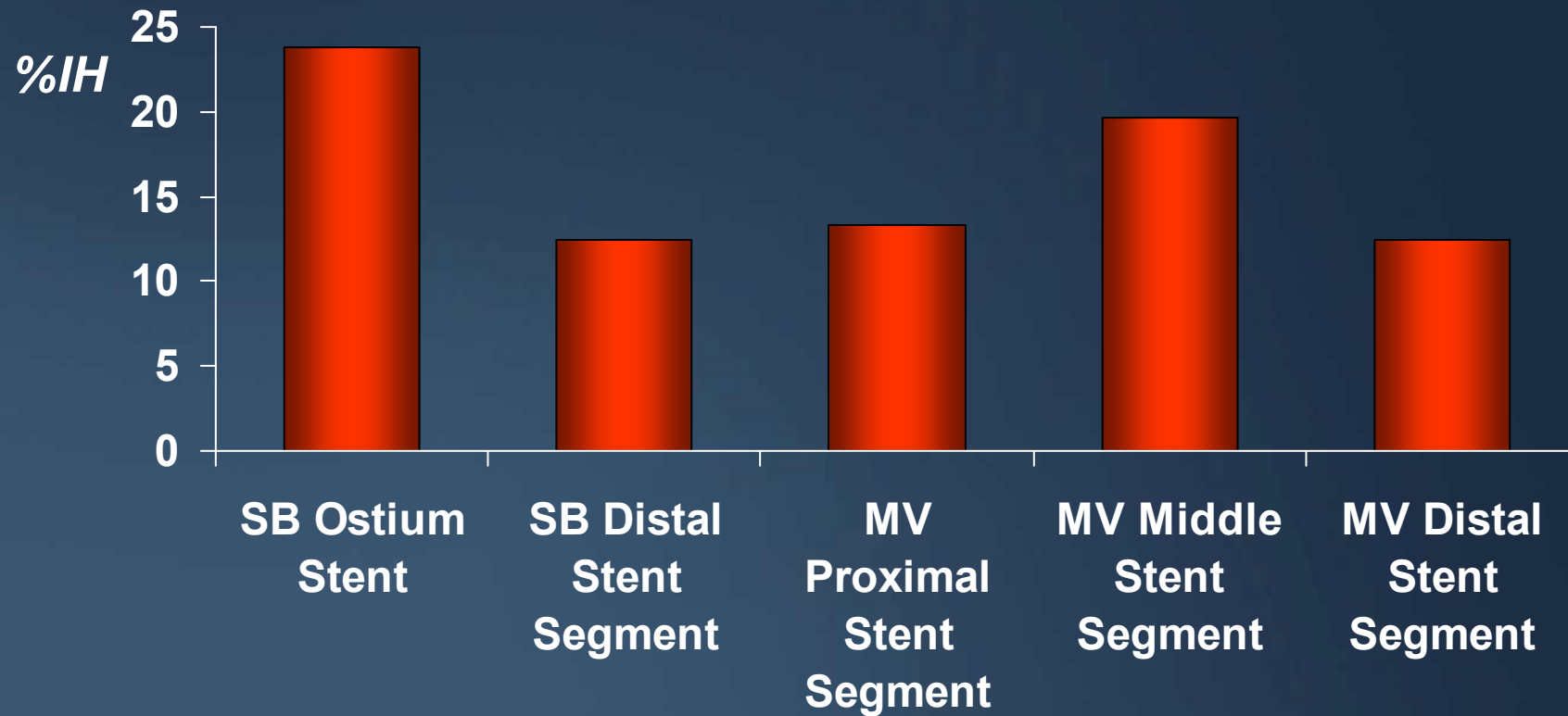
- Stent expansion was significantly less in the SB than in the MV ($87.1 \pm 20.4\%$ vs. $97.0 \pm 29.1\%$, $p=0.007$).
- The SB ostium was the most frequent site of the post-procedural MSA.
- At the SB ostium, follow-up MLA correlated with post-procedural MSA ($r=0.805$, $p < 0.001$).
- The percentage of neointimal area was higher at the SB ostium than at the MV proximal, MV distal, and SB distal stent ($p < 0.0001$).
- The optimal threshold of post-procedural MSA to predict follow-up $MLA \geq 4\text{mm}^2$ at the SB ostium was 4.83mm^2 , yielding an area under the curve of 0.88 (95% confidence interval: 0.80 to 0.95).



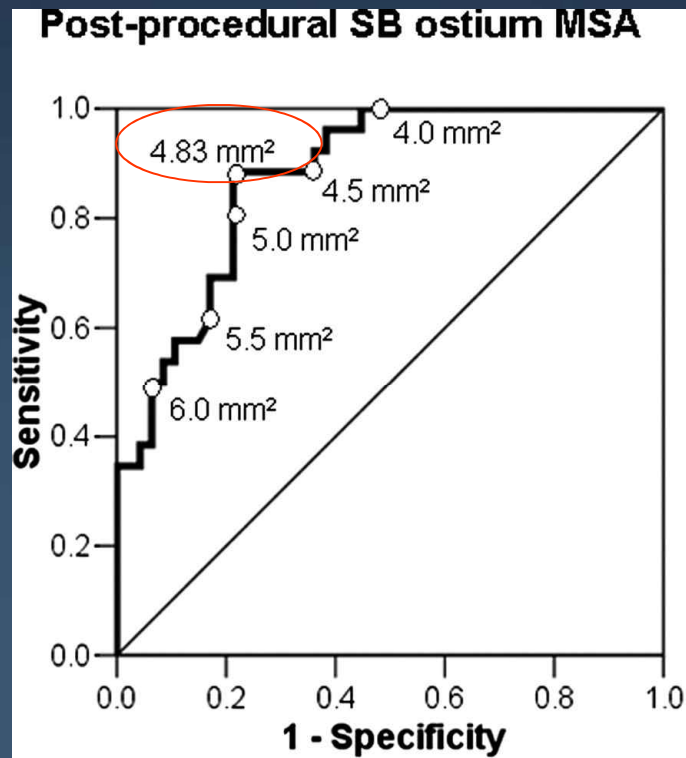
Correlation Between Follow-Up MLA vs Post-Procedural MSA



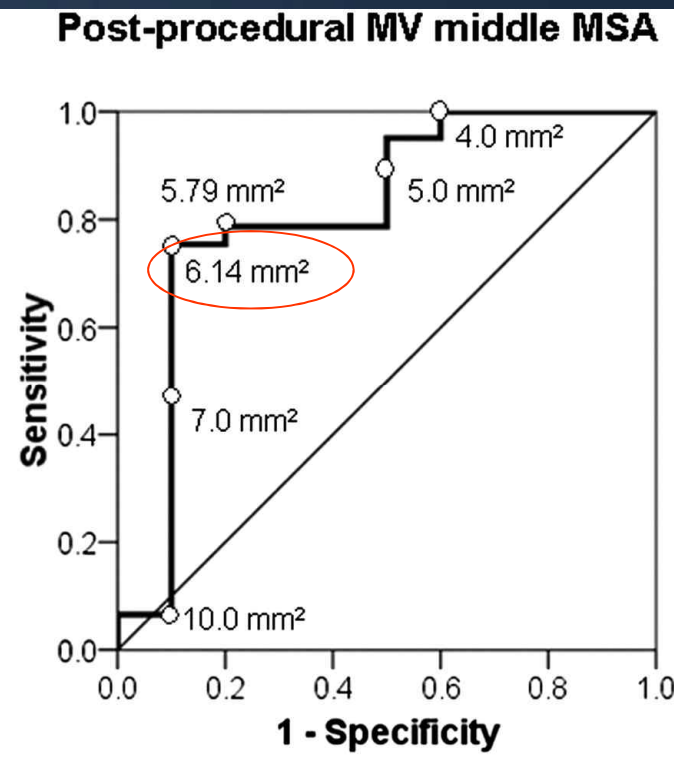
Percentage of Neointimal Hyperplasia in the Sidebranch and Main Vessel



The Optimal Cutoff Value of Post-Procedural MSA to Predict a Follow-up MLA $\geq 4\text{mm}^2$ After Bifurcation T-Stenting

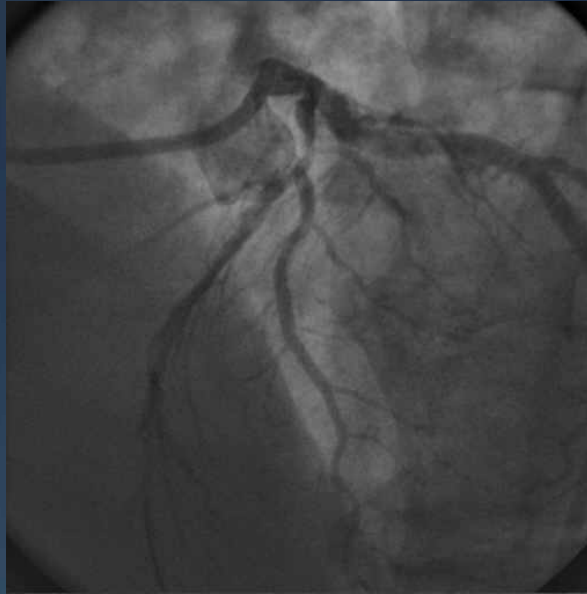


AUC=0.88
(95%CH=0.80-0.95)

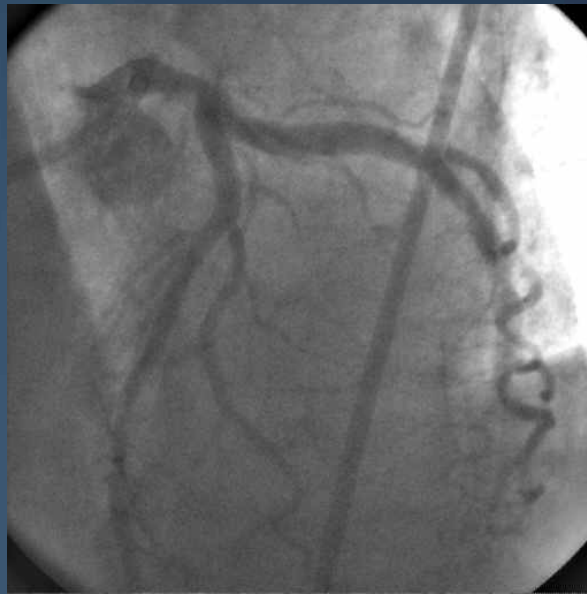


AUC=0.81
(95%CH=0.64-0.99)

**Pre-
intervention**



**Post-
intervention**



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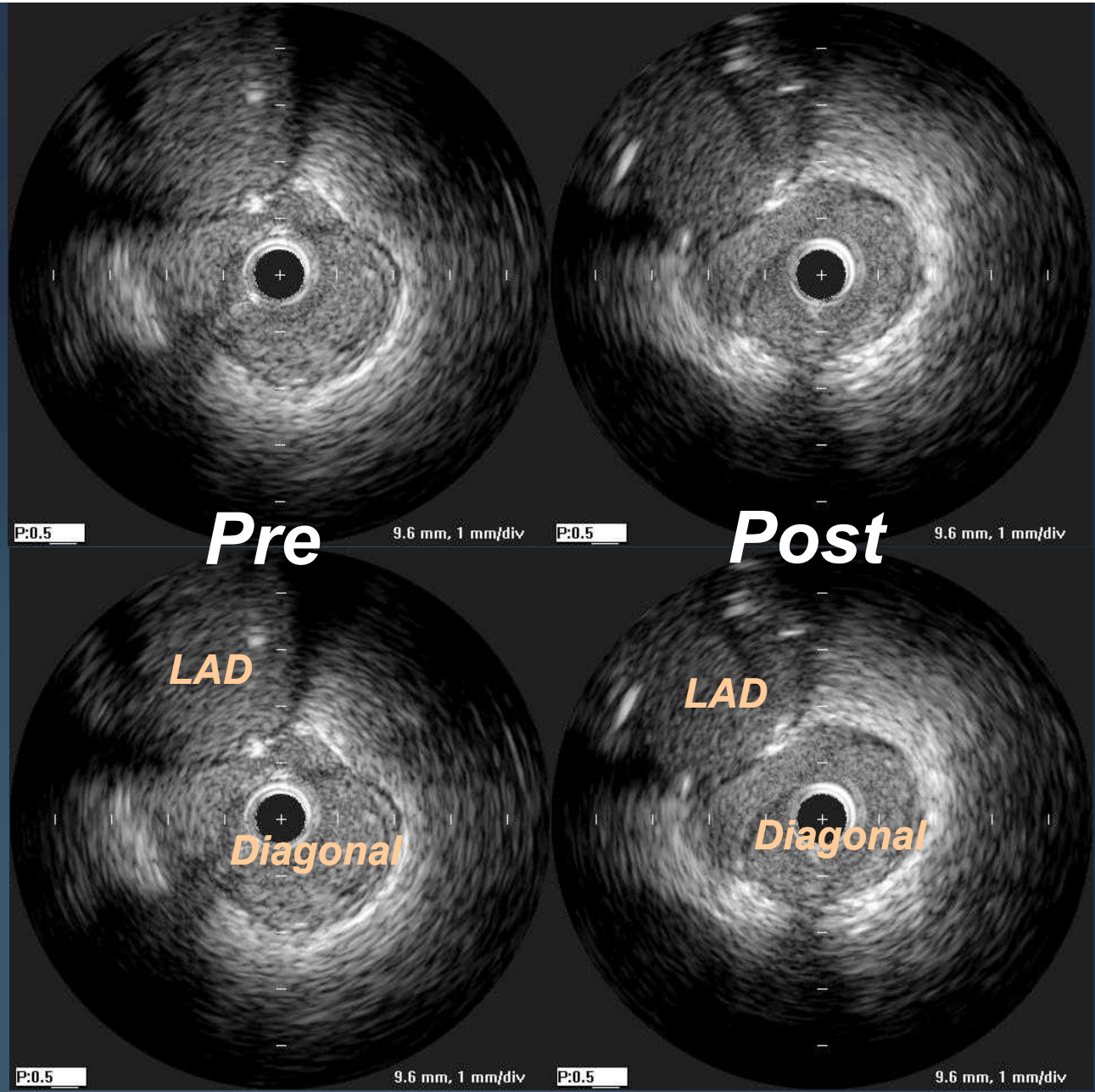


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Pre

Post

LAD

LAD

Diagonal

Diagonal

P:0.5

9.6 mm, 1 mm/div

P:0.5

9.6 mm, 1 mm/div

P:0.5

9.6 mm, 1 mm/div

P:0.5

9.6 mm, 1 mm/div



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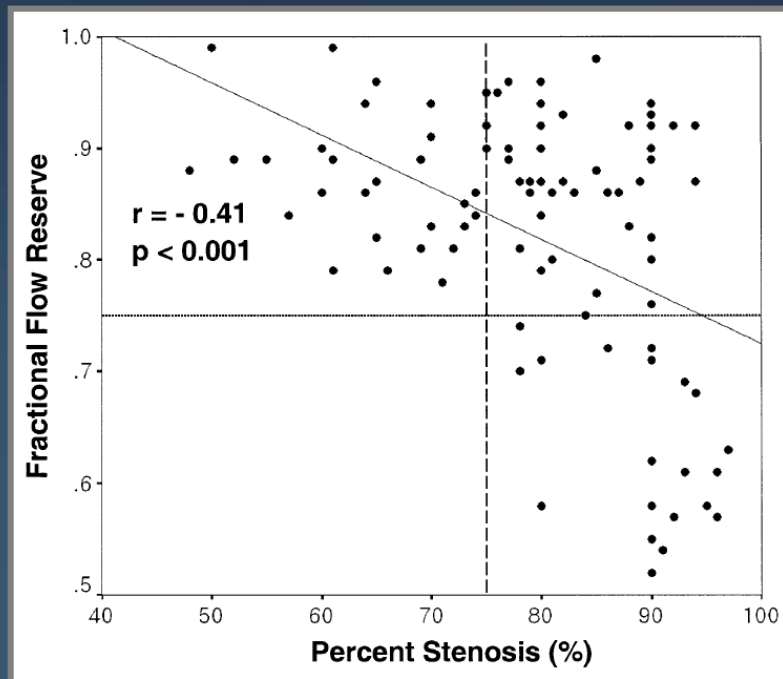


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FFR Assessment of 97 Jailed Side Branch Lesions



- *There was a negative correlation between the % stenosis on QCA and FFR ($r = -0.41$, $p < 0.001$).*
- *Only 27% of lesions with QCA DS $>75\%$ were functionally significant as assessed by FFR (<0.75).*

