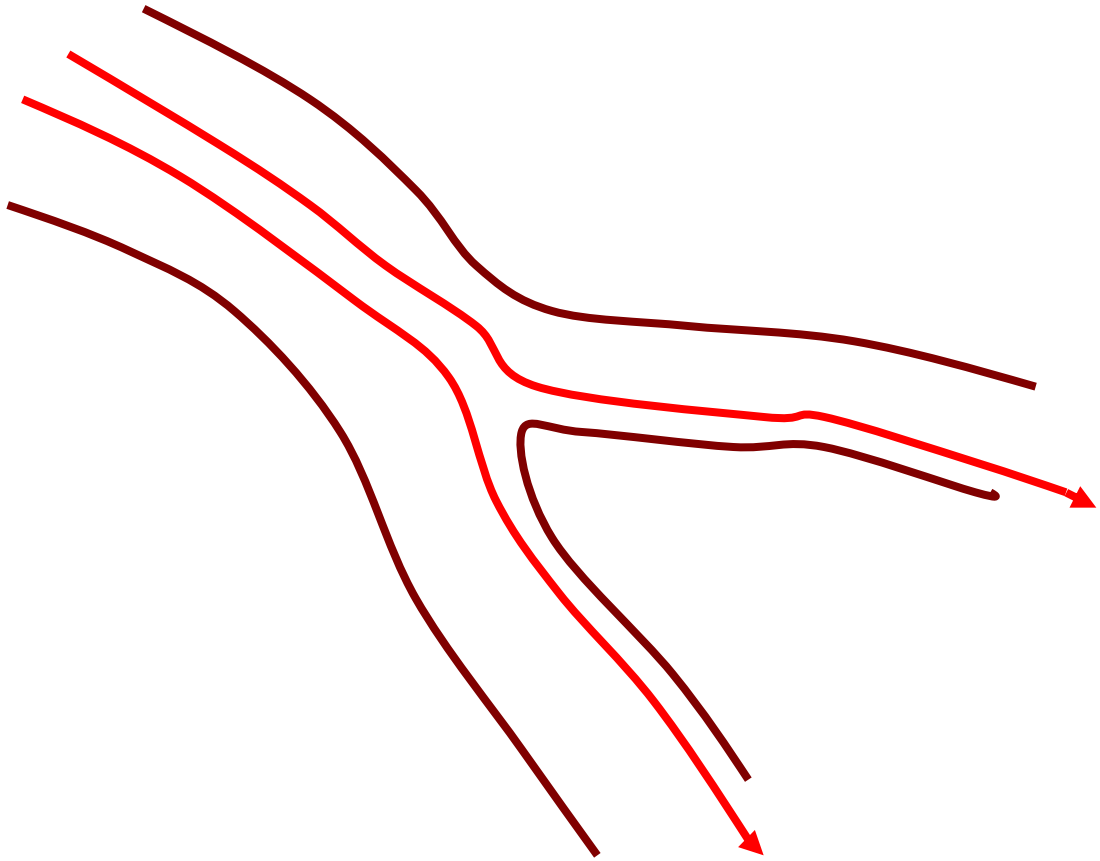
DETERMINANT of SUCCESS for distal LM stenting?

MC Morice, ICPS, Massy, Générale de Santé, France

TCTAP 2015

No conflict to disclose

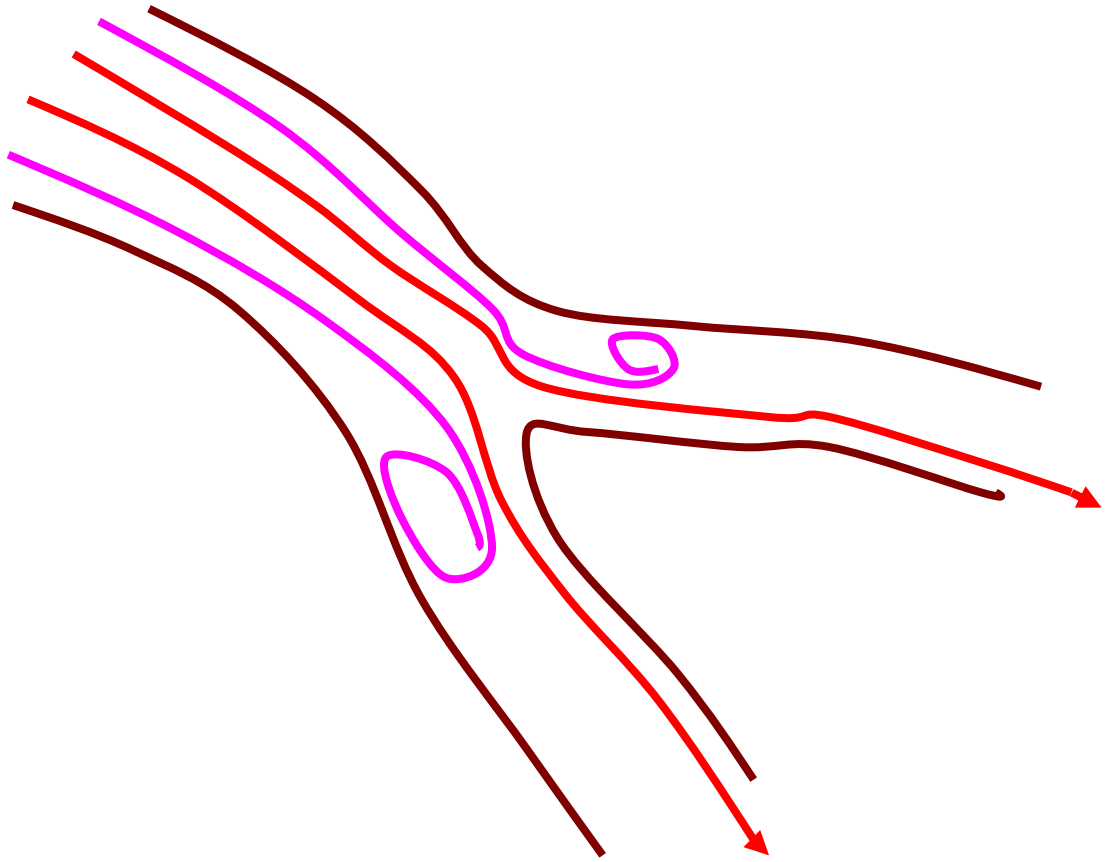
Flow Patterns and Spatial Distribution of Atherosclerotic Lesions in Human Coronary Arteries



High wall shear stress = antiatherogenic

Asakura, Circulation Research 1990; 66:1045-1066

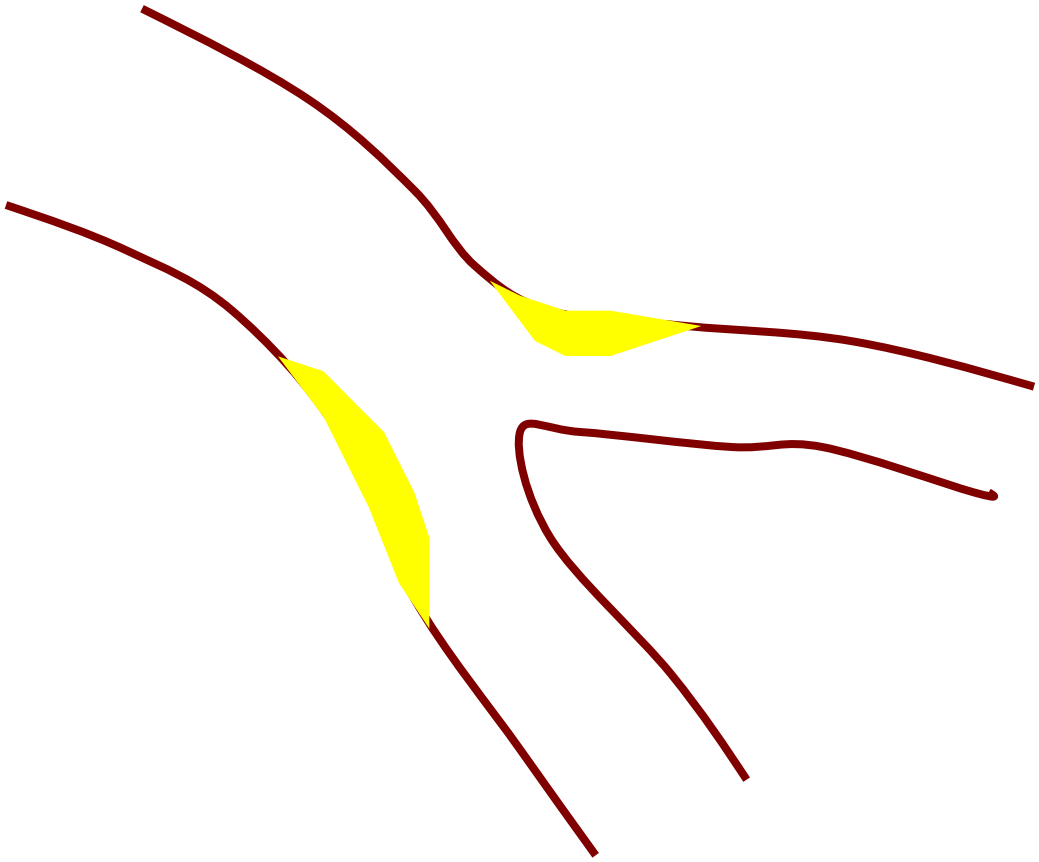
Flow Patterns and Spatial Distribution of Atherosclerotic Lesions in Human Coronary Arteries

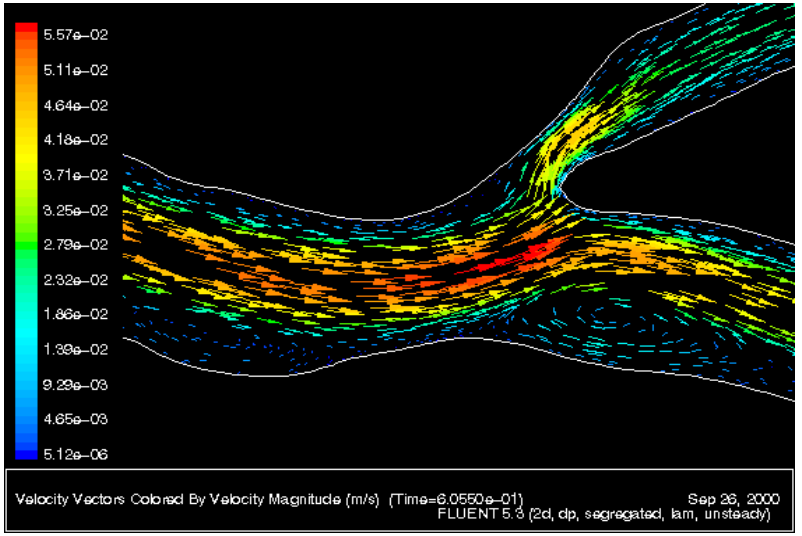


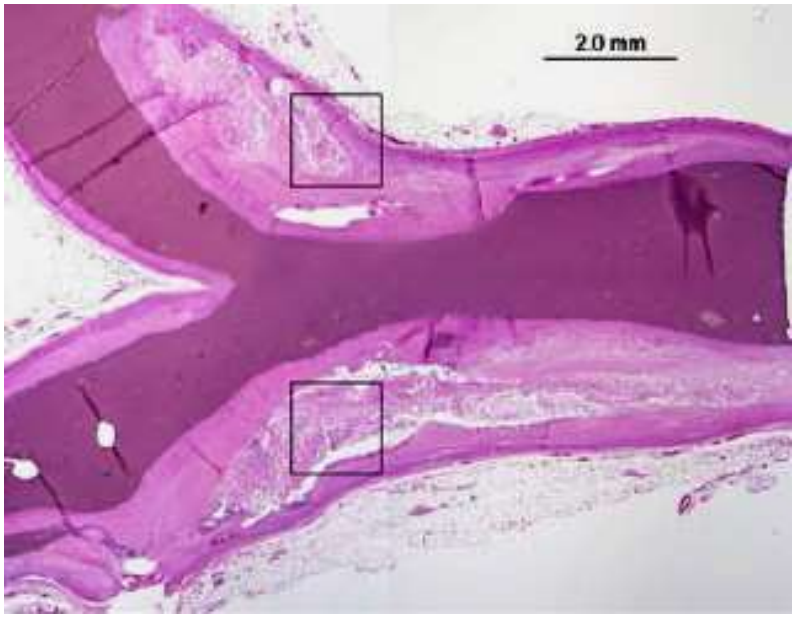
Low wall shear stress = proatherogenic

Asakura, Circulation Research 1990; 66:1045-1066

Low wall shear stress and atheroma in bifurcation

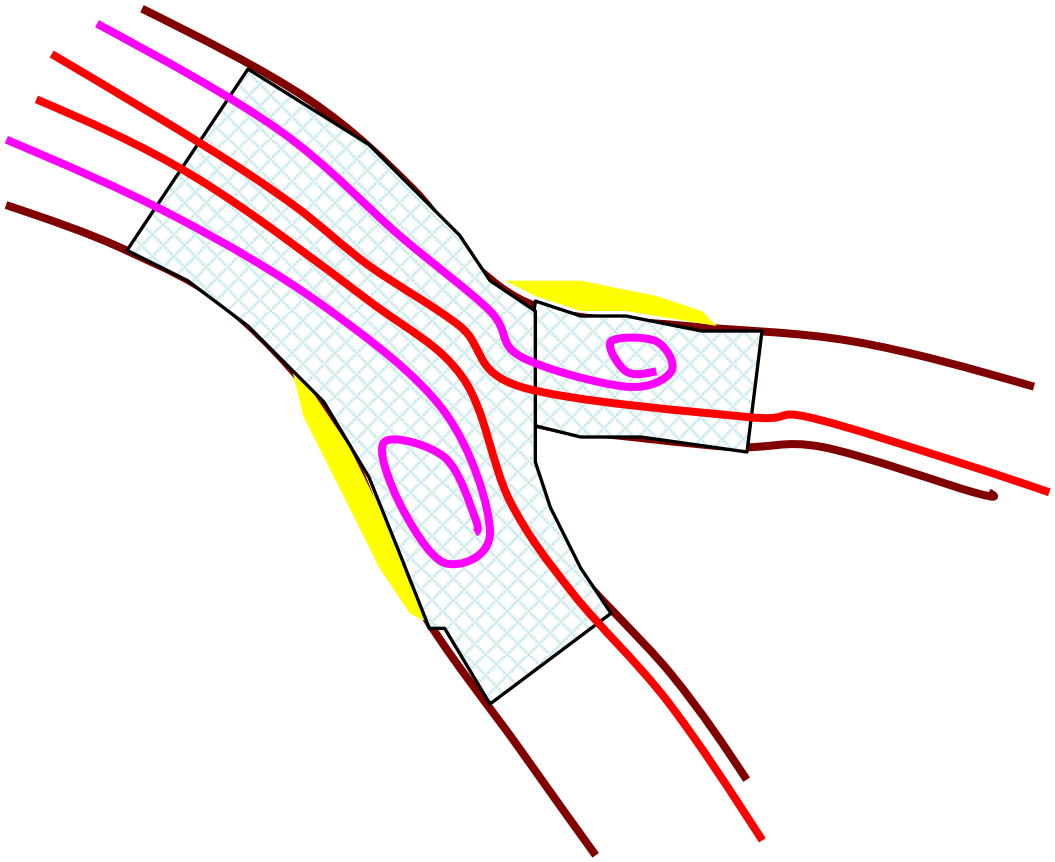






Virmani, Chatzizisis

Restauration of initial flow (+ stent turbulences)



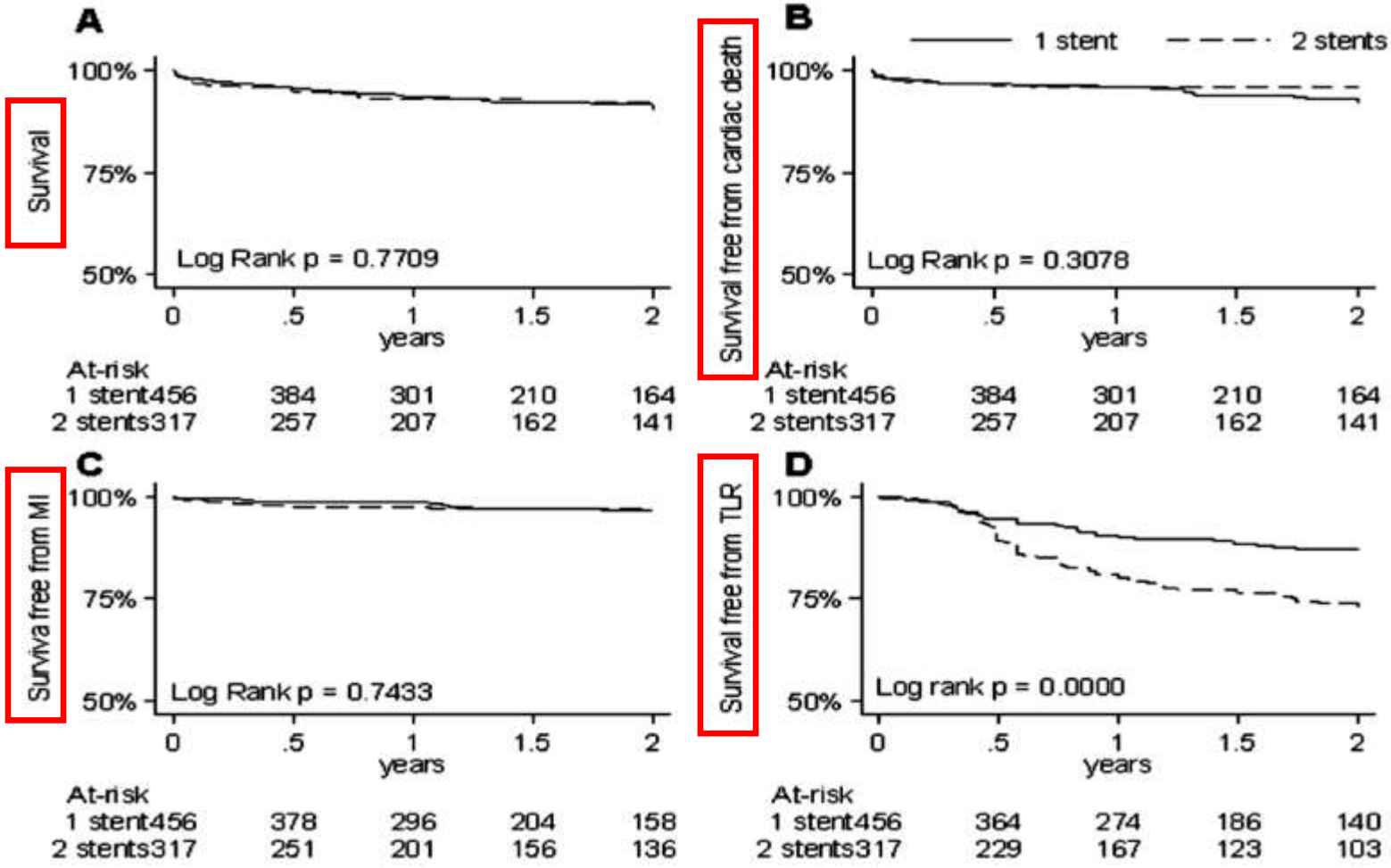
WSS < 0.5 Pa =
risk of restenosis

Flow mediated NIH and neo-atheroma

Virmani, Mintz …

One or two stents in a bifurcation ?
As for all bifurcations 1 if possible, 2 if needed

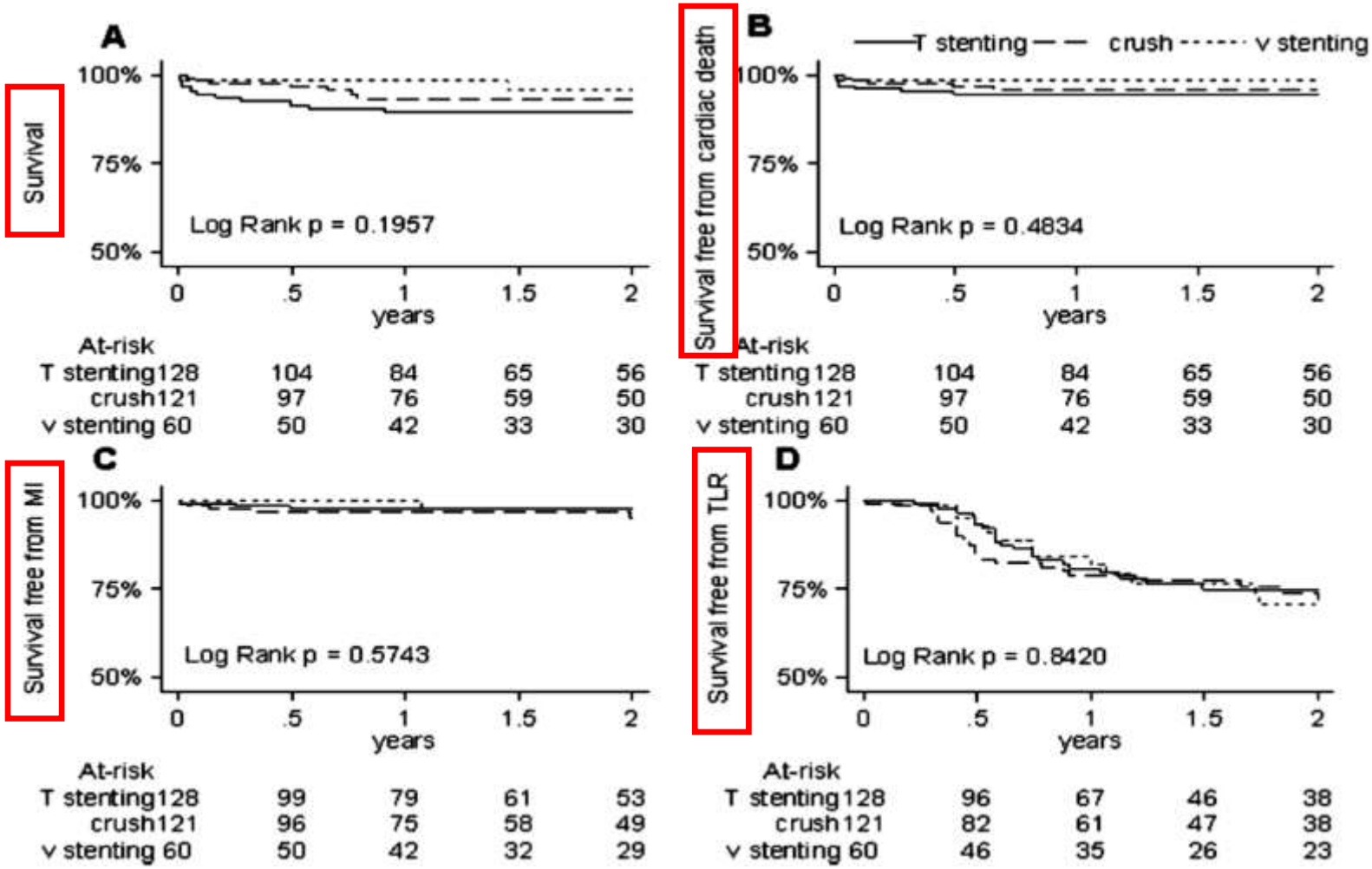
Impact of Bifurcation Technique on 2-Year Clinical Outcomes in 773 Pts With Distal ULM Stenosis Treated With DES



Palmerini Circ Cardiovasc Interv 2008;1;185-192

Impact of Bifurcation Technique on 2-Year Clinical Outcomes in 773 Pts With Distal ULM Stenosis Treated With DES

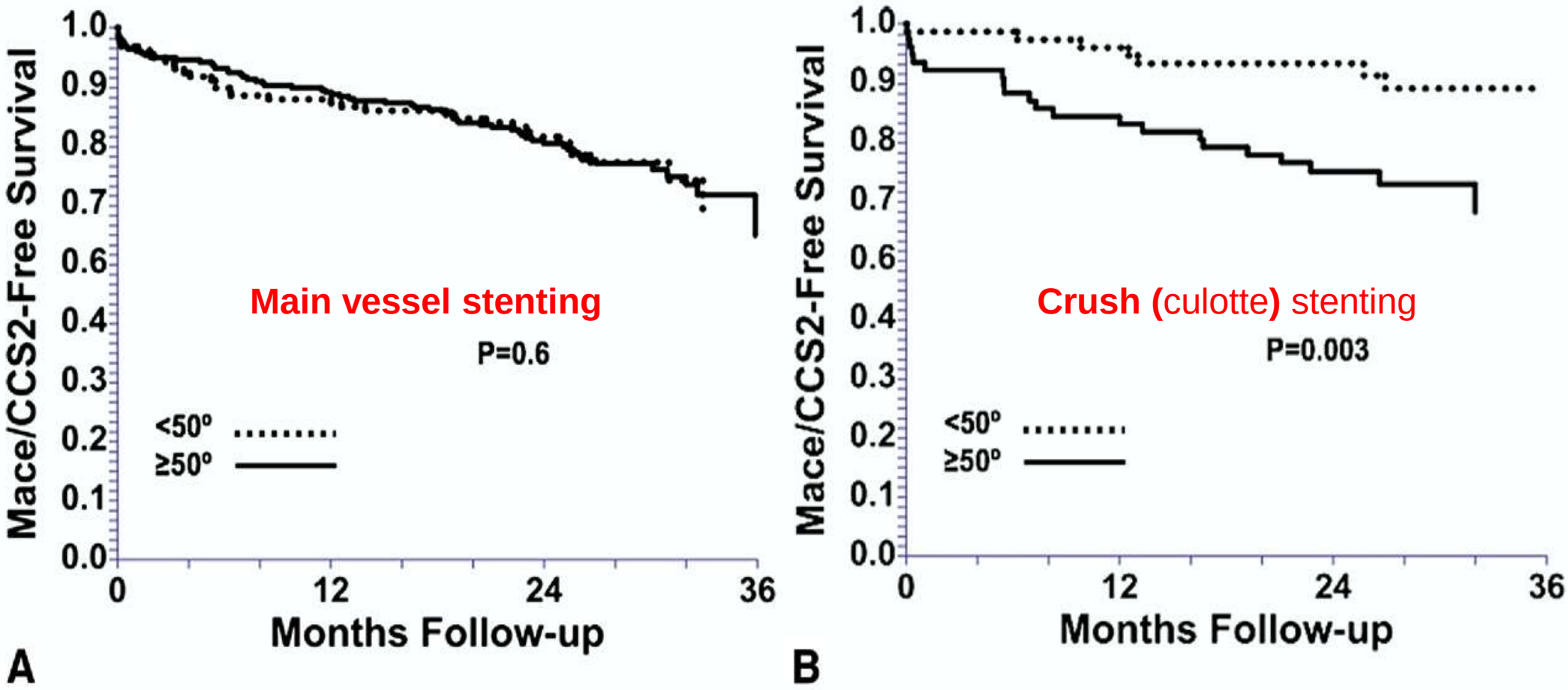
T-stenting, V-stenting, or crush stenting ?



Palmerini Circ Cardiovasc Interv 2008;1;185-192

Some double stenting technique limitations

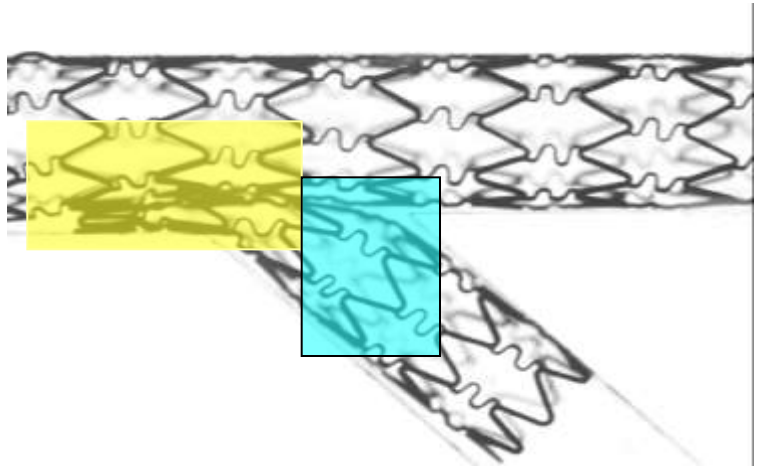
Outcome After Bifurcation PCI: role of angle



Kaplan-Meier curves for MACE or CCS class 2 angina-free survival / bifurcation angle

Collins Am J Cardiol 2008;102:404–410

Crush Technique

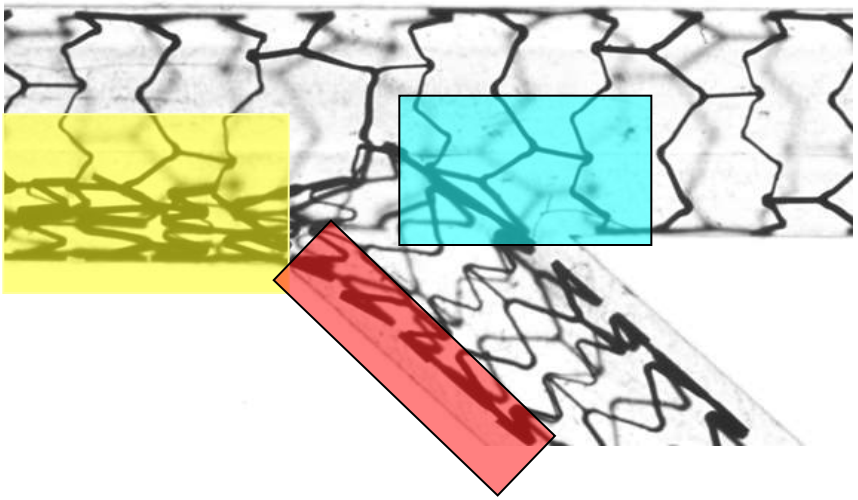


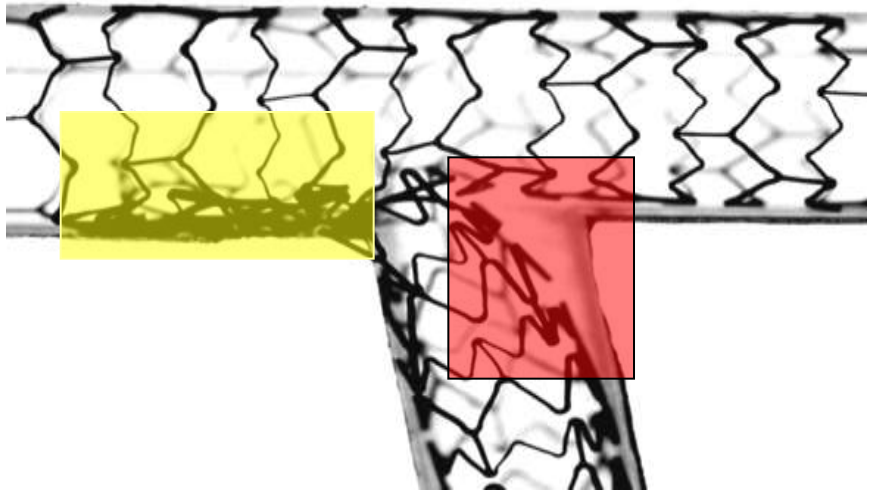
Stagnation area between the struts

Delayed endothel.

Recirculation

Stent not apposed





Courtesy of John Ormiston

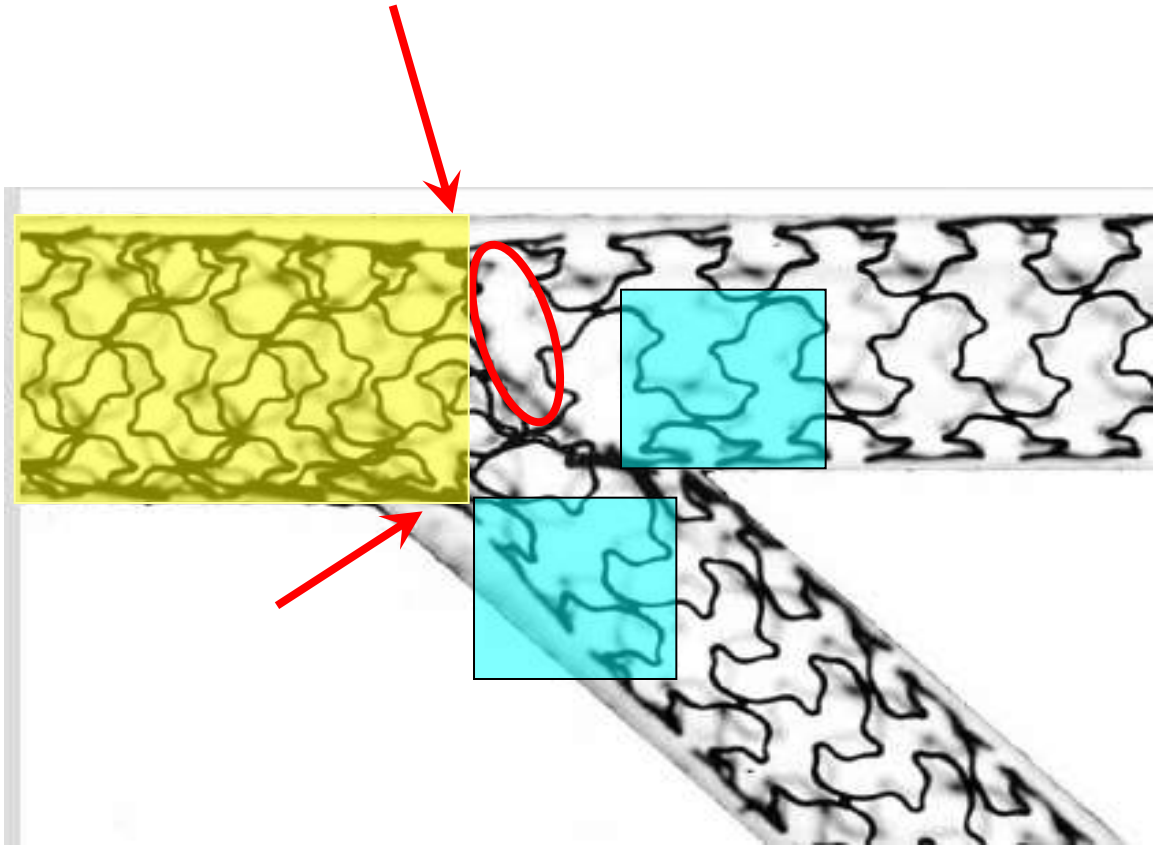
Culotte stenting : 1y dedicated QCA and clinical outcomes

Predictors of binary restenosis

Variable	Odds ratio (95% CI)	*P*-value
Age increase by 10 years	2.38 (1.21–4.96)	0.01
Diabetes	3.43 (0.71–16.60)	0.13
Male sex	0.62 (0.15–2.53)	0.51
Medina classification	0.42 (0.13–1.32)	0.14
Restenotic lesion	0.52 (0.12–2.24)	0.38
Bifurcation angle increase by 10°	1.53 (1.04–2.23)	0.03
Calcified lesion	0.53 (0.12–2.24)	0.39
Proximal main vessel		
Reference vessel diameter decrease by 1 mm	4.55 (0.17–123.36)	0.37
Baseline stenosis increase by 10%	0.91 (0.67–1.23)	0.54
Distal main vessel		
Reference vessel diameter decrease by 1 mm	0.10 (0.00–3.17)	0.19
Baseline stenosis increase by 10%	1.47 (1.03–2.09)	0.03
Side branch vessel		
Reference vessel diameter decrease by 1 mm	31.83 (1.71–592.77)	0.02
Baseline stenosis increase by 10%	0.97 (0.82–1.15)	0.75
Kissing balloon post-dilatation	0.37 (0.13–1.10)	0.07

Adriaenssens EHJ 2008; 29: 2868–2876

Culotte Technique



Stent not apposed

Stagnation area between the struts

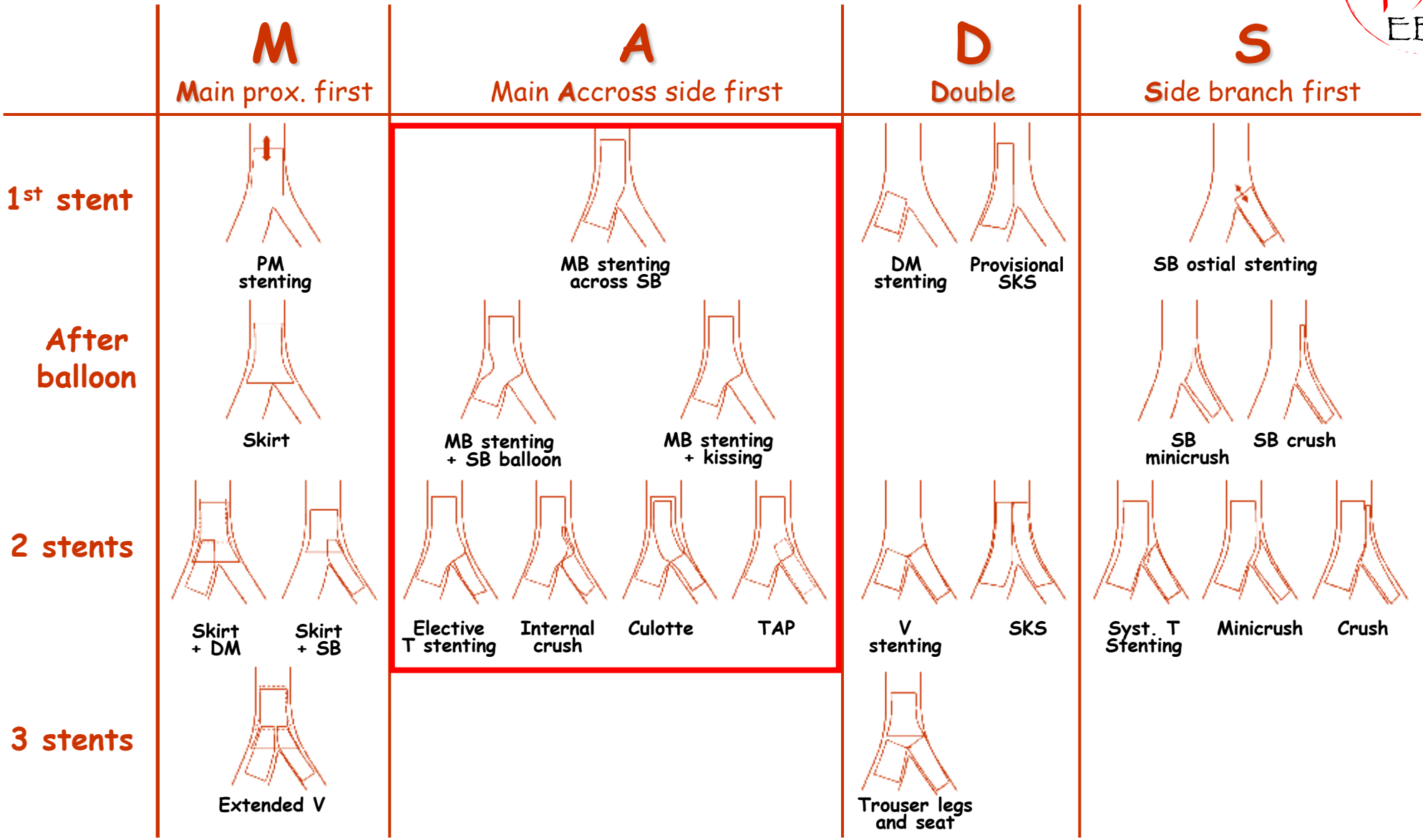
Delayed endothel.

Recirculation

Courtesy of John Ormiston

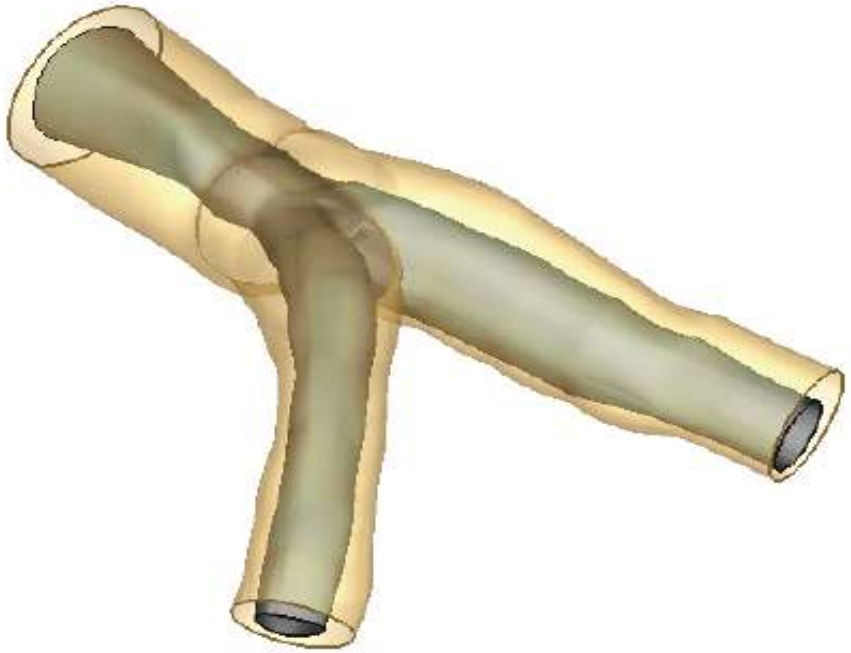
How to limit stent implantation in distal LM ?: Provisional stenting strategy !

EBC

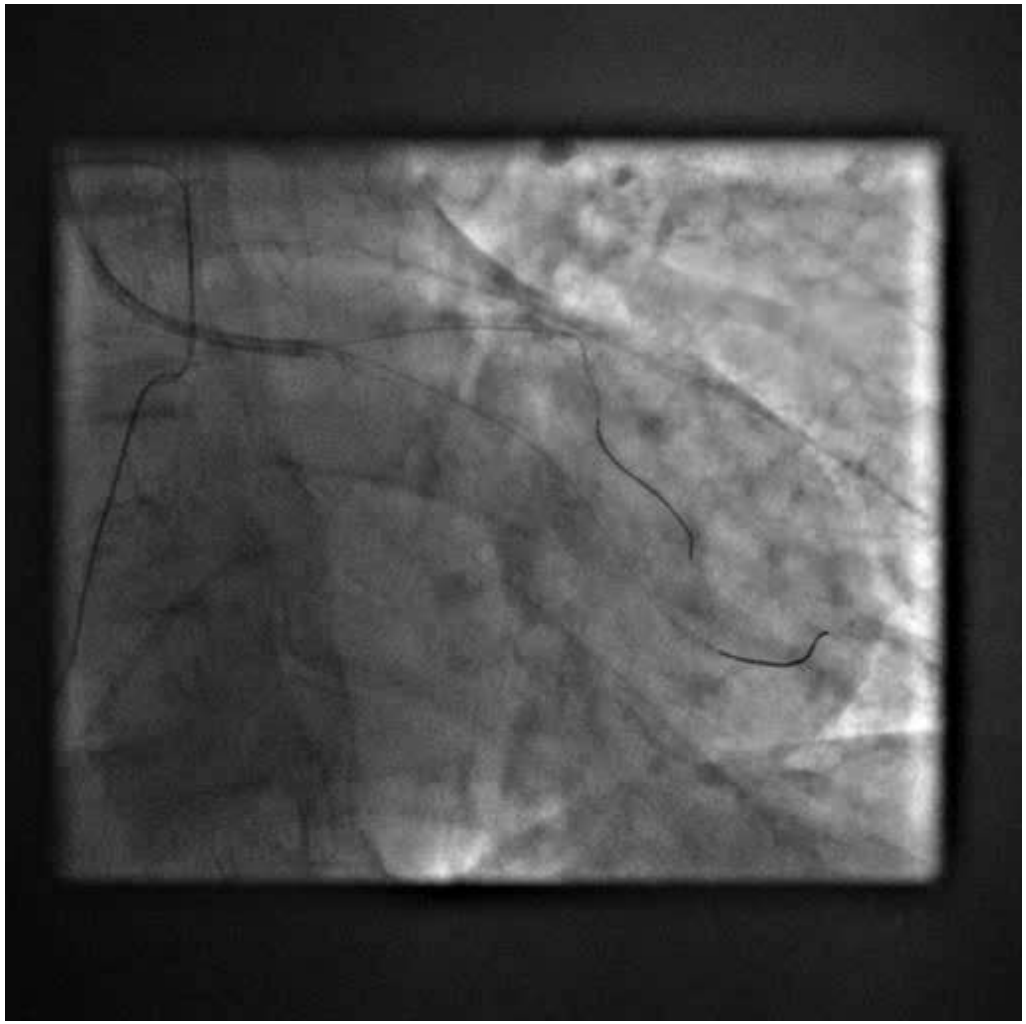


Y. Louvard, CCVI 2008; 71: 175-83

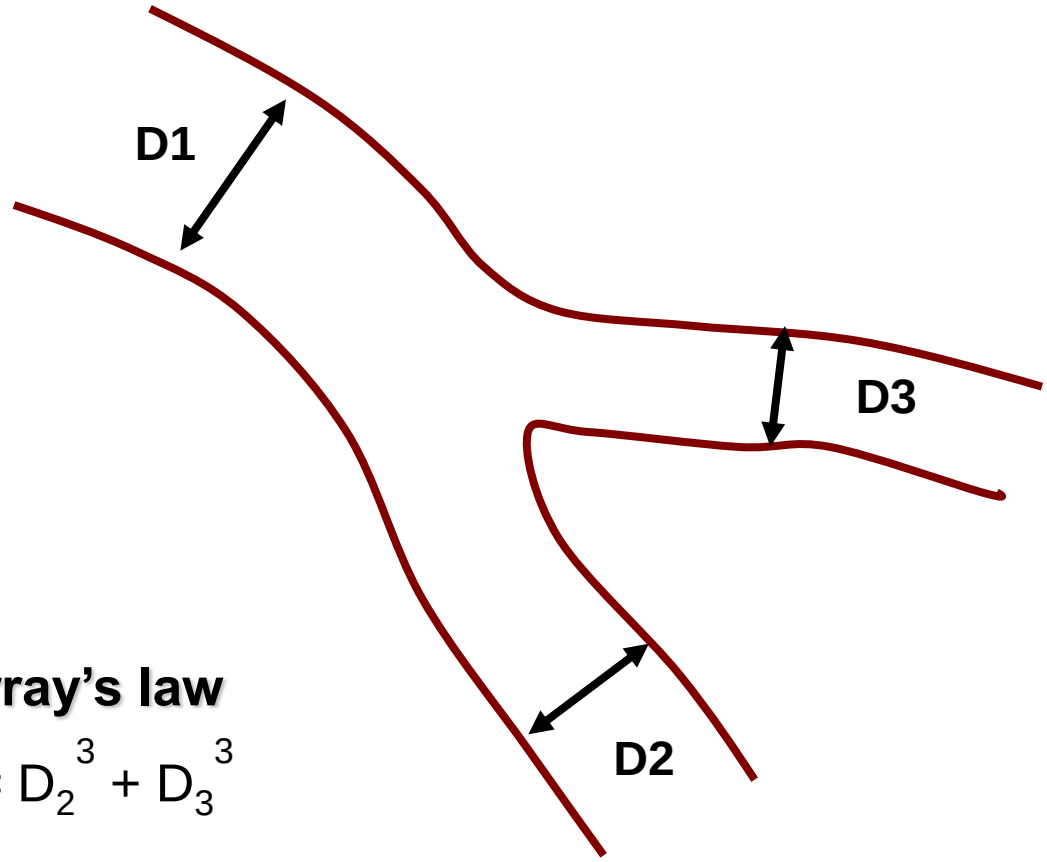
Three-dimensional LM model



LM,LAD1,Cx1 1,0,0



Structure-function scaling laws of vascular trees

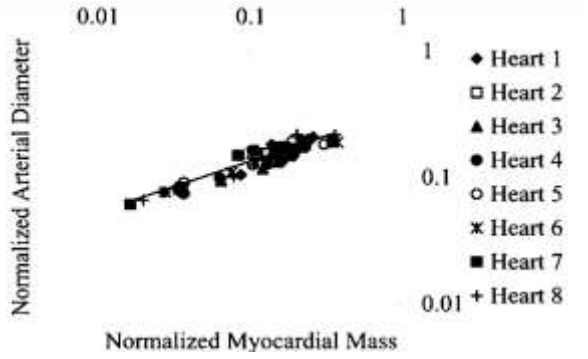


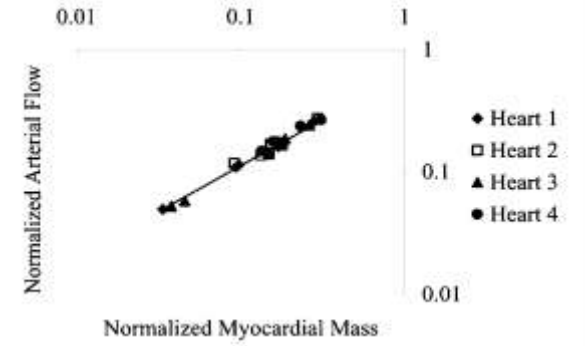
Murray's law

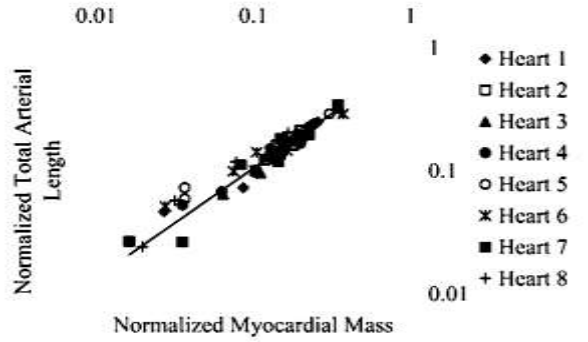
$$D_1^3 = D_2^3 + D_3^3$$

Finet's law

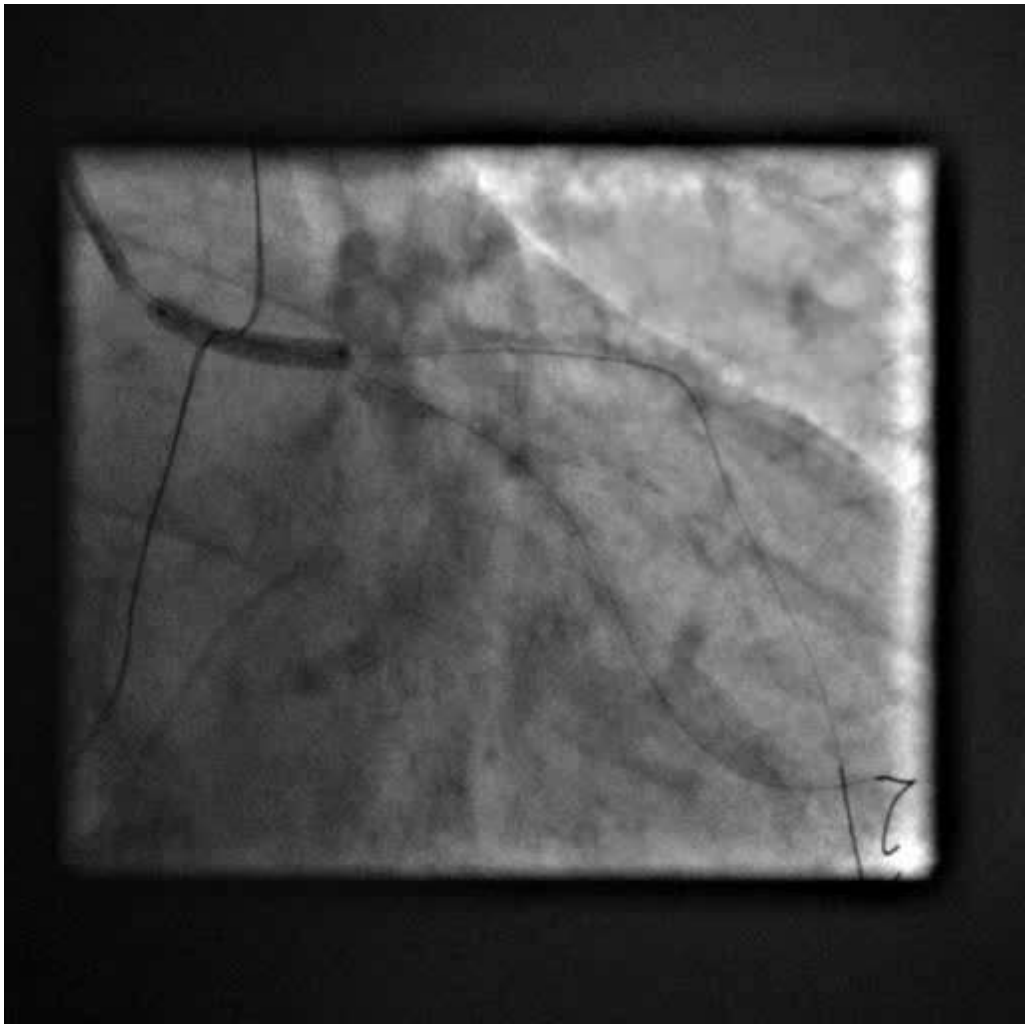
$$D_1 = 0.67(D_2 + D3)$$



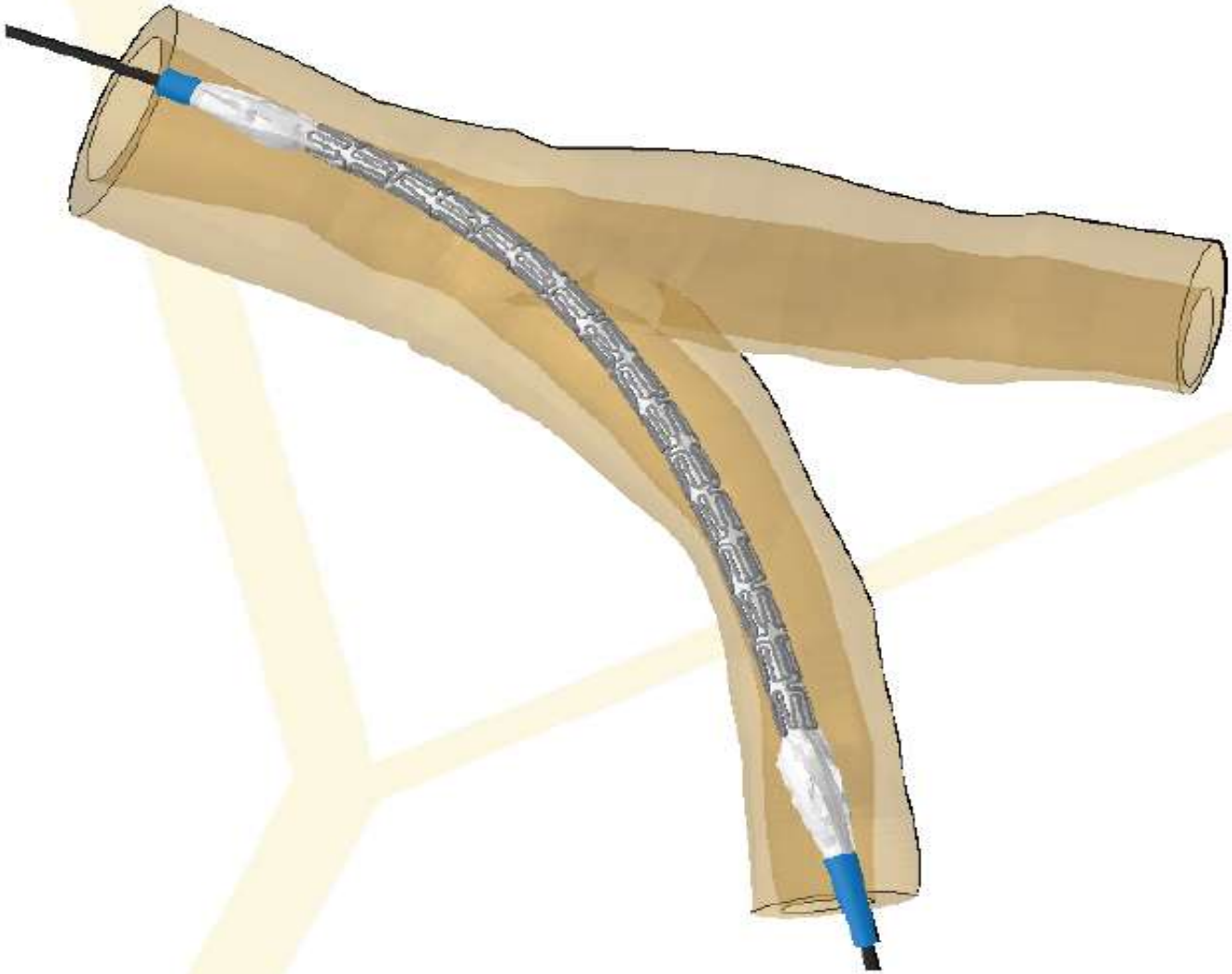




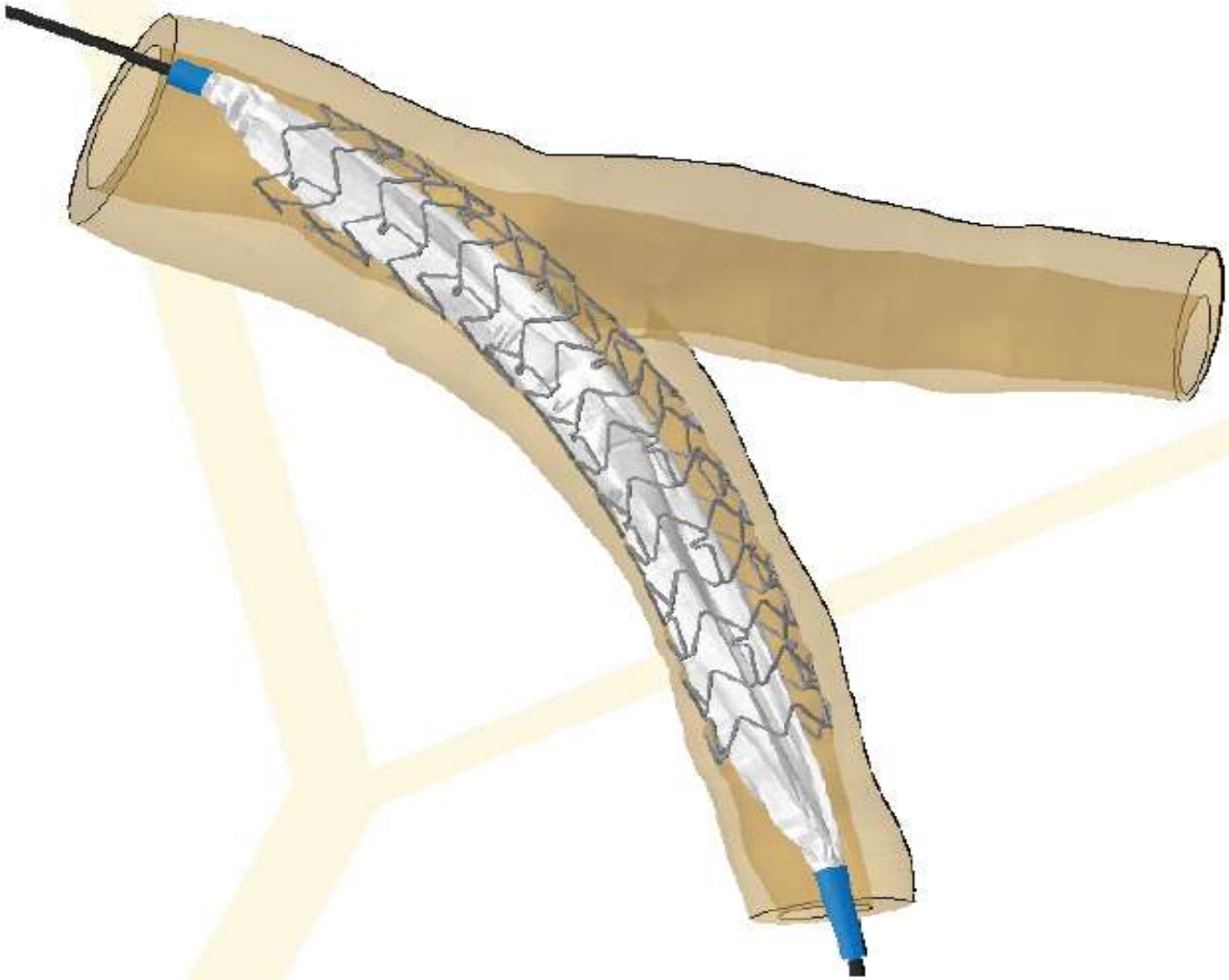
LM stenting: LM to LAD, 3X23 Xience Prime



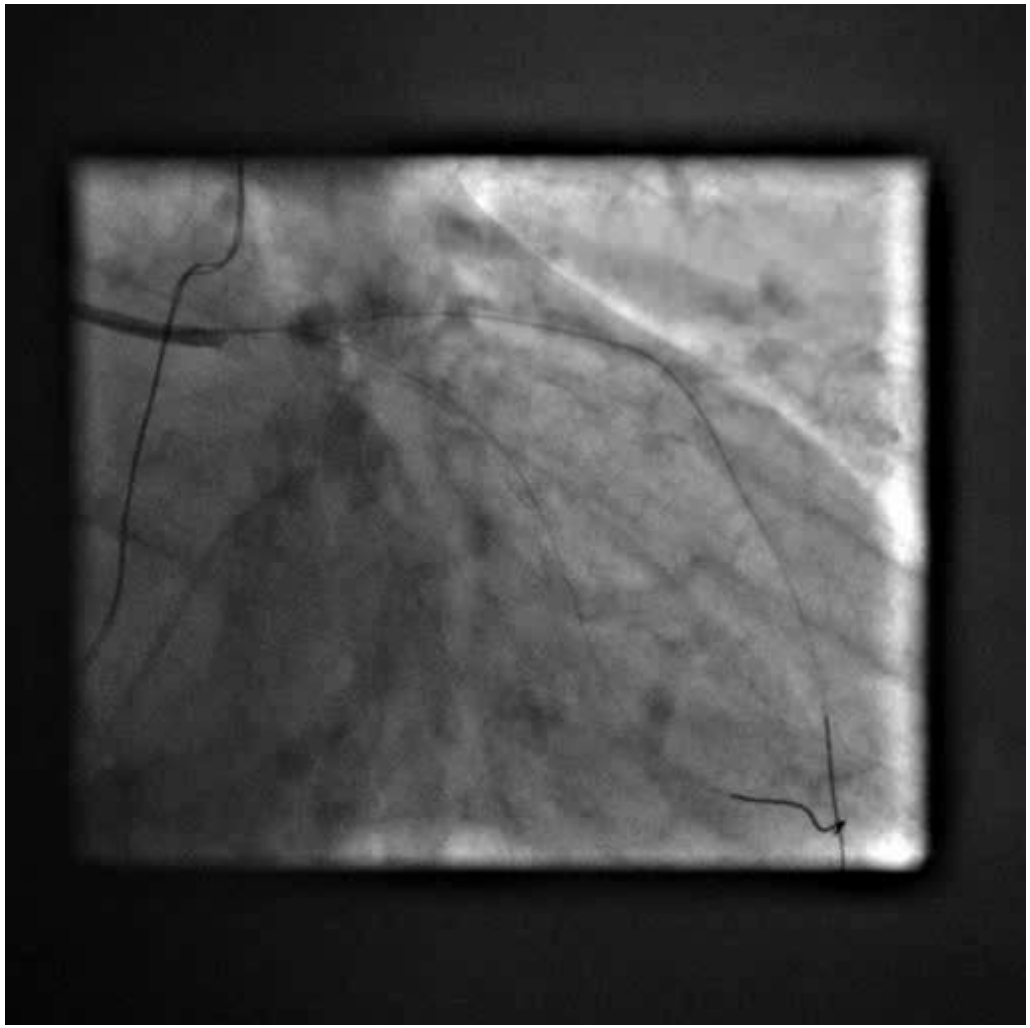
Stent deployment



Stent deployment



LM post stenting

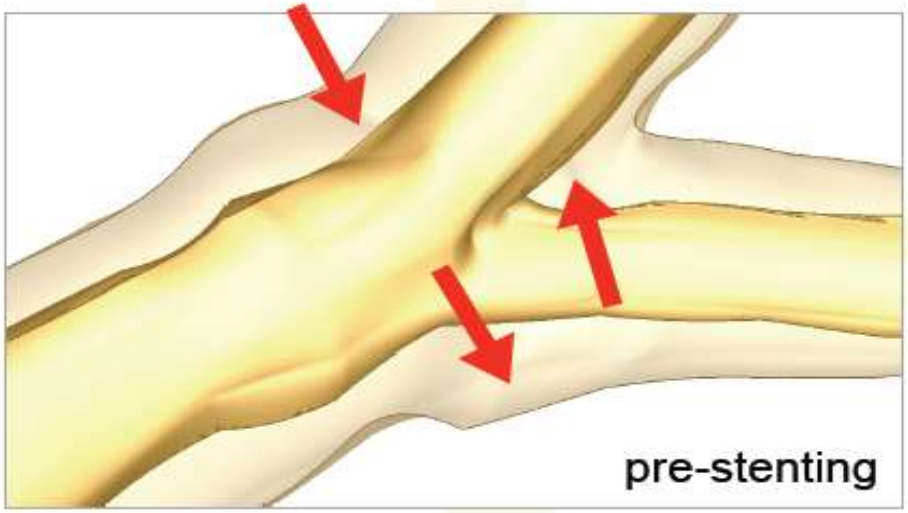


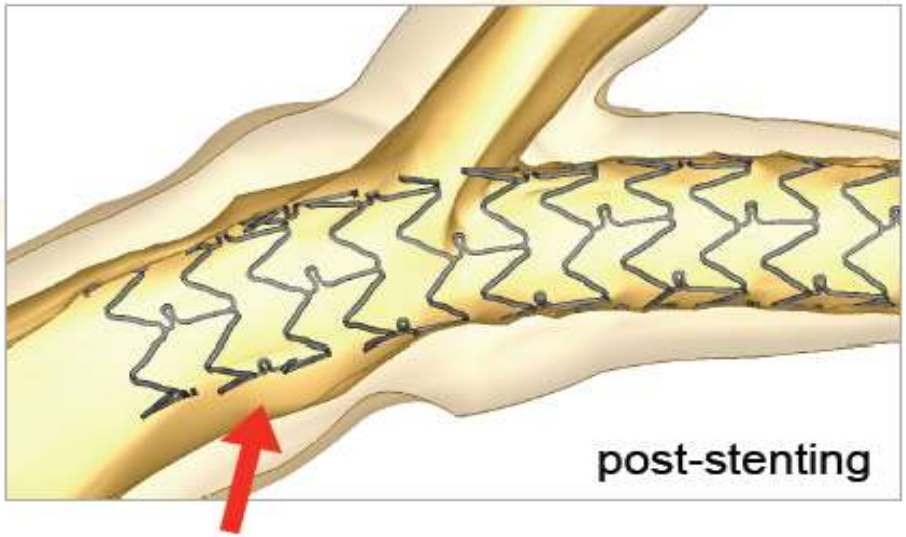
Stent deployment

Simulated stent deployment significantly enlarges the diameter of the LAD.

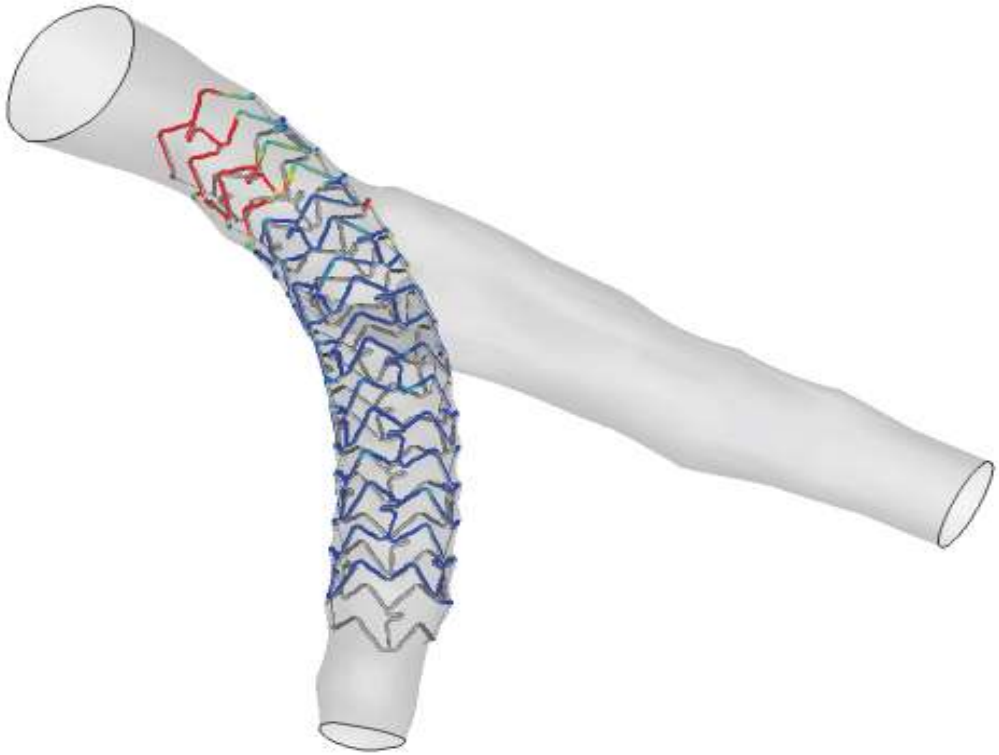
A serious malapposition can be observed in the LM. Therefore, performing a proximal optimisation (POT) seems recommended before inserting an additional guidewire.

This top view shows a reduction of LCX diameter (circular => elliptic). This is due to a combination of carina shift AND a movement of the lateral wall.



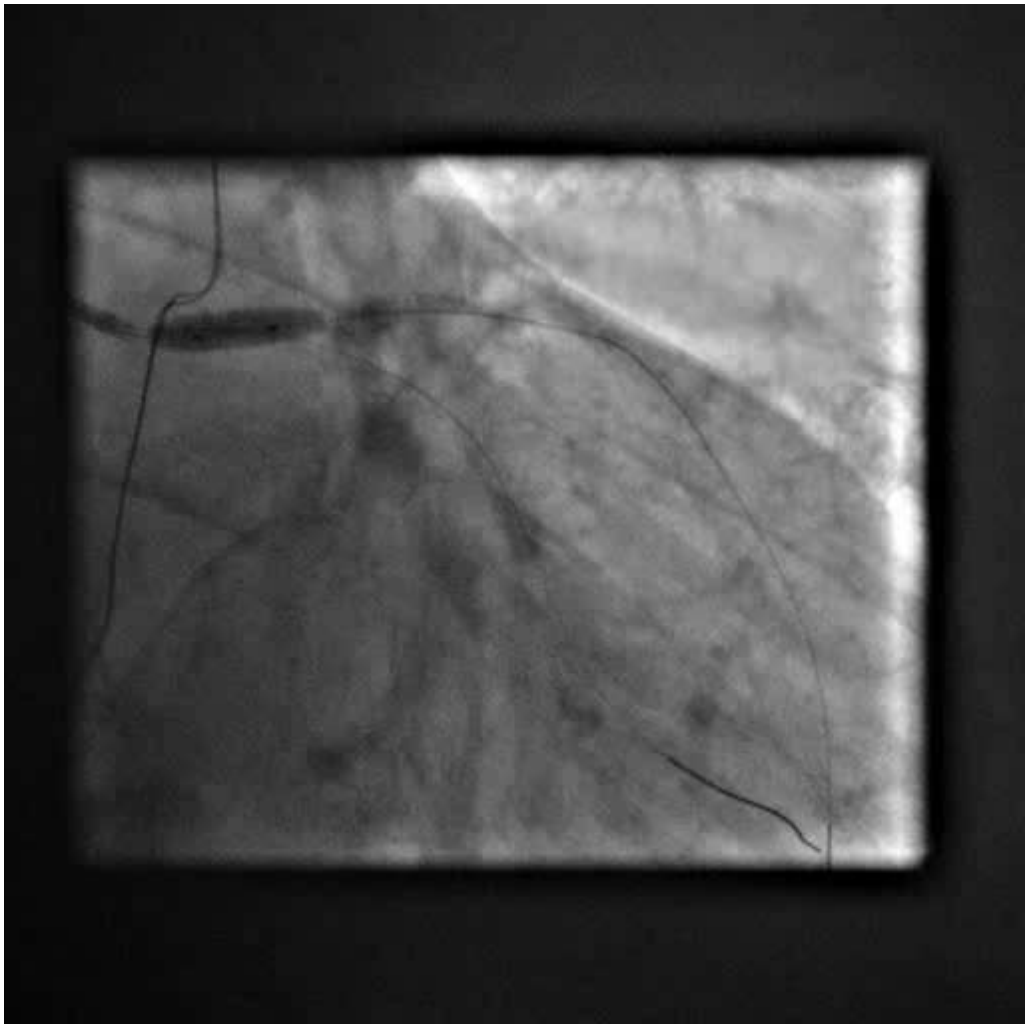


Strut apposition analysis



Strut-artery distance [mm]

POT technique: 1 stent = 2 diameters

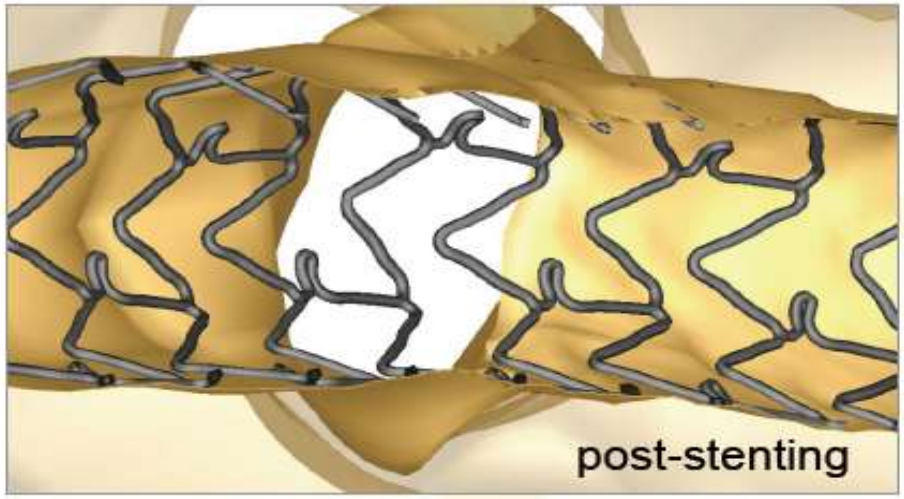


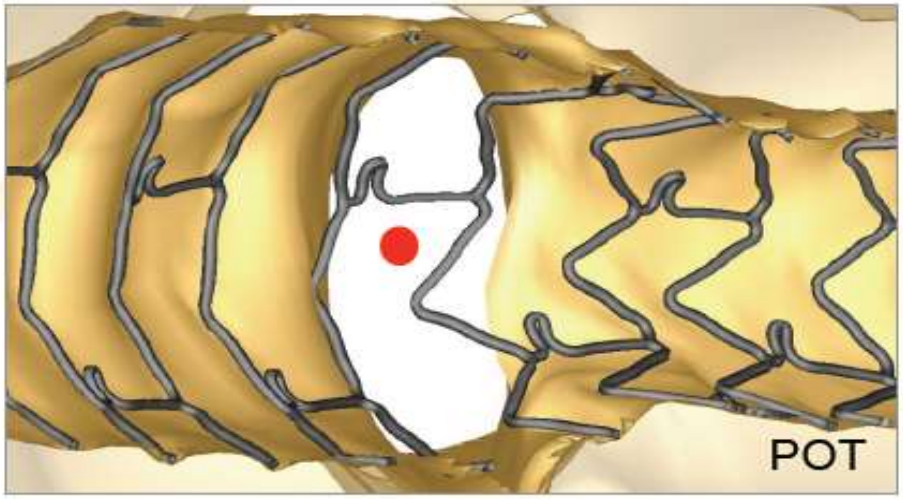
Proximal optimisation technique (POT)

Proximal optimisation seems to reduce the number of cells covering the side branch ostium

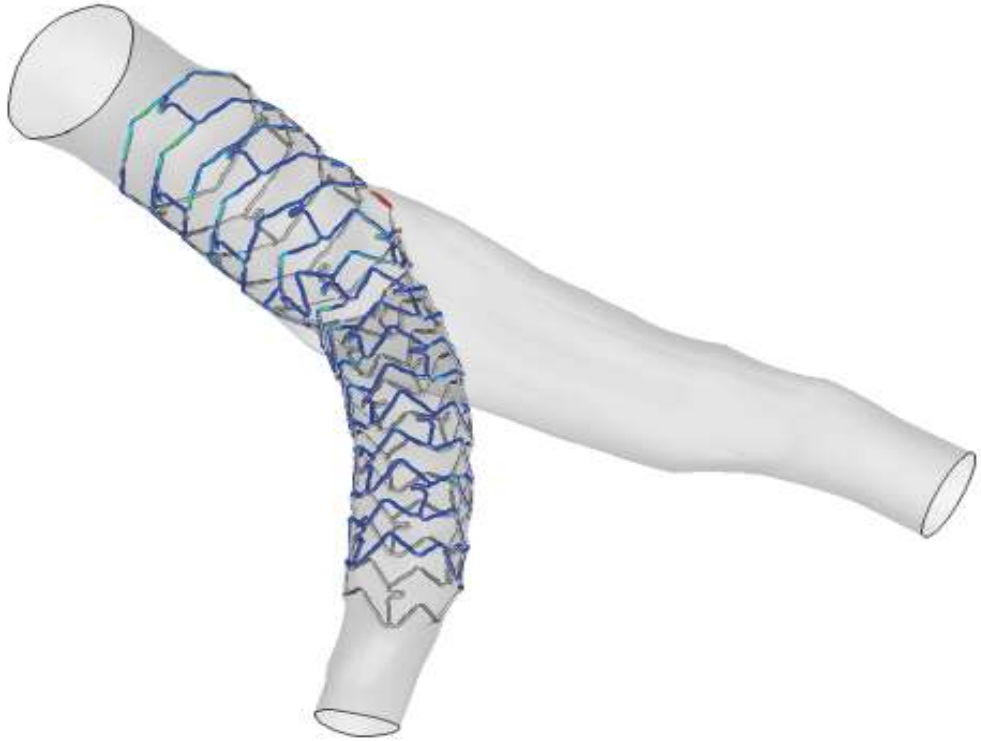
It also enlarges these cells, possible facilitating side branch access

The location where the guidewire goes into the side branch is indicated with the red circle





Strut apposition analysis



Strut-artery distance [mm]

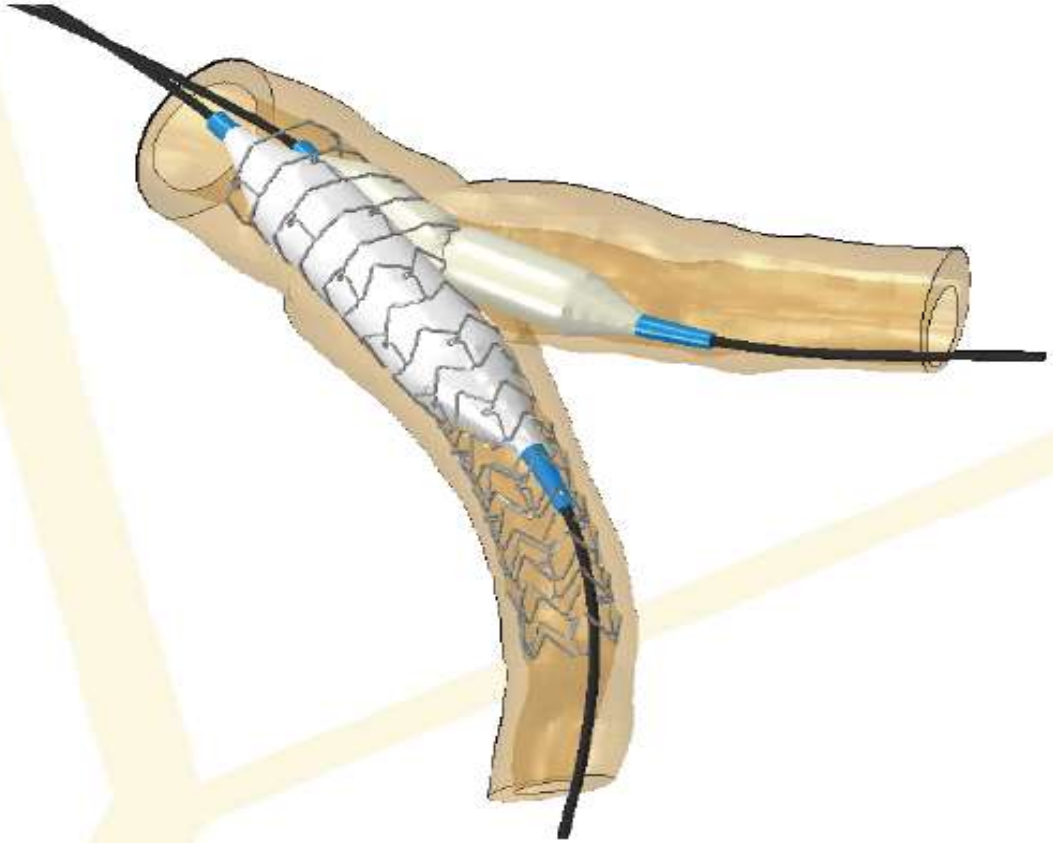
0.2

0.1

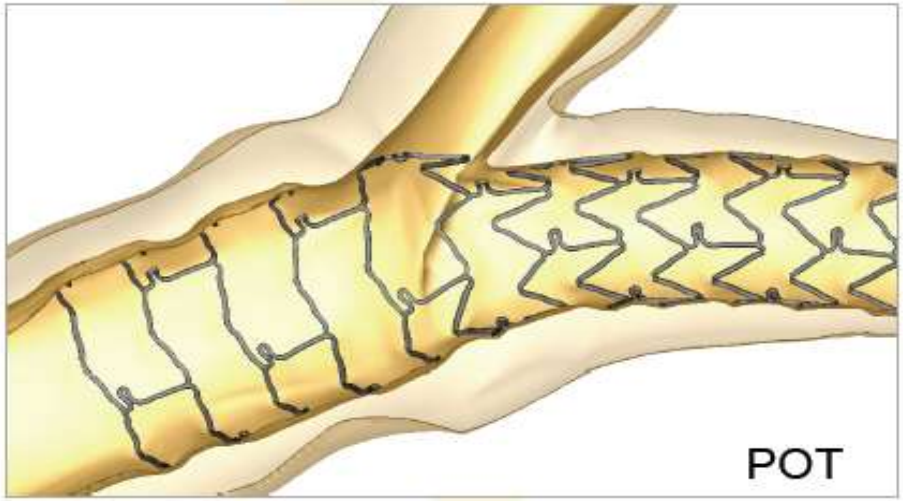
0.0

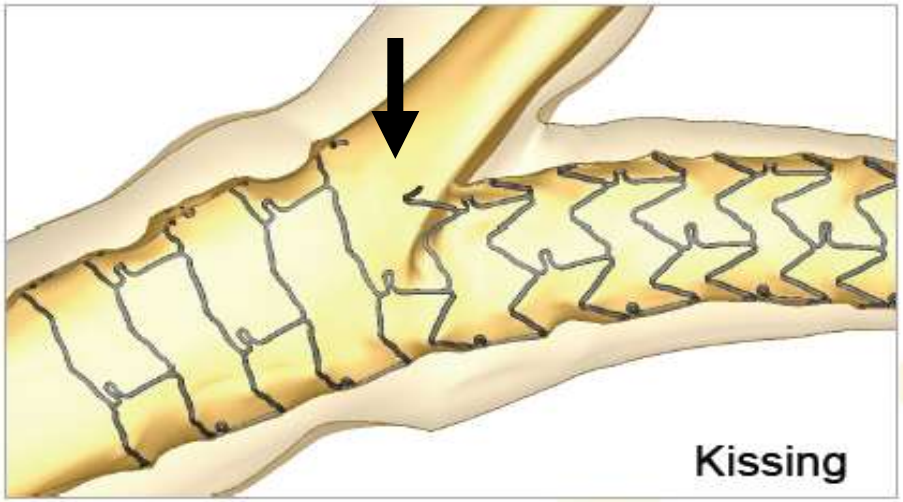
Kissing balloon inflation (Hiryu NC 3,5X10, 3X10)

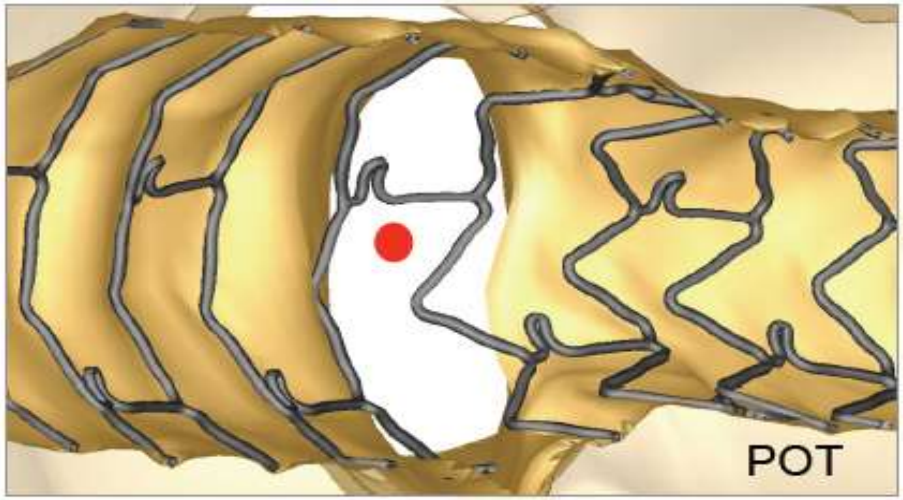
Final kissing inflation

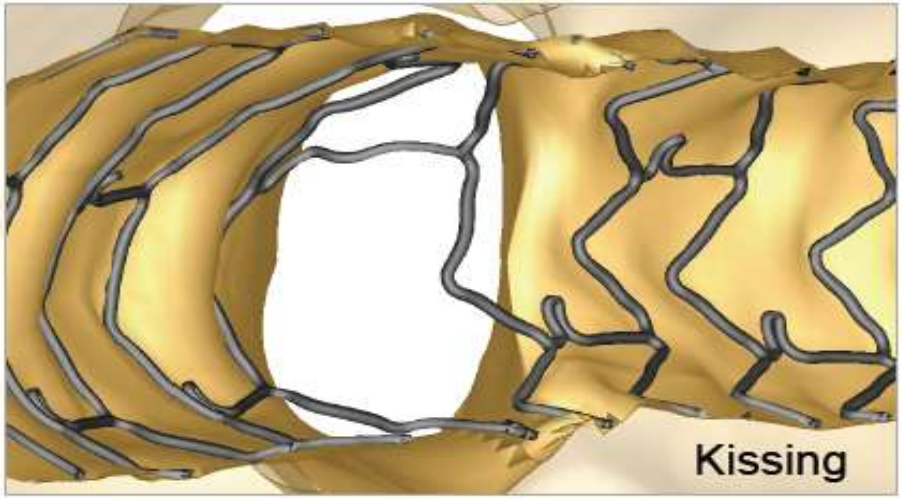


Final kissing inflation



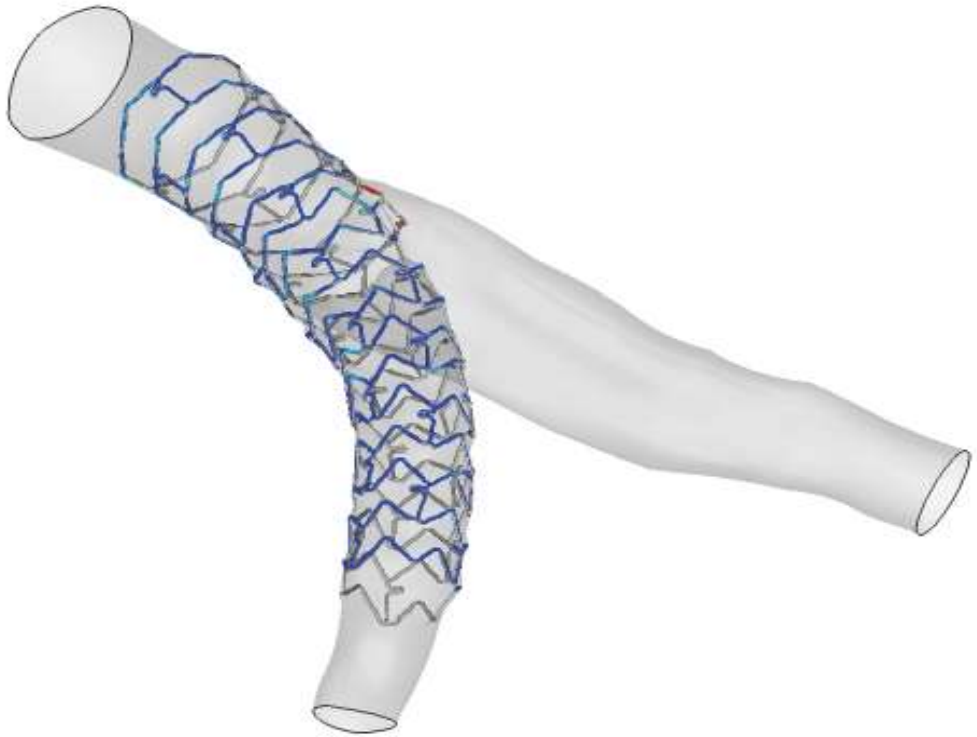






From J. Wentzel, P. Mortier

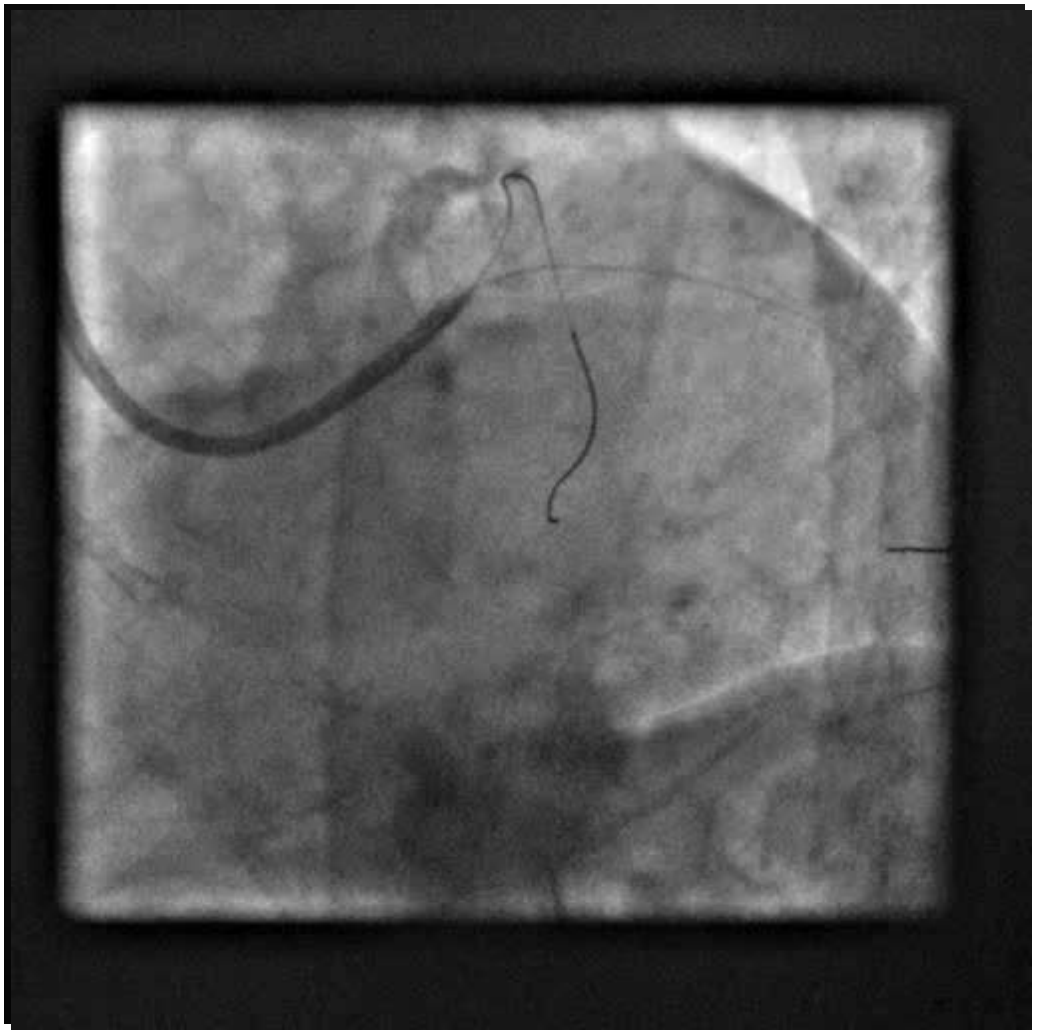
Strut apposition analysis



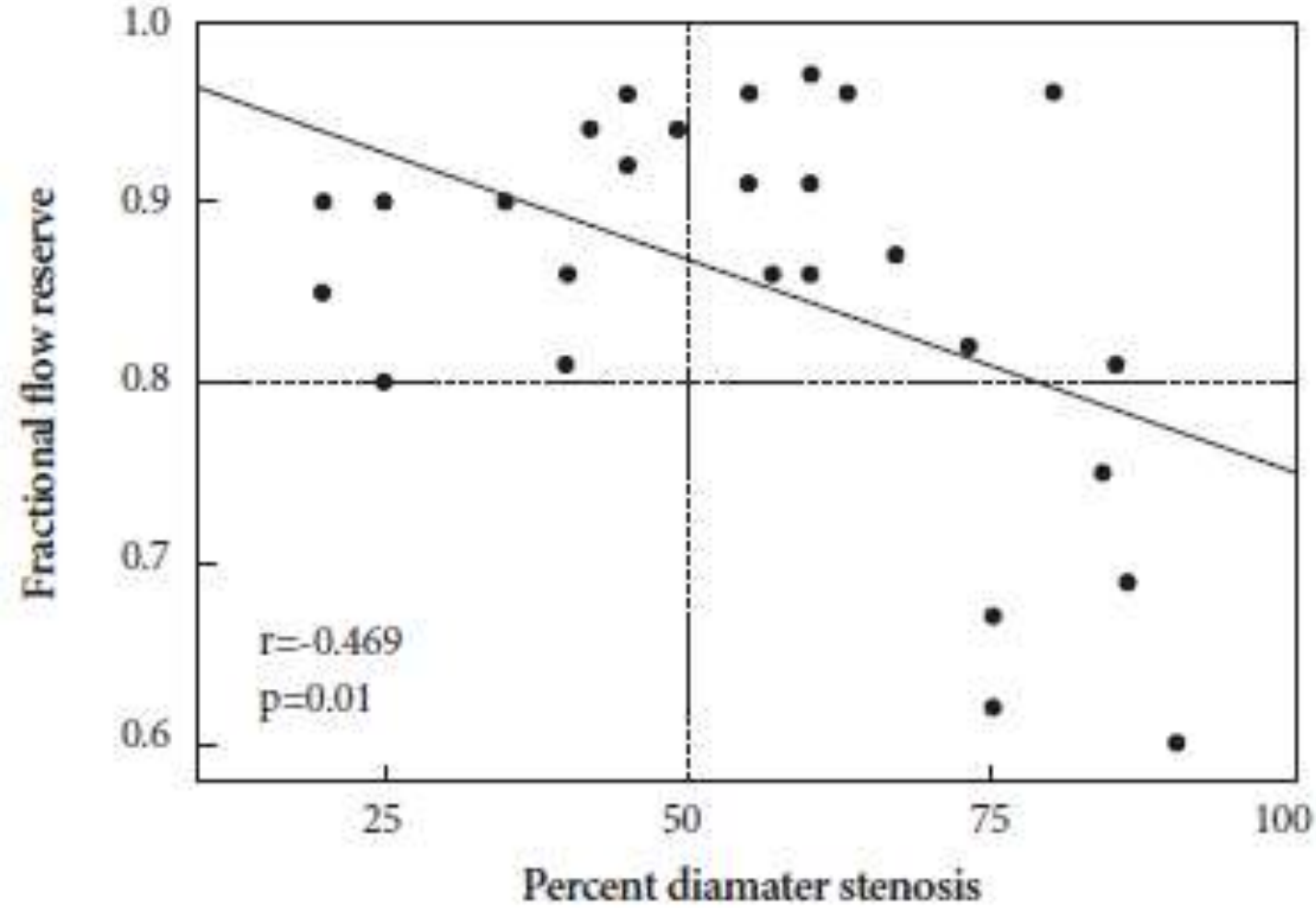
Strut-artery distance [mm]

From J. Wentzel, P. Mortier

Post Kissing balloon inflation

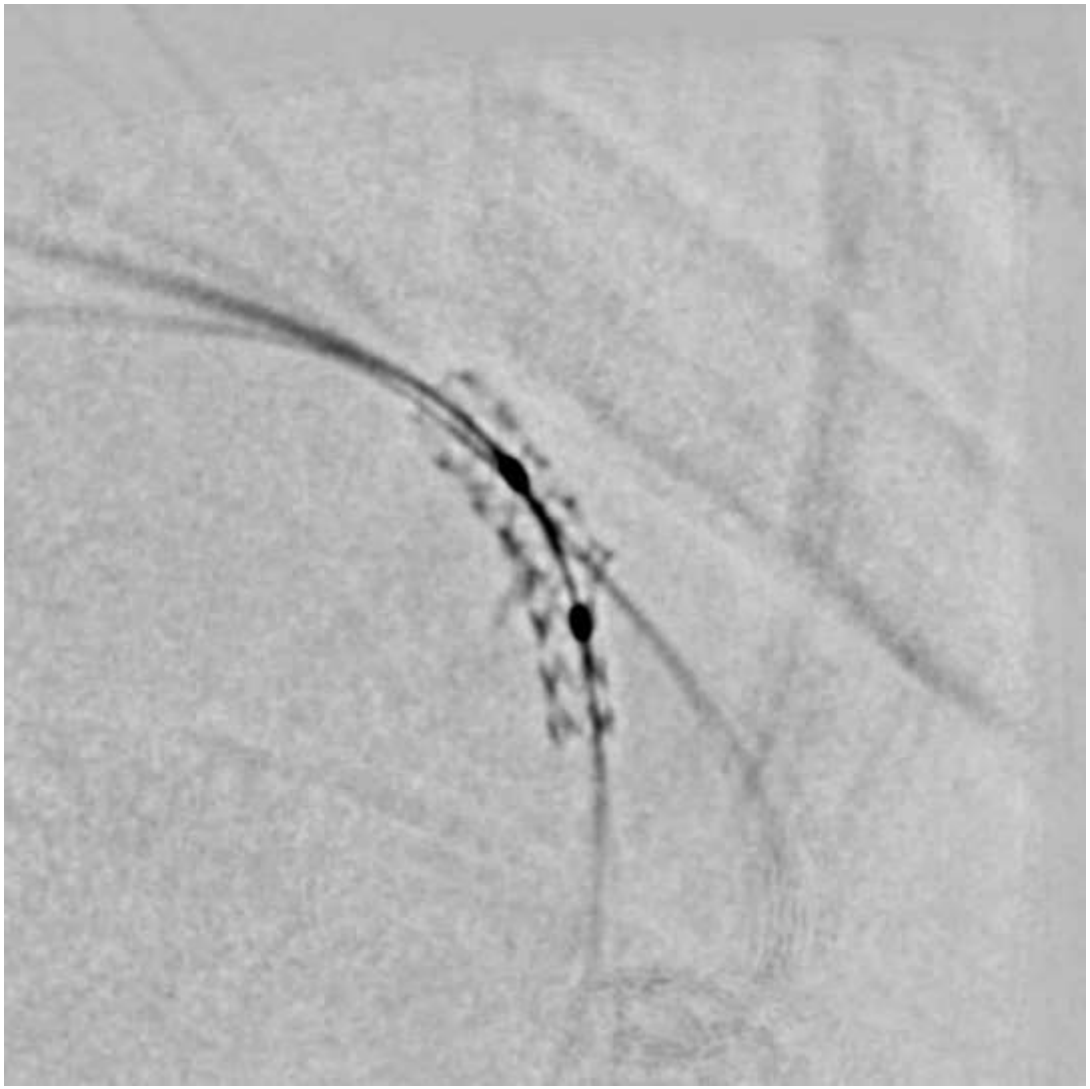


FFR Versus Angiography in Left Circumflex Ostial Intervention After Left Main Crossover Stenting



Nam, Koo, Korean Circ J 2011;41:304-307

Optimal aspect for T stenting



Final

Main Compare Registry

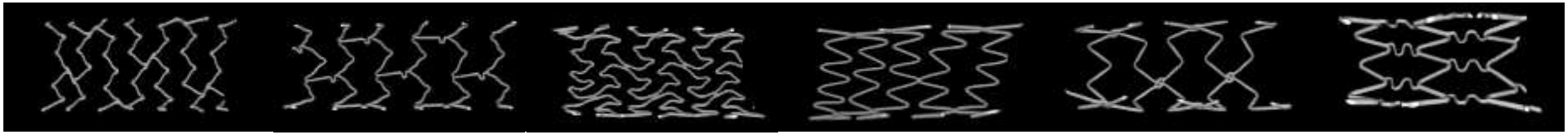
Predictors of Death at 3 years' Follow-up

	HR	95% CI	P
Previous CHF	2.658	1.032-6.847	0.043
Chronic Renal Failure	4.865	2.102-11.257	<0.001
COPD	2.927	1.004-8.534	0.049
Euroscore ≥ 6	3.243	1.482-7.094	0.003
IVUS guidance	0.429	0.211-0.872	0.019

Park SJ et al. Circ Cardiovasc Intervent. 2009;2:167-177

Wich stent ?

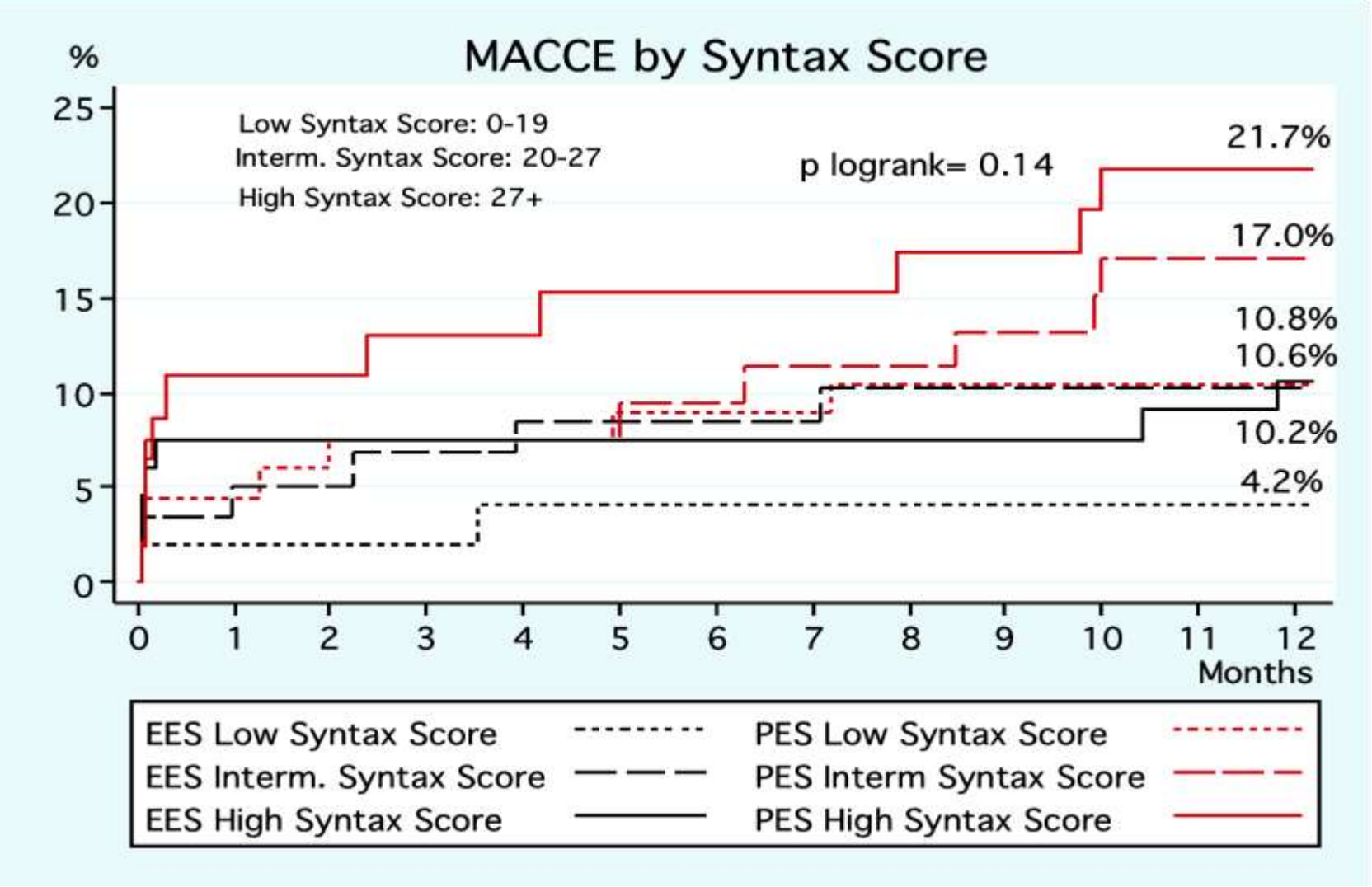
Maximal Expansion Capacity and Workhorse Designs



	Element	Xience V	Taxus	Integrity	Biomatrix	Cypher
2.25	Very Small workhorse. *max exp: 2.75mm*	Medium Workhorse (6 crowns , 3 cells) *max. expansion: to 3.5mm*	Small workshorse (2 cells) *max expansion: 3.5mm*	Small workhorse (7crowns, 2 cells*) *max expansion: 3.2mm* **1.5 cell in Resolute*	Medium workhorse (6 crowns, 2 cells) max expansion: 3.5mm	Medium workhorse (6 cells) max expansion: 3.75mm
2.50	Small workshorse (8 crowns, 2 cells) *max expansion : 3.5mm*					
2.75			Medium Workhorse (3 cells) *max expansion: 4.25mm*			
3.00	Medium Workhorse (8 crowns, 2 cells) *max expansion : 4.25mm*			Medium workhorse (10 crowns, 2 cells) *max expansion : 4.4mm*		
3.50		Large workhorse: (9 crowns , 3 cells) *max expansion : 4.5mm*			Large workhorse (9 crowns, 3 cells) max expansion: 4.5mm	Large workhorse (7 cells) max expansion: 4.75mm
4.00	Large workhorse (10 crowns, 2 cells) *max expansion: 5.75mm*		Large workhorse (3 cells) *max expansion: 4.5mm*			
4.50						
5.00						

Foin et al. EBC 2011

LEMAX and TAXUS LM french registries



P. Garot AHA 2011

EBC

Conclusions Left main PCI: how ?

- Safety: risk assesment, hemodynamic support, pharmacology
- limit the number of stents in LM: provisional SB stenting strategy
- Full stent apposition;Finet's formula, IVUS/OCT guidance
- Respect the anatomy: 3 segments / 3 diameters
- Kissing after single stenting is still debated, but mandatory after double stenting
- Randomized comparisons of techniques are underway