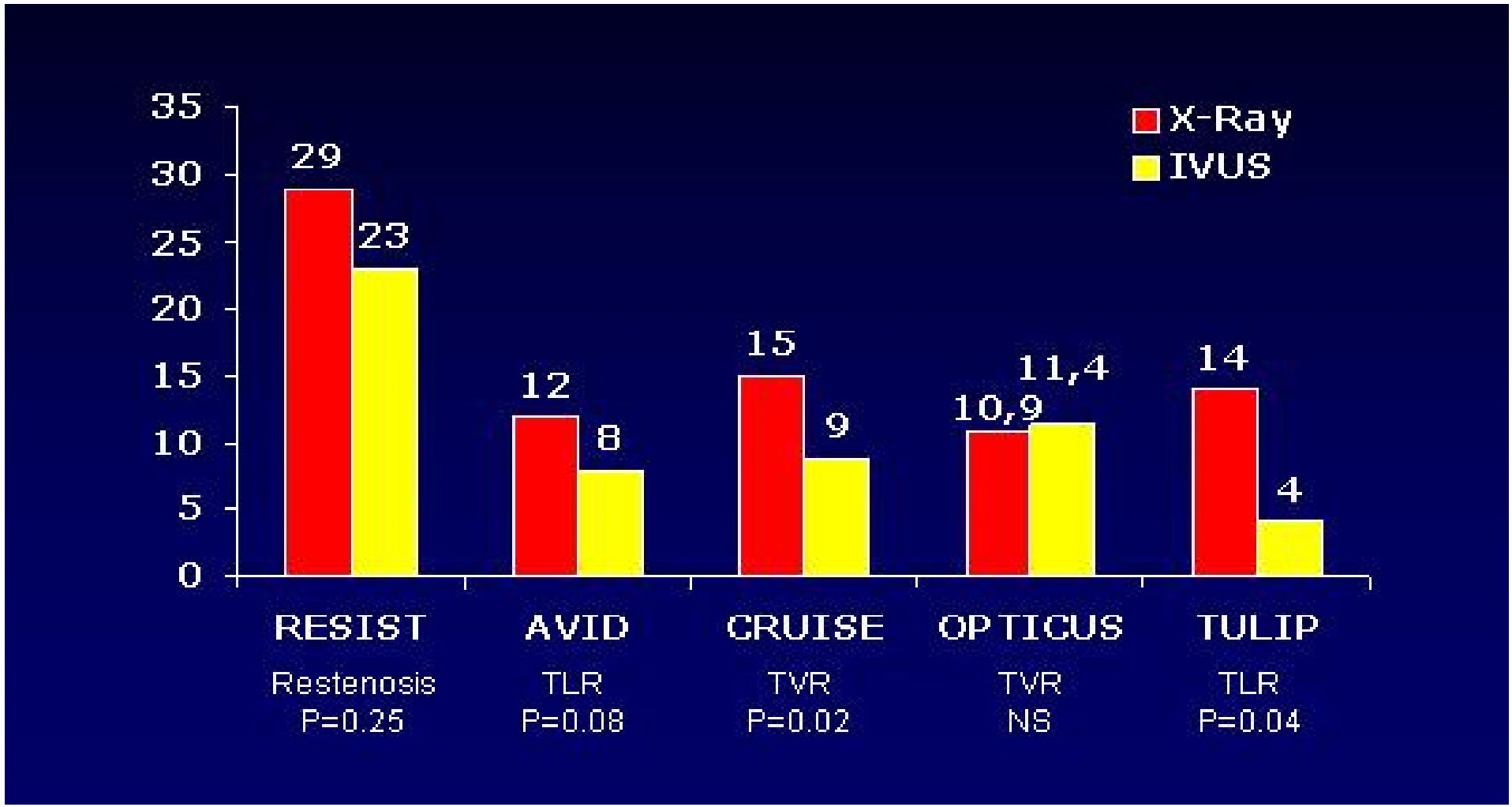
Left Main Stenting: "Evidence vs. Out of Evidence"

Angiographic Guidance Is Enough !

Y. Louvard, ICPS, Massy, France

No conflict of interest to disclose

X-Ray vs IVUS Guidance stenting (BMS randomised trials)



Late stent malapposition risk is higher after drug-eluting stent compared with bare-metal stent implantation and associates with late stent thrombosis

Ayman K.M. Hassan[1,2], Sandrin C. Bergheanu[1,3,4], Theo Stijnen[5], Bas L. van der Hoeven[1], Jaapjan D. Snoep[3], Josepha W.M. Plevier[6], Martin J. Schalij[1], and J. Wouter Jukema[1]*

[1]Department of Cardiology C5-P, Leiden University Medical Center, PO Box 9600, 2300 RC Leiden, The Netherlands; [2]Department of Cardiology, Assiut University, Asslut, Egypt; [3]Department of Clinical Epidemiology, Leiden University Medical Center, Leiden, The Netherlands; [4]Einthoven Laboratory for Experimental Vascular Medicine, Leiden University Medical Center, Leiden, The Netherlands; [5]Department of Medical Statistics, Leiden University Medical Center, Leiden, The Netherlands; and [6]Information Specialist Walaeus Library, Leiden University Medical Center, Leiden, The Netherlands

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Aims	Late stent malapposition (LSM) may be acquired (LASM) or persistent. LSM may play a role in patients who develop late stent thrombosis (ST). Our objective was to compare the risk of LASM in bare metal stents (BMS) with drug-eluting stents (DES) and to investigate the possible association of both acquired and persistent LSM with (very) late ST.
Methods and results	We searched PubMed and relevant sources from January 2002 to December 2007. Inclusion criteria were: (a) intravascular ultrasonography (IVUS) at both post-stent implantation and follow-up; (b) 6–9-month-follow-up IVUS; (c) implantation of either BMS or the following DES: sirolimus, paclitaxel, everolimus, or zotarolimus; and (d) follow-up for LSM. Of 33 articles retrieved for detailed evaluation, 17 met the inclusion criteria. The risk of LASM in patients with DES was four times higher compared with BMS (OR = 4.36, CI 95% 1.74–10.94) in randomized clinical trials. The risk of (very) late ST in patients with LSM (five studies) was higher compared with those without LSM (OR = 6.51, CI 95% 1.34–34.91).
Conclusion	In our meta-analysis, the risk of LASM is strongly increased after DES implantation compared with BMS. Furthermore, LSM seems to be associated with late and very late ST.

USE of IVUS MIGHT PREVENT STENT THROMBOSIS

The potential clinical utility of intravascular ultrasound guidance in patients undergoing percutaneous coronary intervention with drug-eluting stents

Probal Roy, Daniel H. Steinberg, Steven J. Sushinsky, Teruo Okabe, Tina L. Pinto Slottow, Kimberly Kaneshige, Zhenyi Xue, Lowell F. Satler, Kenneth M. Kent, William O. Suddath, Augusto D. Pichard, Neil J. Weissman, Joseph Lindsay, and Ron Waksman*

Division of Cardiology, Washington Hospital Center, 110 Irving Street, NW, Suite 4B-1, Washington, DC 20010, USA

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Aims To assess the impact on clinical outcomes of intravascular ultrasound (IVUS) guidance during drug-eluting stent (DES) implantation. IVUS guidance during percutaneous coronary intervention (PCI) has been demonstrated to be useful in optimizing stent deployment. However, it is not proved that routine use of IVUS guidance with DES implantation can prevent stent thrombosis or restenosis.

Methods and results The clinical outcomes of 884 patients undergoing IVUS-guided intracoronary DES implantation from April 2003 to May 2006 were compared with the outcomes of a propensity-score matched population undergoing DES implantation with angiographic guidance alone. The primary endpoint of the study was definite stent thrombosis at 12 months. The secondary endpoint was major adverse cardiac events (MACE). After propensity-score matching, the two groups were well matched for clinical and angiographic characteristics. Patients undergoing IVUS-guided DES implantation underwent less direct stenting, more post-dilation, and had greater cutting balloon and rotational atherectomy use. At 30 days and at 12 months, a higher rate of definite stent thrombosis was seen in the No IVUS group (0.5 vs. 1.4%; $P = 0.046$) and (0.7 vs. 2.0%; $P = 0.014$), respectively. There were no major differences in late stent thrombosis and MACE (14.5 vs. 16.2%; $P = 0.33$) at 12 month follow-up between the groups. Rates of death and Q-wave myocardial infarction were similar, and there was no significant difference between groups in target vessel revascularization. However, a trend was seen in favour of the IVUS group in target lesion revascularization (5.1 vs. 7.2%; $P = 0.07$). IVUS guidance was an independent predictor of freedom from cumulative stent thrombosis at 12 months (adjusted HR 0.5, CI 0.1–0.8; $P = 0.02$).

Conclusion IVUS guidance during DES implantation has the potential to influence treatment strategy and reduce both DES thrombosis and the need for repeat revascularization.

Bifurcation lesions

CAN IVUS REDUCE DEATH AND STENT THROMBOSIS BUT NOT TLR?

Long-Term Outcomes of Intravascular Ultrasound-Guided Stenting in Coronary Bifurcation Lesions

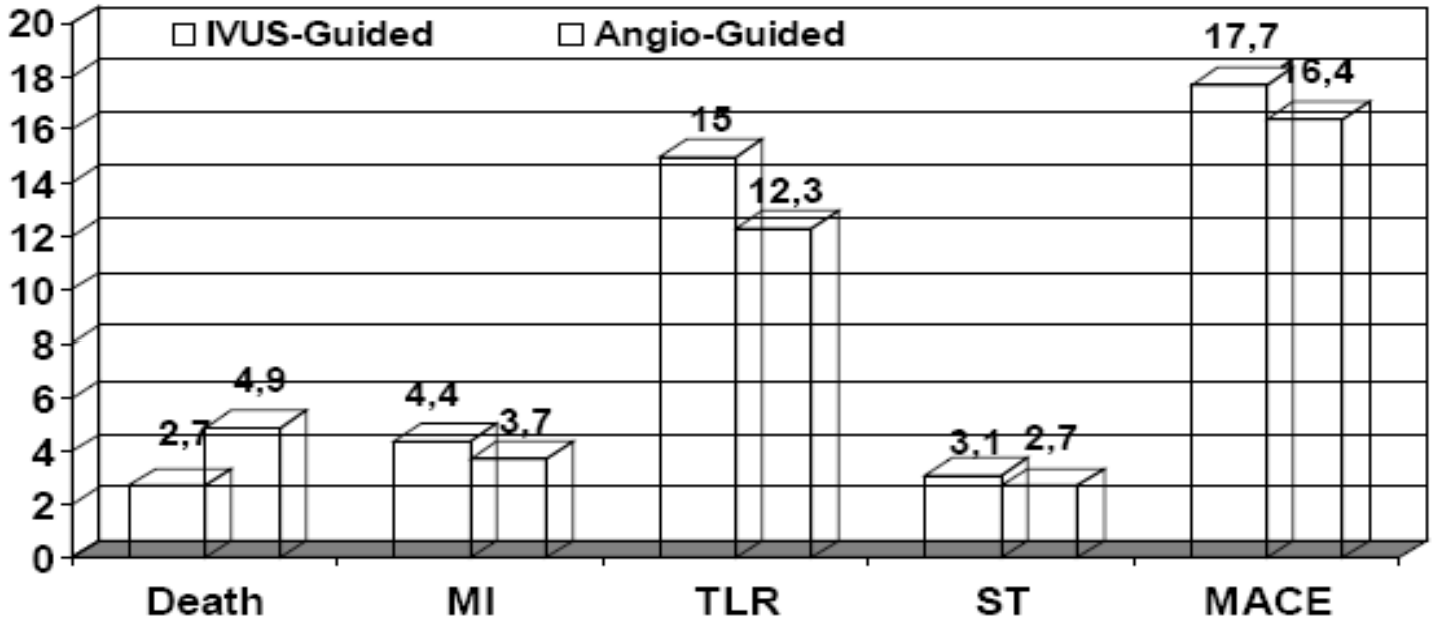
Sung-Hwan Kim, MD[a], Young-Hak Kim, MD, PhD[a], Soo-Jin Kang, MD, PhD[a], Duk-Woo Park, MD, PhD[a], Seung-Whan Lee, MD, PhD[a], Cheol Whan Lee, MD, PhD[a], Myeong-Ki Hong, MD, PhD[a], Sang-Sig Cheong, MD, PhD[b], Jae-Joong Kim, MD, PhD[a], Seong-Wook Park, MD, PhD[a], and Seung-Jung Park, MD, PhD[a,*]

Stenting for bifurcation lesions is still challenging, and the effect of intravascular ultrasound (IVUS) guidance on long-term outcomes has not been evaluated. We assessed the long-term outcomes of IVUS-guided stenting in bifurcation lesions. We evaluated 758 patients with de novo nonleft main coronary bifurcation lesions who underwent stent implantation from January 1998 to February 2006. We compared the adverse outcomes (i.e., death, stent thrombosis, and target lesion revascularization) within 4 years, after adjustment using a multivariate Cox proportional hazard model and propensity scoring. IVUS-guided stenting significantly reduced the long-term all-cause mortality (hazard ratio [HR] 0.31, 95% confidence interval [CI] 0.13 to 0.74, p = 0.008) in the total population and in the patients receiving drug-eluting stents (DESs) (HR 0.24, 95% CI 0.06 to 0.86, p = 0.03), but not in the patients receiving bare metal stents (HR 0.41, 95% CI 0.13 to 1.26, p = 0.12). IVUS-guided stenting had no effect on the rate of stent thrombosis (HR 0.48, 95% CI 0.16 to 1.43, p = 0.19) or target lesion revascularization (HR 1.47, 95% CI 0.79 to 2.71, p = 0.21). In patients receiving DESs, however, IVUS guidance reduced the development of very late stent thrombosis (0.4% vs 2.8%, p = 0.03, log-rank test). In conclusion, in patients receiving DESs, IVUS-guided stenting for treatment of bifurcation lesions significantly reduced the 4-year mortality compared to conventional angiographically guided stenting. In addition, IVUS guidance reduced the development of very late stent thrombosis in patients receiving DESs. (Am J Cardiol

Is IVUS beneficial for PCI of bifurcation lesions ? Evidence from 4314-patient registry (I-BIGIS)

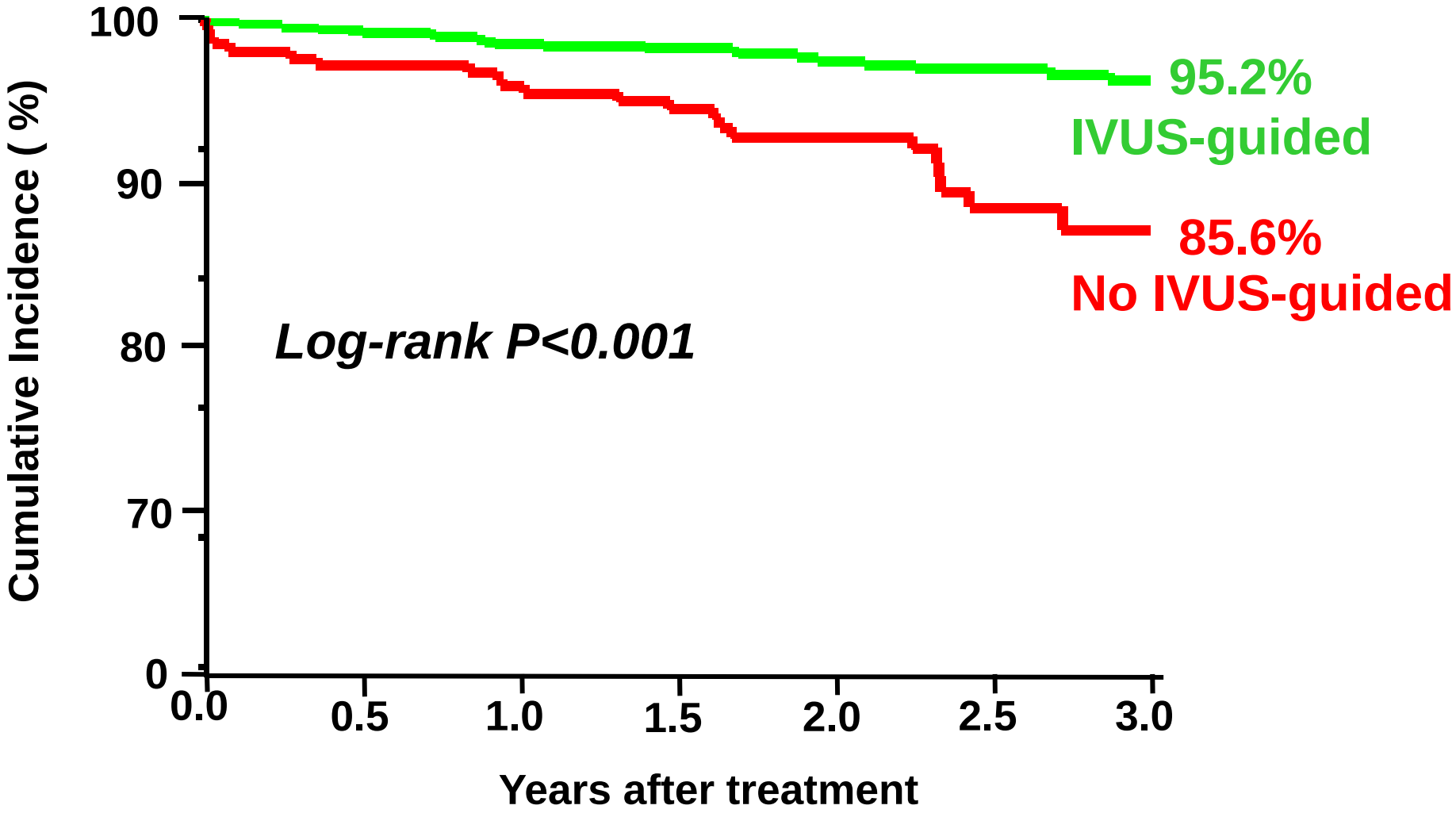
Long-Term Outcome (24.4 ± 15.1 months

- **Even at extensive multivariable analysis with propensity adjustment, IVUS guidance was not associated with any statistically significant impact on the risk of MACE, death, myocardial infarction, TLR (neither on the main branch nor on the side branch), or stent thrombosis (all p>0.05).**



Distal left main

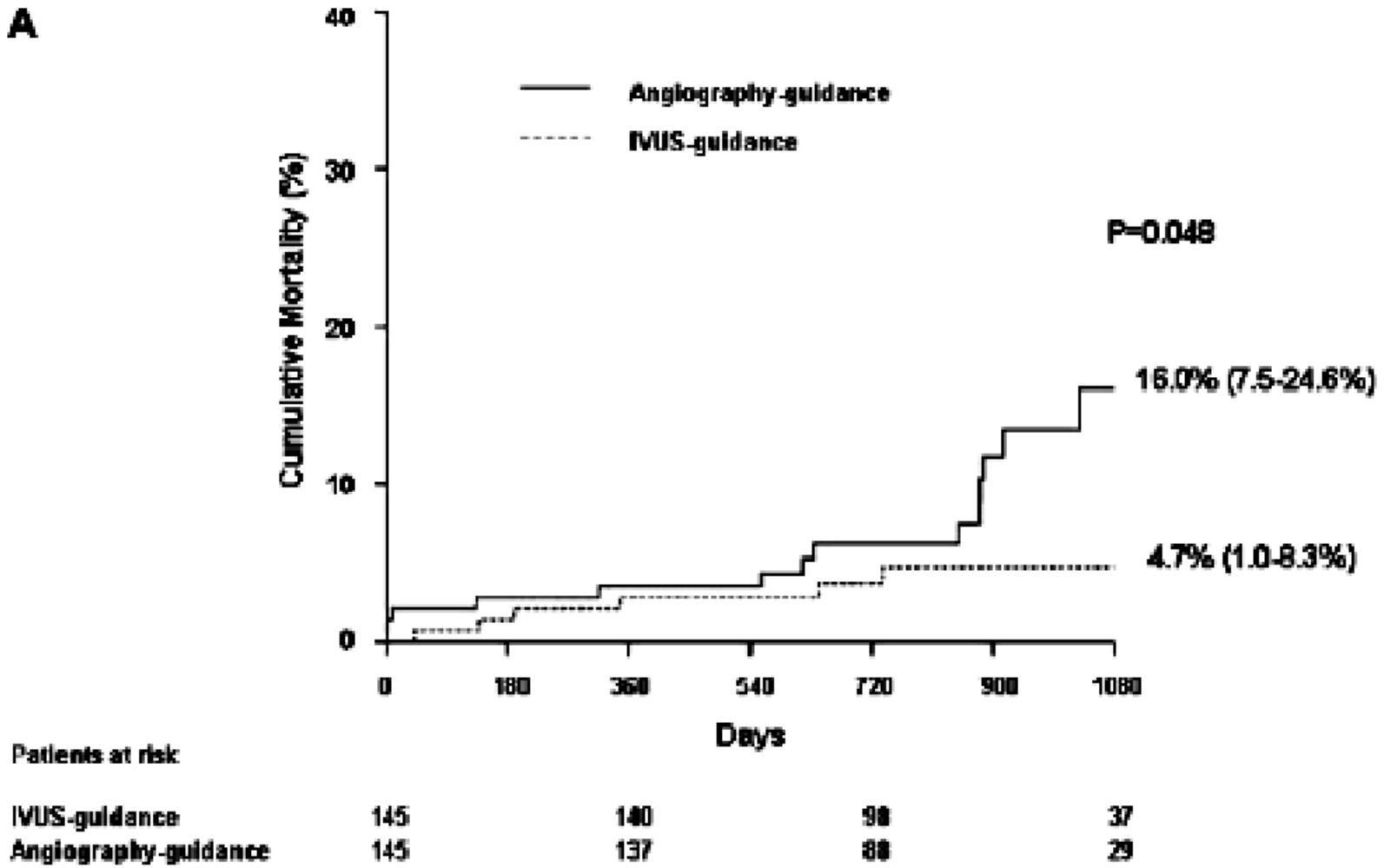
All-Cause Mortality (DES) According to IVUS Guidance



Preliminary Data from MAIN COMPARE Registry (n=2311)

Impact of IVUS Guidance on Long-Term Mortality in Stenting for ULM Stenosis

145 propensity matched pairs of patients receiving DES



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

ANY IMPACT OF IVUS ON LEFT MAIN

Comparison of Early Outcome of Percutaneous Coronary Intervention for Unprotected Left Main Coronary Artery Disease in the Drug-Eluting Stent Era With Versus Without Intravascular Ultrasonic Guidance

Pierfrancesco Agostoni, MD, Marco Valgimigli, MD, Carlos A.G. Van Mieghem, MD, Gaston A. Rodriguez-Granillo, MD, Jiro Aoki, MD, Andrew T.L. Ong, MBBS, Keiichi Tsuchida, MD, Eugène P. McFadden, MD, Jurgen M. Ligthart, BSc, Pieter C. Smits, MD, PhD, Peter de Jaegere, MD, PhD, George Sianos, MD, PhD, Willem J. Van der Giessen, MD, PhD, Pim De Feyter, MD, PhD, and Patrick W. Serruys, MD, PhD

The aim of this study was to assess the short- and mid-term clinical impact of intravascular ultrasound guidance in 58 patients referred for elective percutaneous treatment of unprotected left main coronary artery disease with drug-eluting stents. The use of intravascular ultrasound, used in 41% of the procedures, was not associated with additional clinical benefit with respect to angiographic-assisted stent deployment.

(Am J Cardiol 2005;95:644–647)

Cordis Europa, NV, Roden, The Netherlands) and paclitaxel-eluting stents (Taxus, Boston Scientific Corp., Natick, Massachusetts) have been used as part of the Rapamycin-Eluting Stent Evaluated At Rotterdam Cardiology Hospital and the Taxus-Stent Evaluated At Rotterdam Cardiology Hospital registries, respectively. These protocols were approved by the hospital ethics committee and are in accordance with the Declaration of Helsinki. Written informed consent was obtained from every patient.

Angiographic success was defined as residual ste-

Agostoni Am J Cardiol. 2005 Mar 1;95(5):644-7

IVUS, what for ?
Left main sizing ?

QCA vs IVUS in Left Main

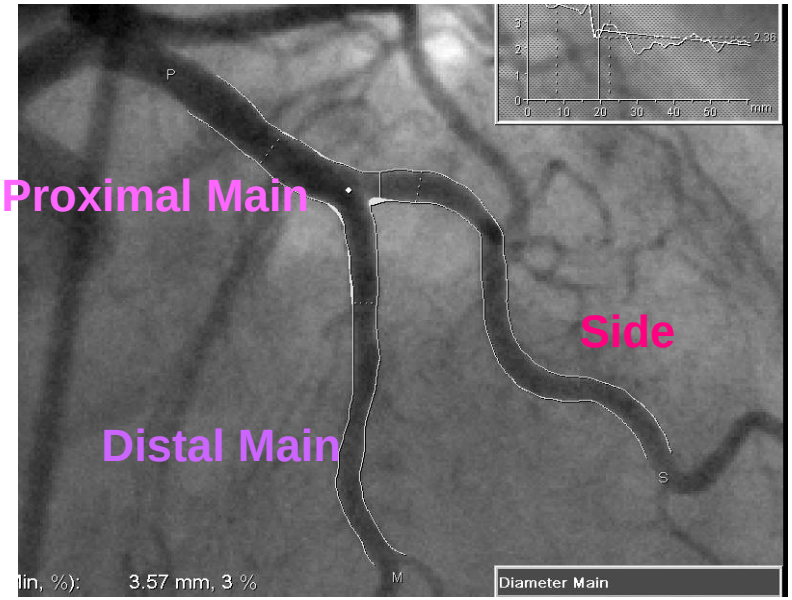
IVUS and Angiographic blinded evaluation of LMCA in 82 consecutive patients

	Angiograpy	IVUS	p value
LM size (mm)	4.01±0.52	4.90±0.51	<0.01

BSA, Age, gender, height, weight or ideal body weight did not predict LM size

Metzger, TCT 2003

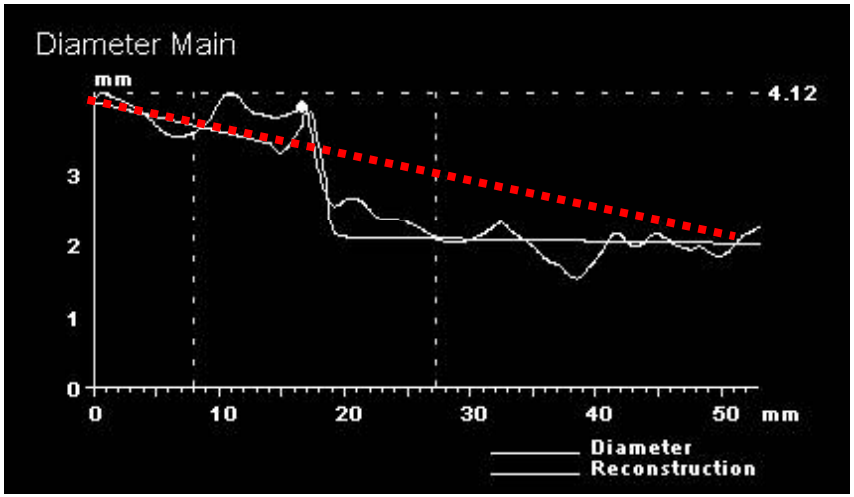
Fractal geometry and QCA

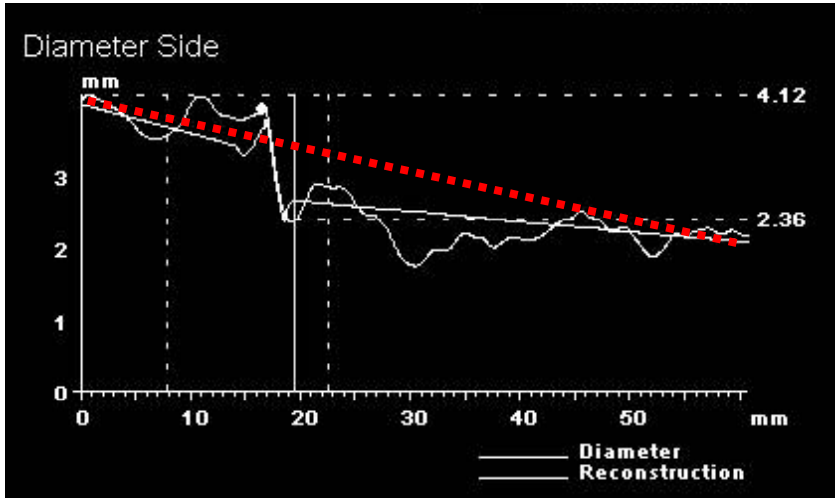


Reference diameter function is **not linear**

PM= (DM + SB)X0.678

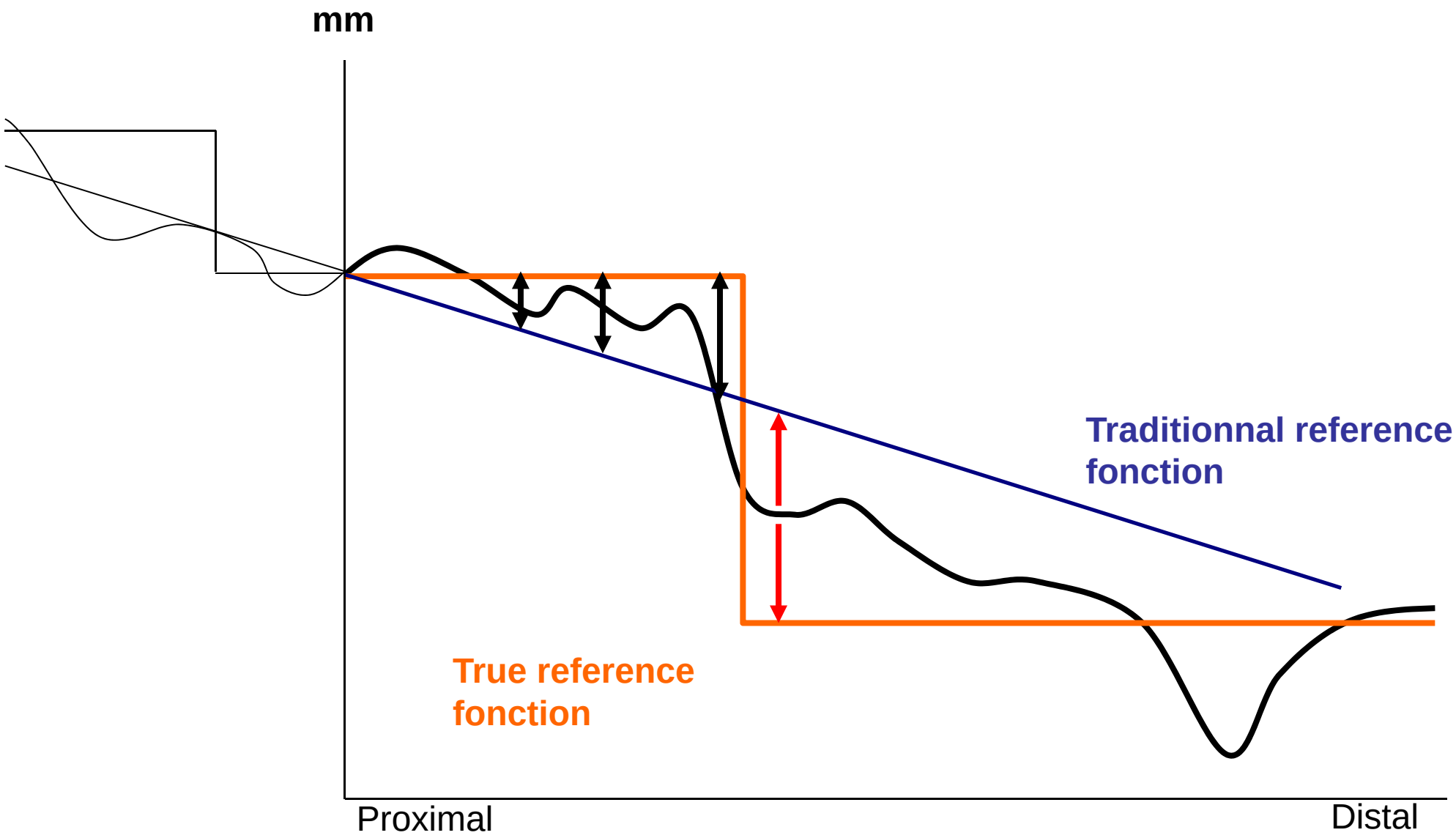
Finet's formula





From Serruys and PIE medical

Fractal geometry and QCA

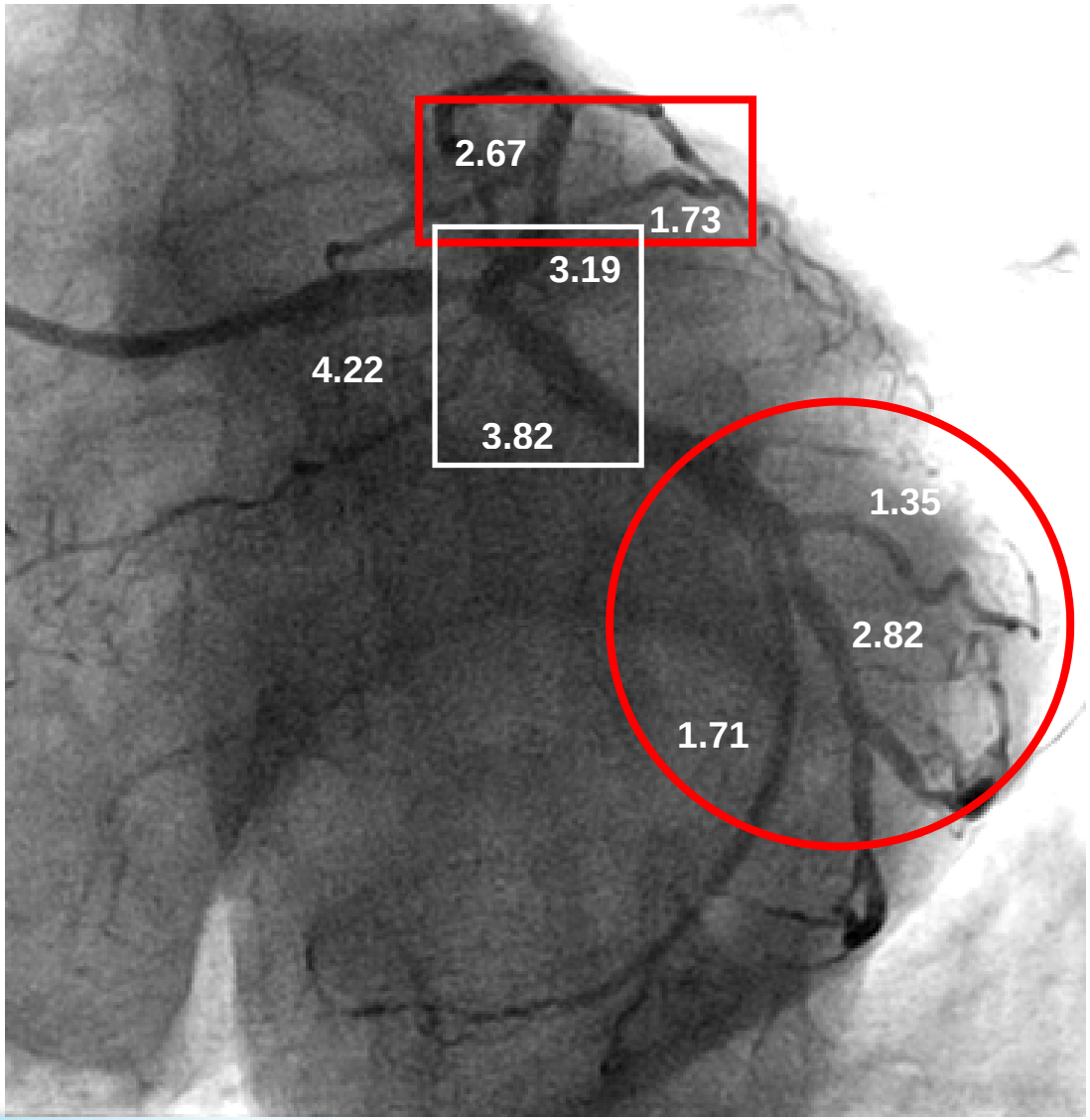


Branching laws and reference diameter measurement (calculation of the 3rd bifurcation segment)

Left main diameter:

(3.19 + 3.82) 0.678 =

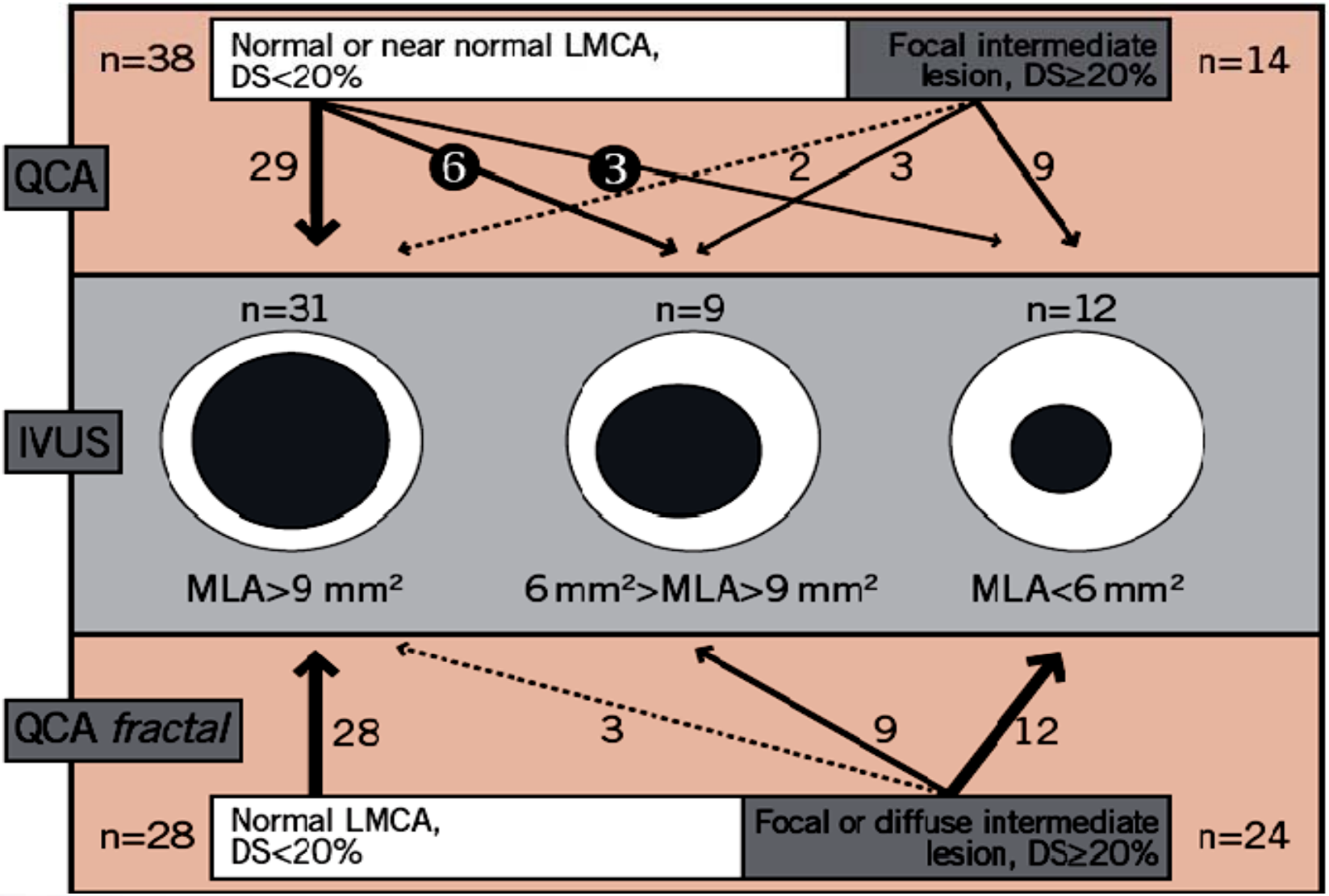
4,75



= 2,98

= 3,75

Diffuse atherosclerotic LMCA disease unmasked by fractal geometric law applied to QCA: an angiographic and IVUS study

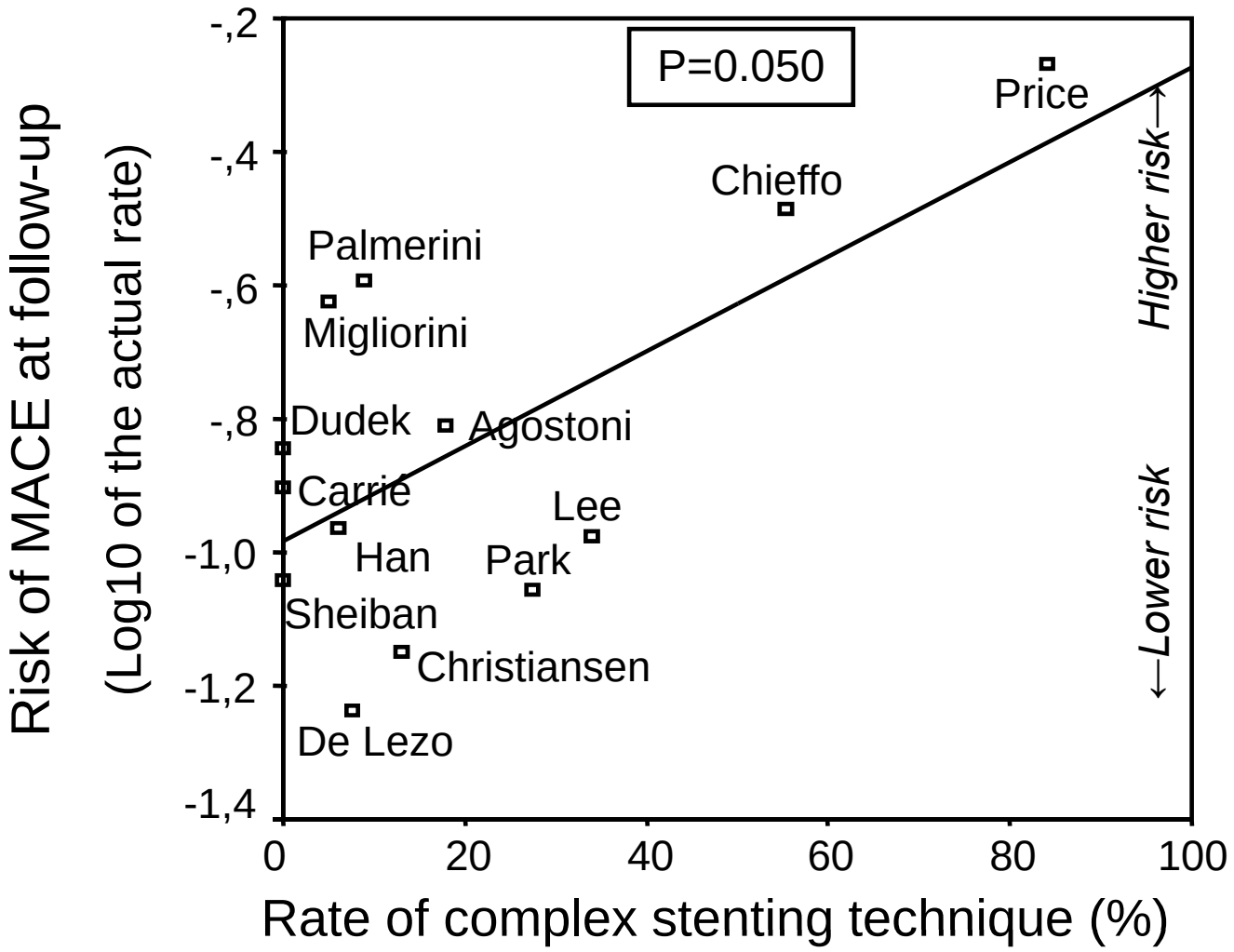


Motreff EuroIntervention 2010; 5: 709-715

IVUS, what for ?
Left main stenting technique choice ?

Stenting technique and MACE rate

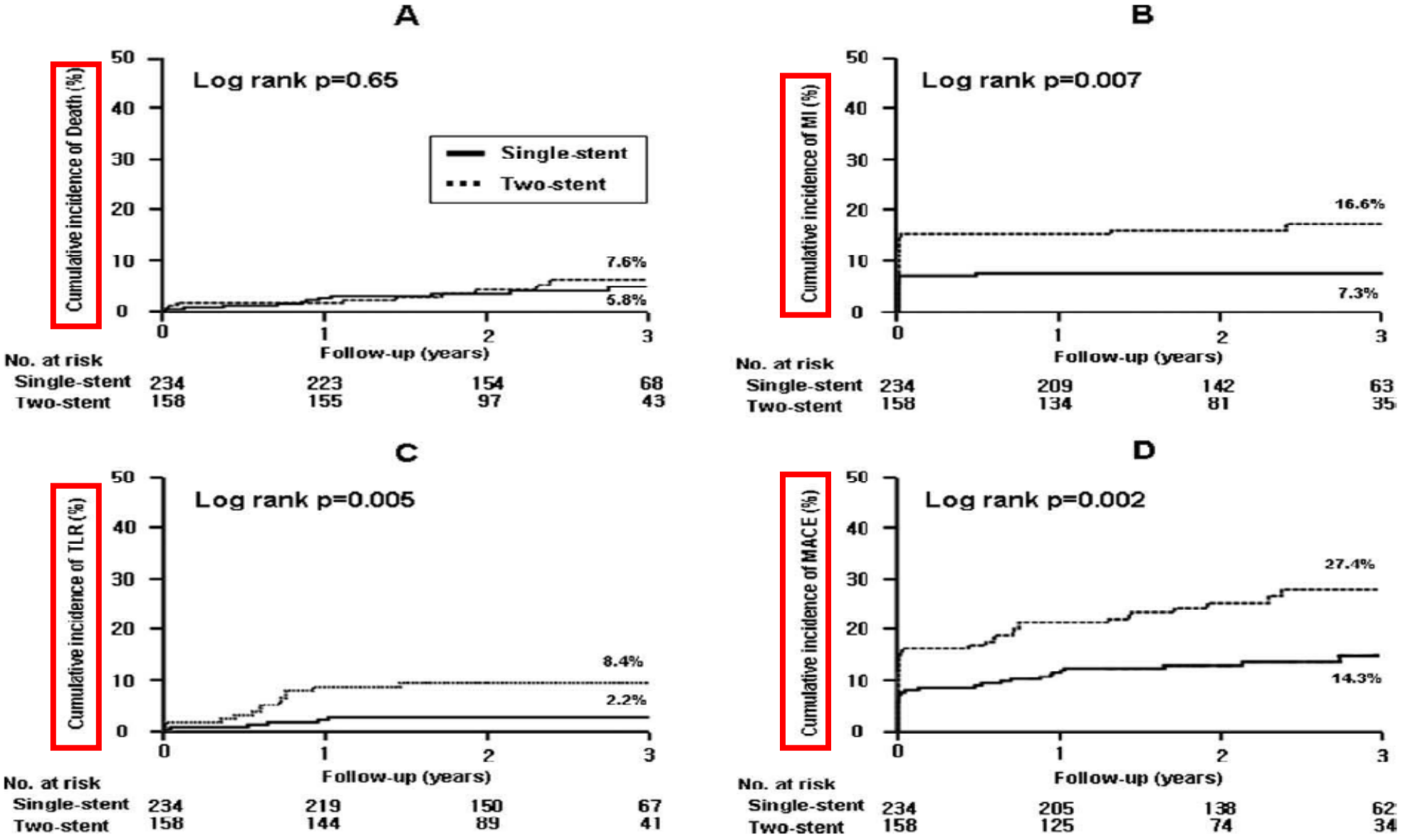
A meta-analysis on 1,274 patients with DES for ULM disease



Patients treated with 2 stents are significantly more likely to have MACE

I. Sheiban, EBC 2008

1- Vs 2-Stent in Treatment of ULM Bifurcation Disease

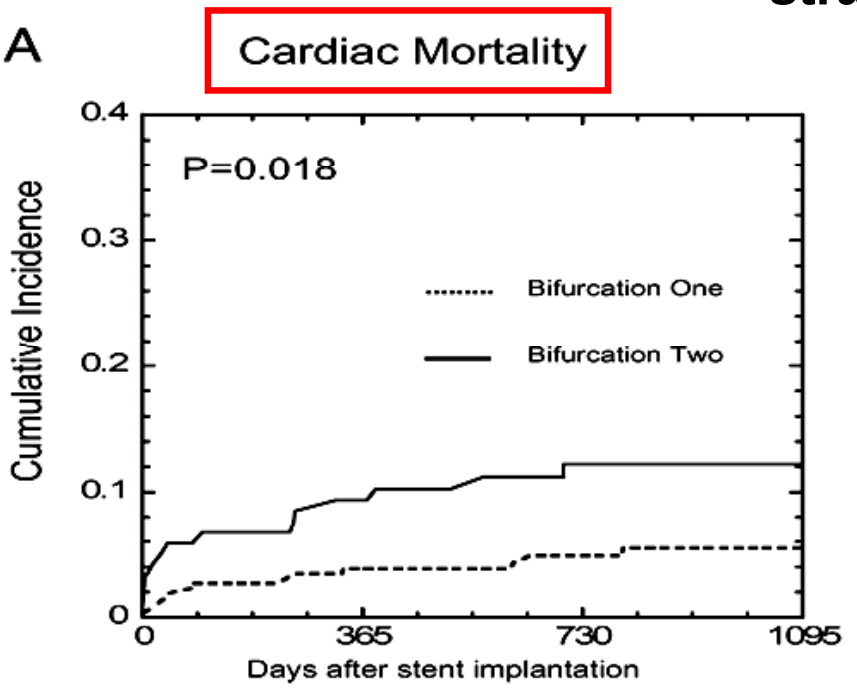


Kim CCI 00:000–000 (2010)

3Y Outcomes After SES Implantation for ULM Coronary Artery Disease: Insights From the j-Cypher Registry

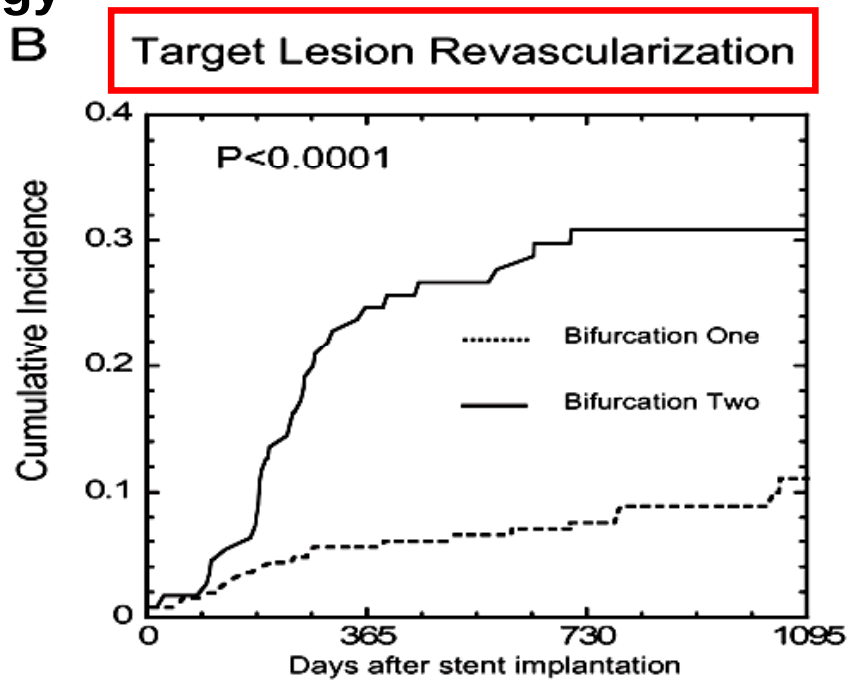
Cardiac death (A) and TLR (B) in pts treated for ULMCA / distal bifurcation stenting strategy

A



Day	0	365	730	1095
Bifurcation One				
Incidence (%)		3.9	4.9	5.5
No. at risk	261	242	180	86
Bifurcation Two				
Incidence (%)		9.4	12.2	12.2
No. at risk	119	105	86	52

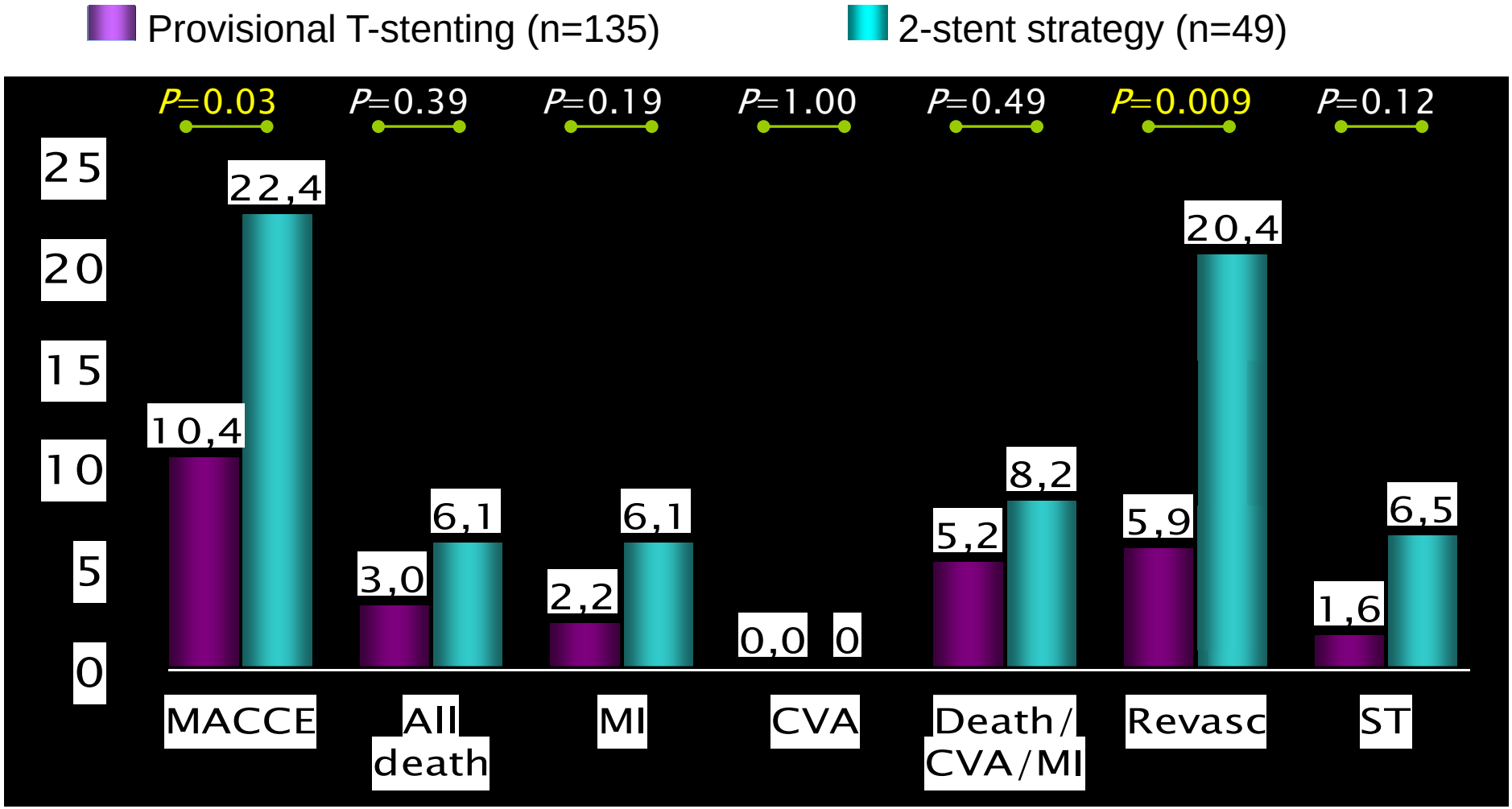
B



Day	0	365	730	1095
Bifurcation One				
Incidence (%)		5.6	7.6	11.1
No. at risk	261	229	161	76
Bifurcation Two				
Incidence (%)		24.6	30.9	30.9
No. at risk	119	81	62	37

Toyofuku Circulation 2009;120;1866-1874;

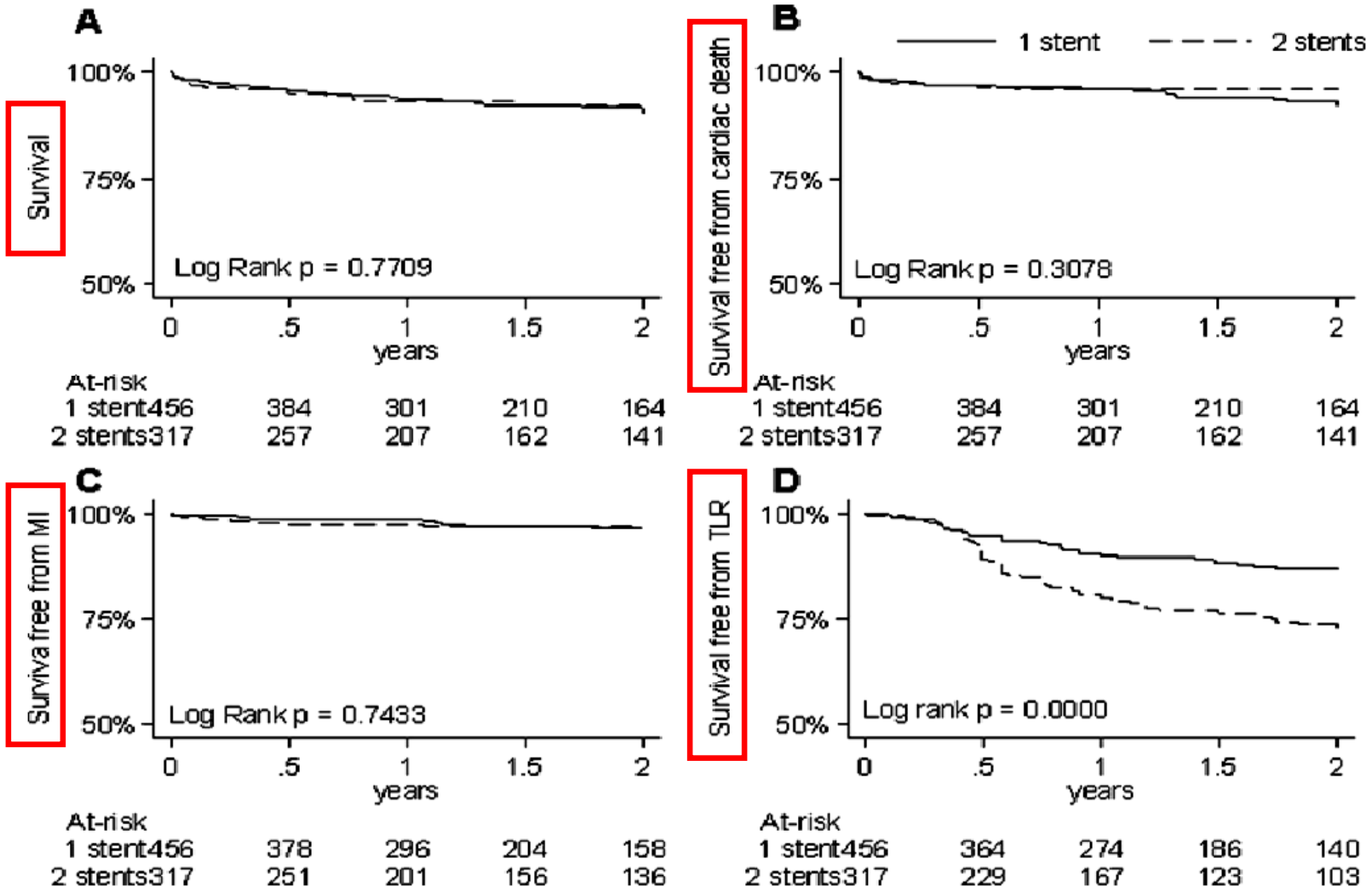
Distal ULM Stenting Techniques: MACCE Components to 12 Months: *T-stenting vs Non T-stenting* (SYNTAX)



ST=Per-protocol stent thrombosis
Site-reported data

ITT population
Patients with LM, LM+1,2,3VD included

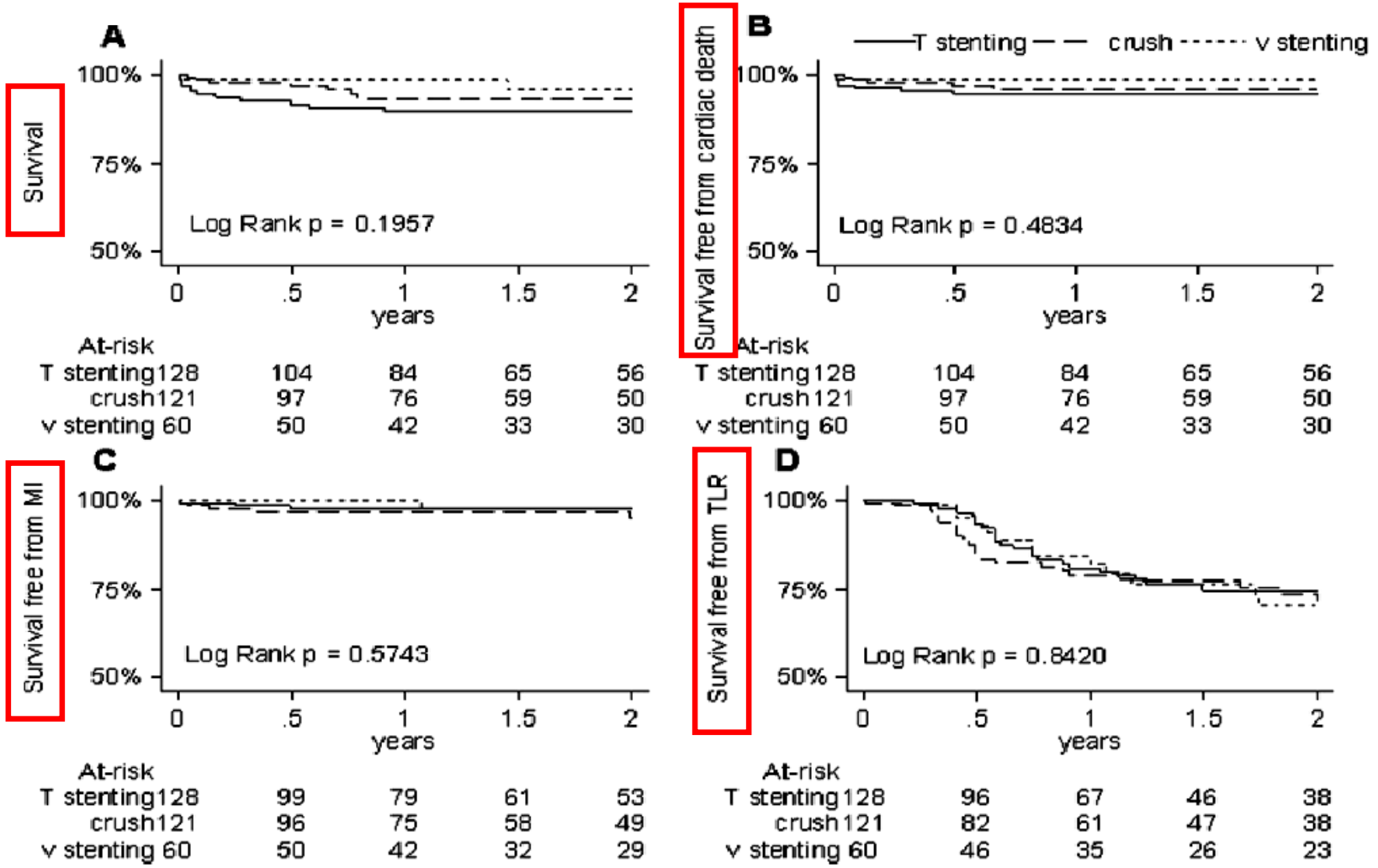
Impact of Bifurcation Technique on 2-Year Clinical Outcomes in 773 Pts With Distal ULM Stenosis Treated With DES



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 ?



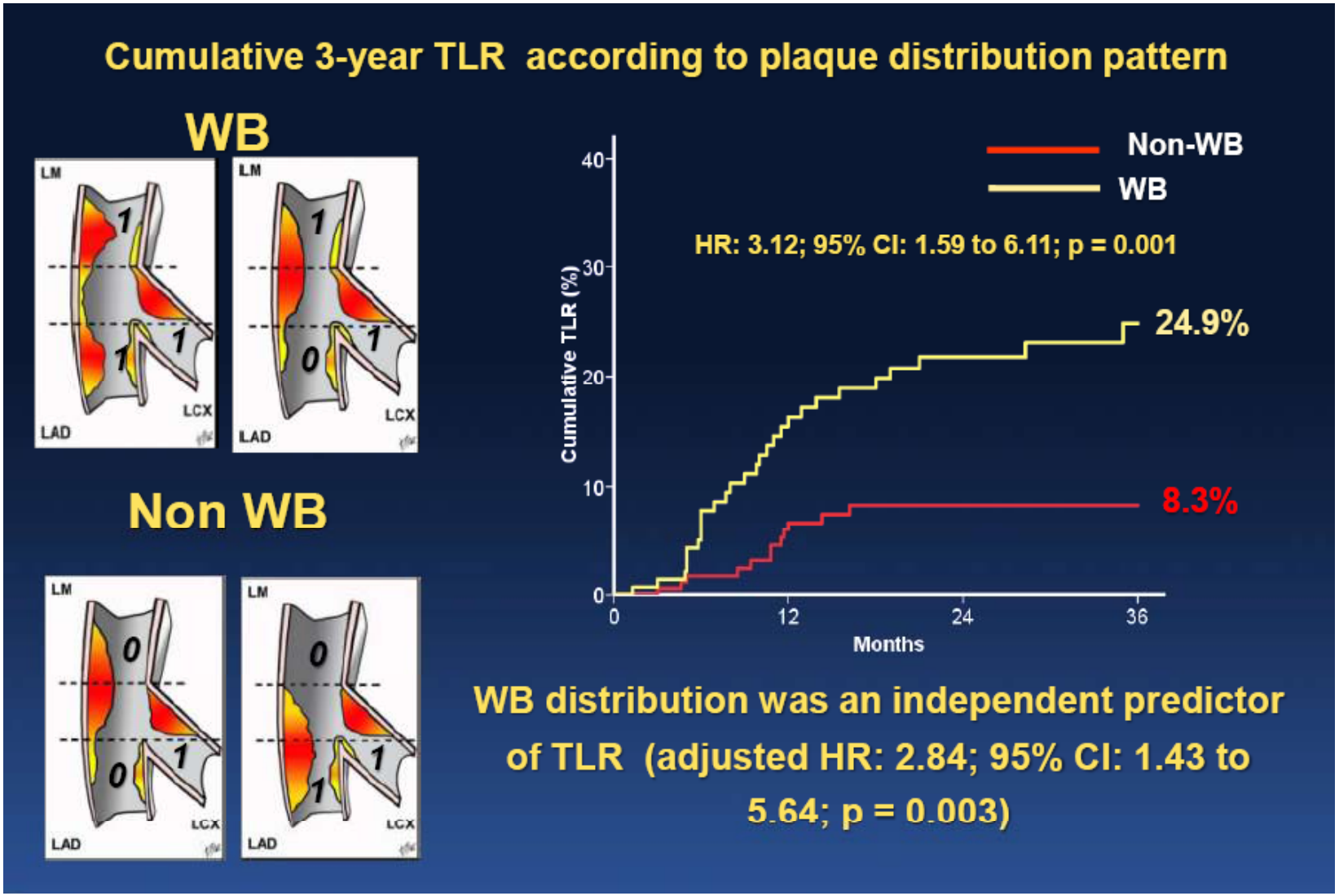
Palmerini Circ Cardiovasc Interv 2008;1;185-192

French Multi-center Left Main studies with DES

	Pilot Taxus* 2004	FRIEND** 2006	LEMAX 2008	= 616
Nb patients	291	151	174	
% distal lesion	78	↘ 69	↘ 81	
% 2 stents	42	↗ 26	↗ 19	
Mean LM stent diameter (mm)	3.44±0.39	3.59±0.49	3.63±0.33	
12 month TLR	5.9%	2.7%	2.3%	

*P. Valgimigli et al. Circulation 2009;119:2349-56 **O.Carrié et al., EuroIntervention 2009;4:449-56

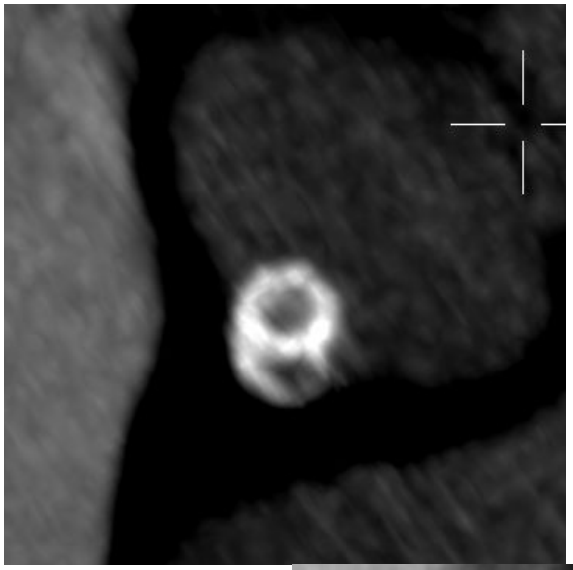
Plaque distribution patterns in distal left main coronary artery to predict outcomes after stent implantation.

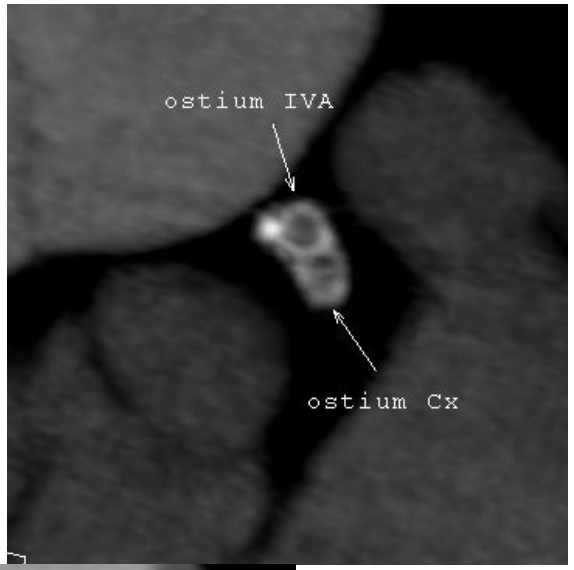


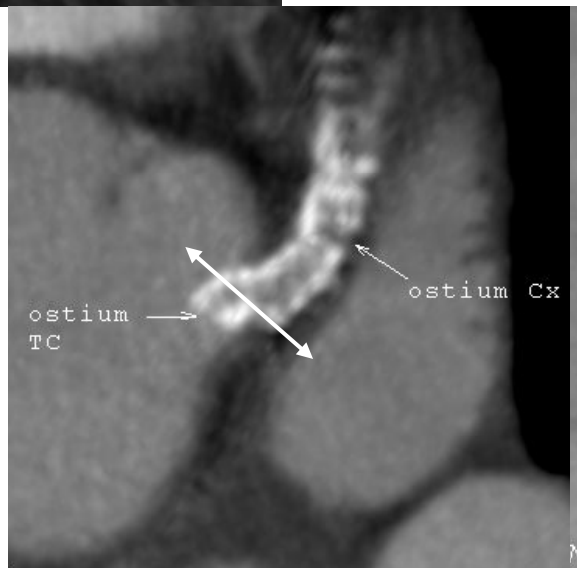
The WB pattern is associated with enhanced TLR risk, regardless of stent technique and plaque severity.

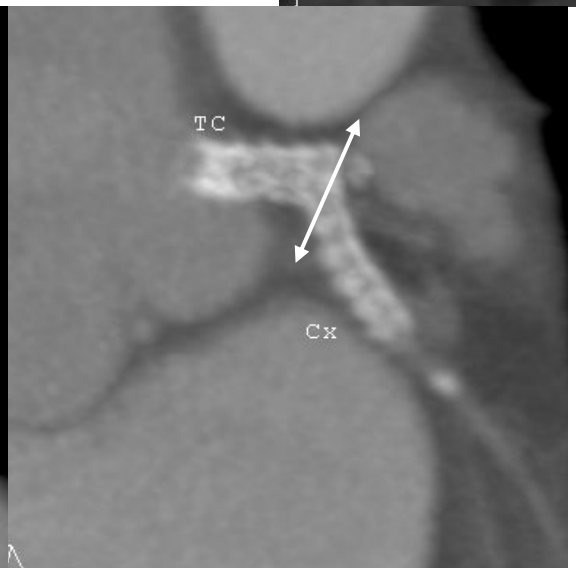
Tamburino JACC Cardiovasc Interv. 2010, 3:624-31

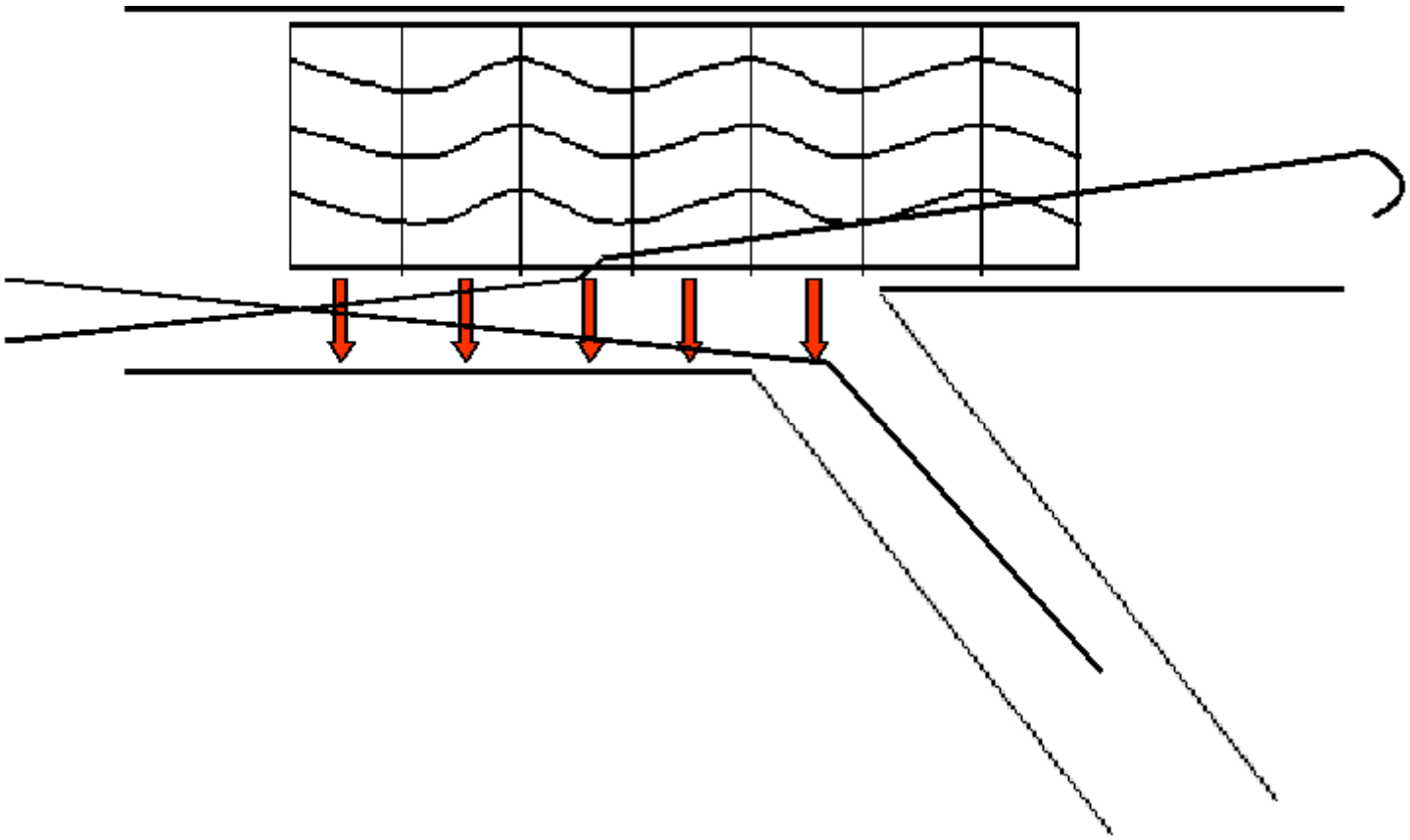
IVUS, what for ?
Procedure guidance ?



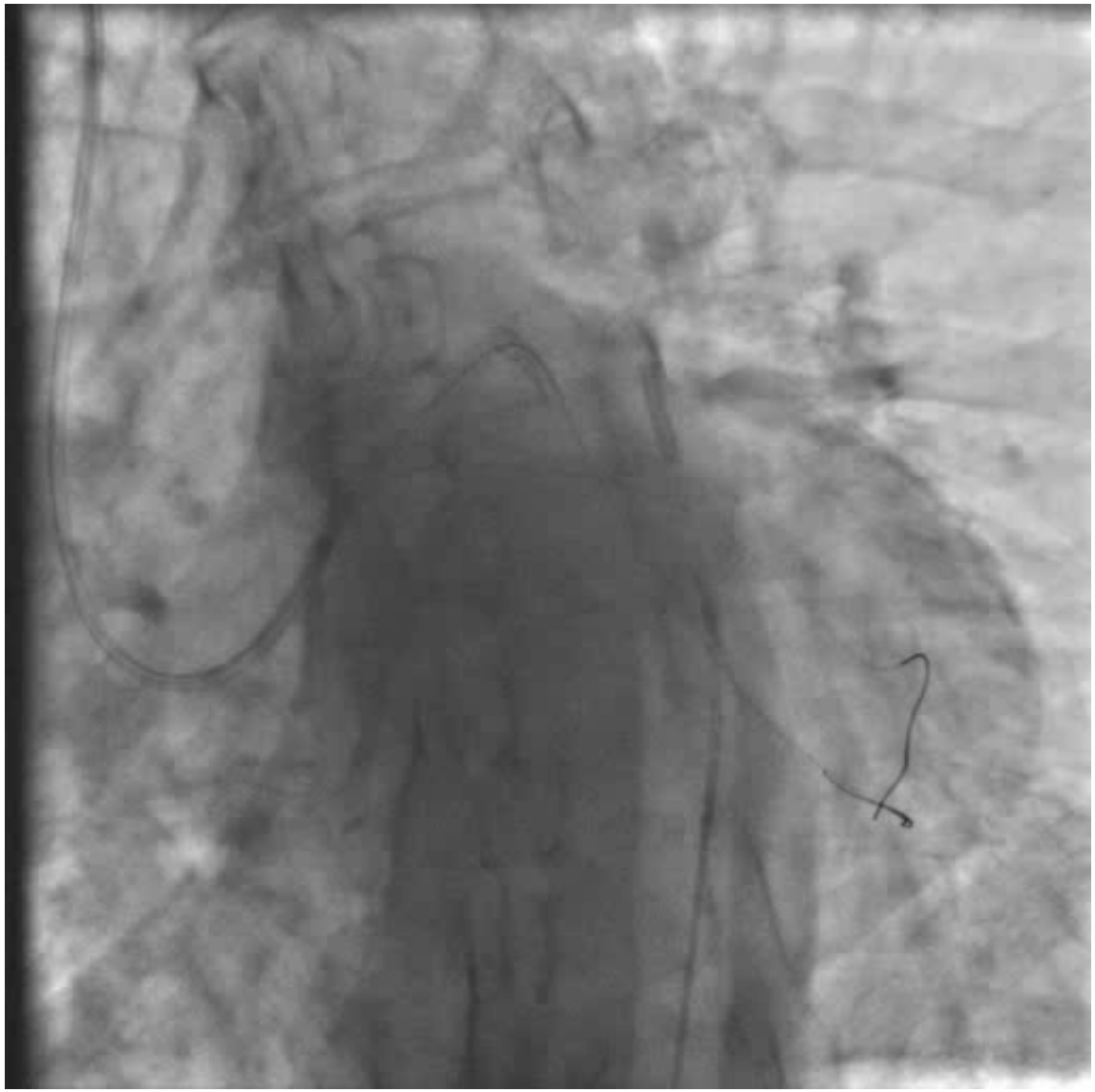

ostium IVA
ostium Cx


ostium
TC
ostium Cx


TC
Cx



IVUS-guided LM stenting

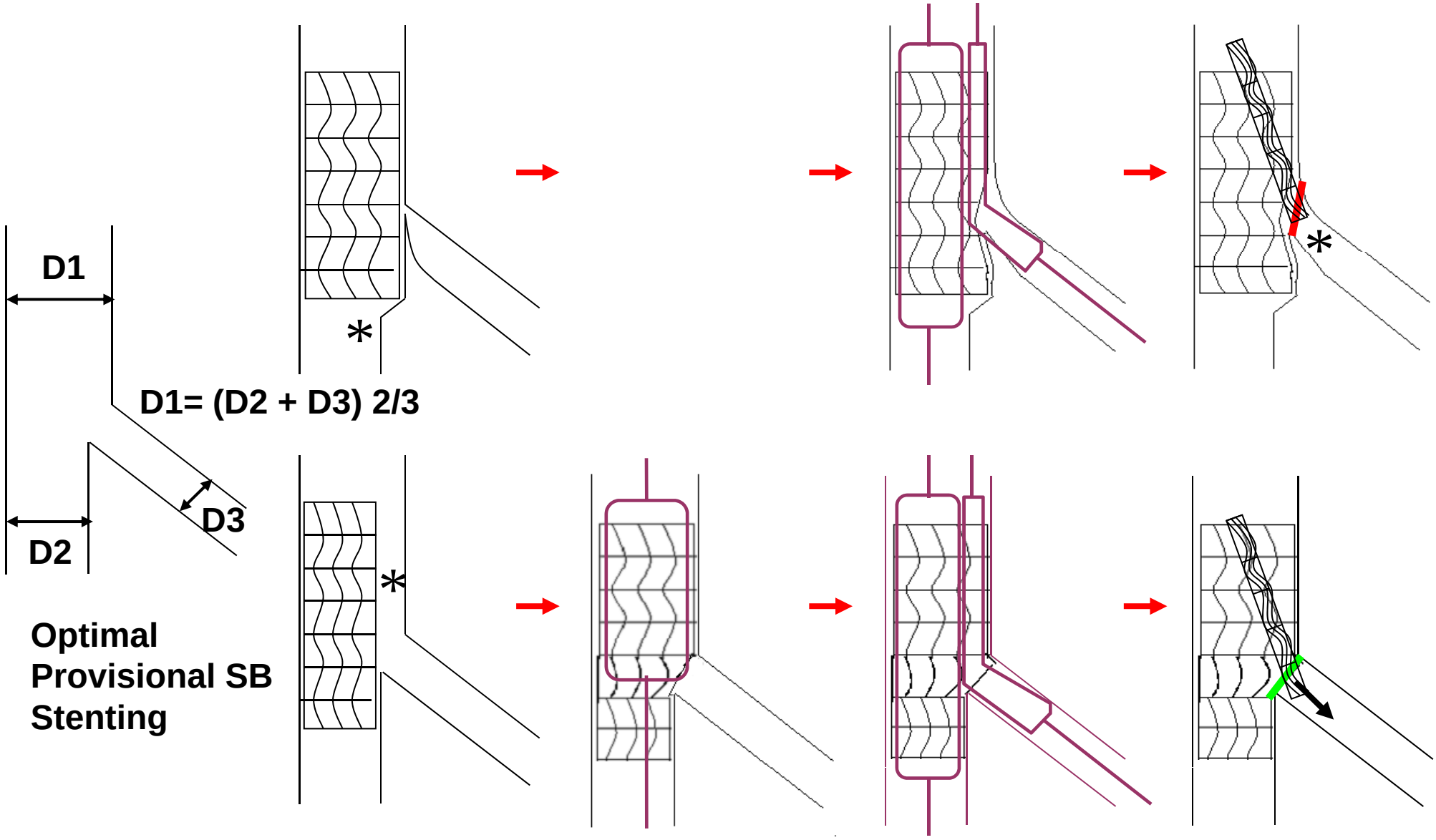


Prox LM

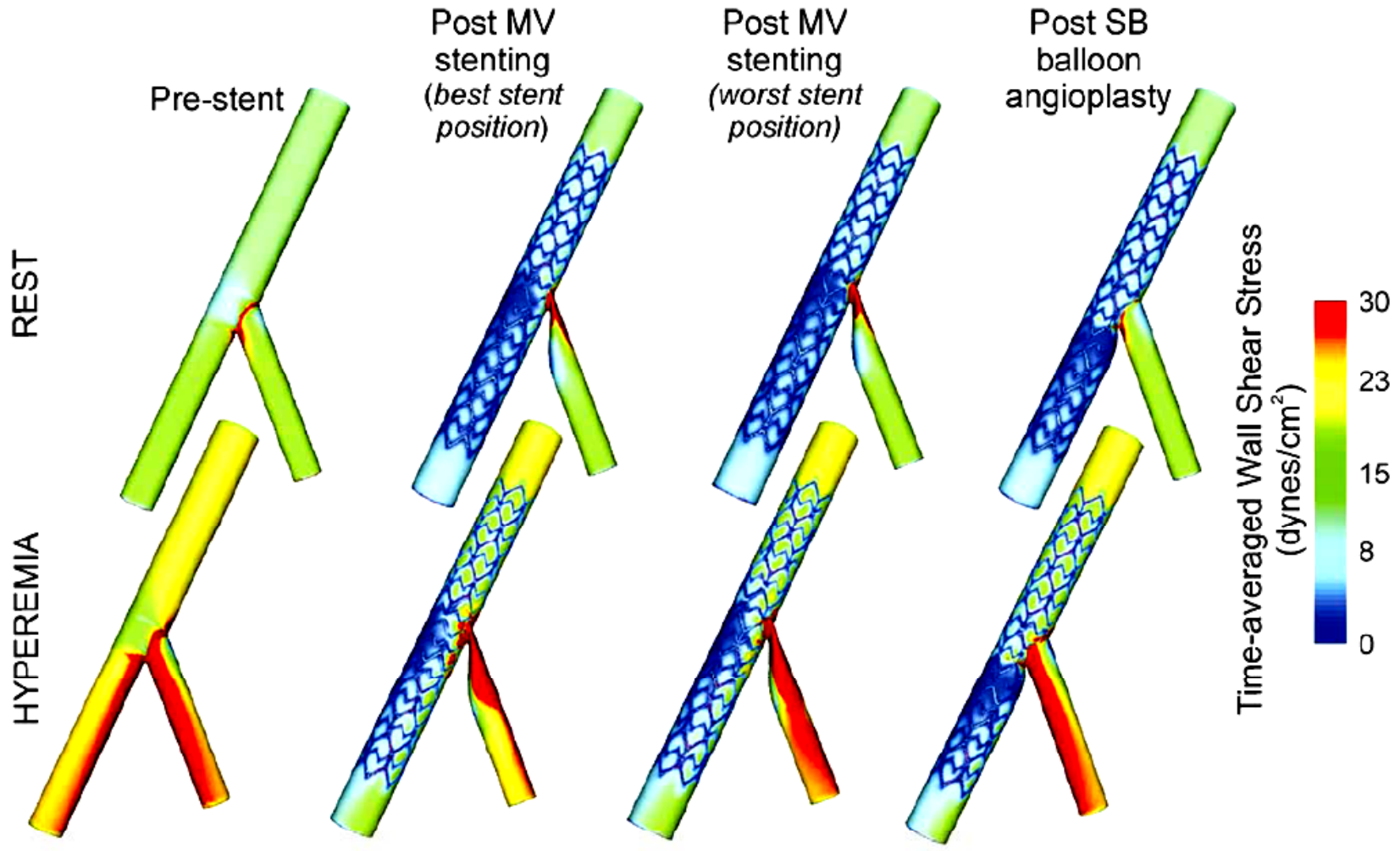
Dist LM

Circ.

Optimal Provisional SB Stenting



Hemodynamic changes after MB stenting and subsequent SB balloon angioplasty in a representative coronary bifurcation



Changes in time-averaged wall shear stress introduced by bifurcation stenting

Williams J Appl Physiol (May 27, 2010)

Distal LM POT

Conclusions

- Left main lumen size can be measured by IVUS and bifurcation dedicated QCA software (Murray's law) giving the same result
- Diffuse LM disease can be detected and LM diameter calculated using the Finet's formula
- Plaque distribution is a predictor of reintervention but doesn't help to choose the adequate technique (minimal stenting = **provisional stategy**)
- Choosing stent from the distal branch diameter followed immediately by POT technique is a very effective way to avoid technical problems during the procedure
- No clinical advantage of IVUS against angio for ULM stenting demonstrated in randomized trial


CHUT !