Bifurcation Stenting: Provisional Strategy

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Joint meeting of Coronary Revascularization

Busan, Korea, december 8-9, 2011

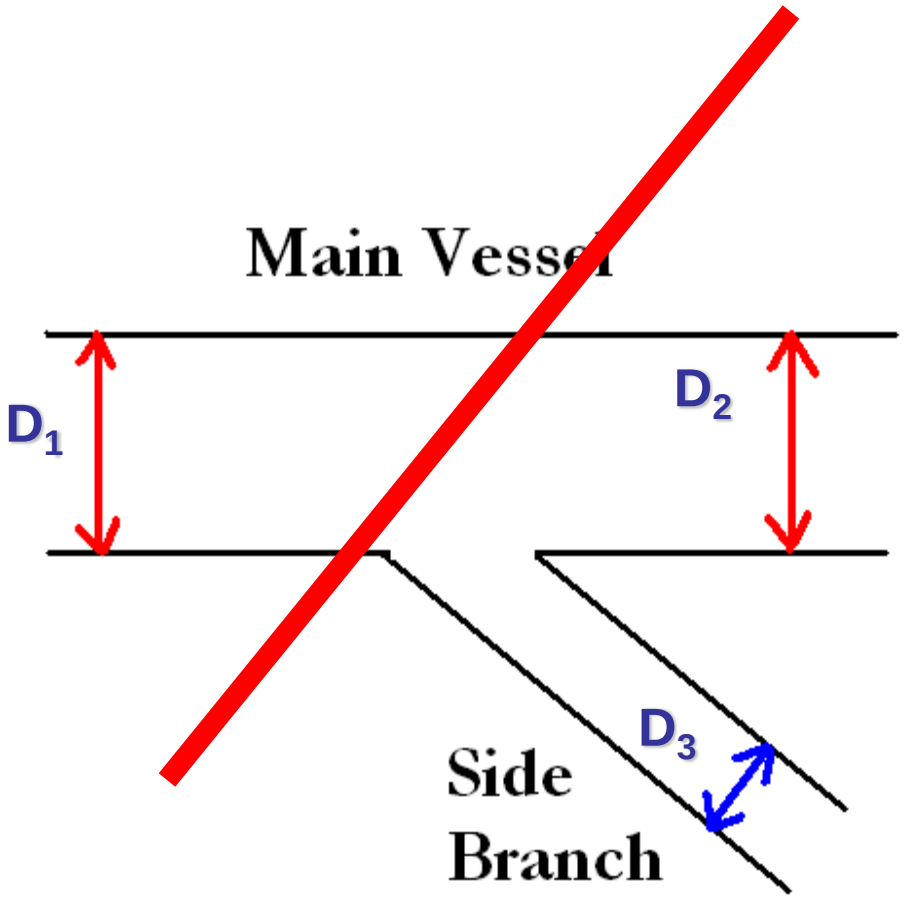
Bifurcation branching laws

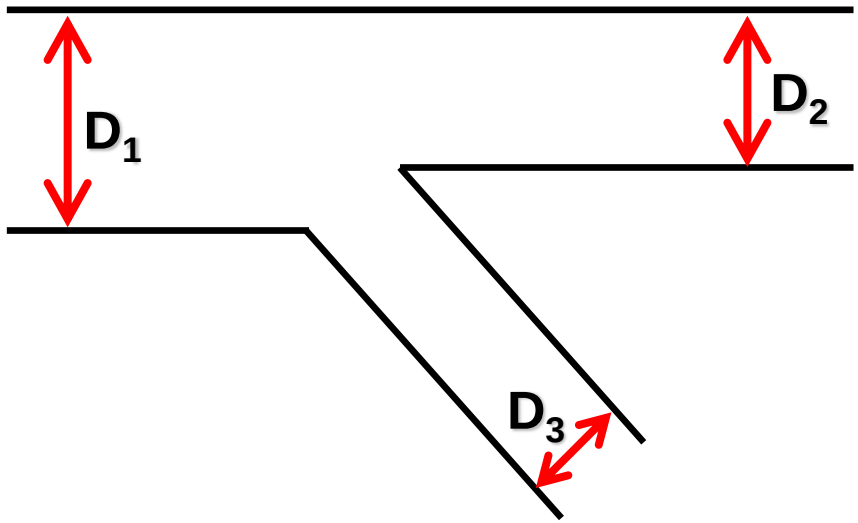
Murray's law

$$D_1^{3*} = D_2^{3*} + D_3^{3*}$$

Finet's law

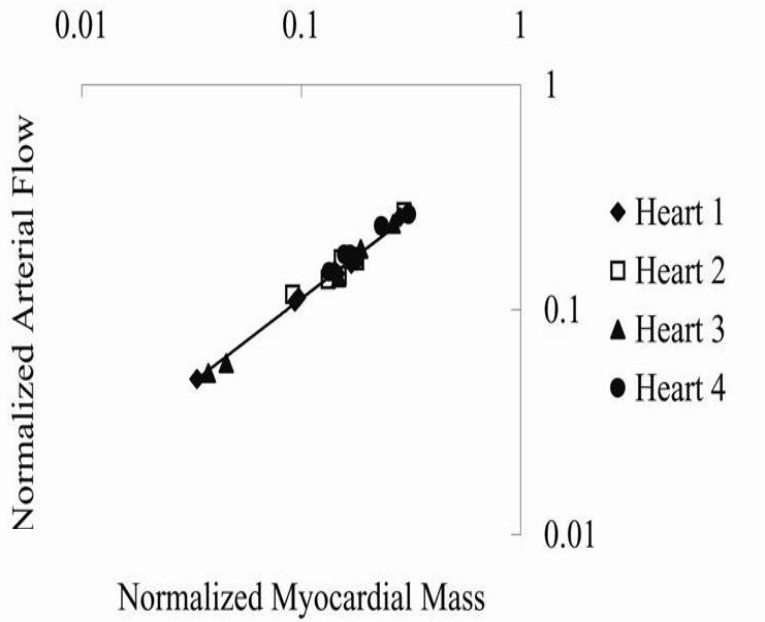
$$D_1 = 0.67(D_2 + D3)$$

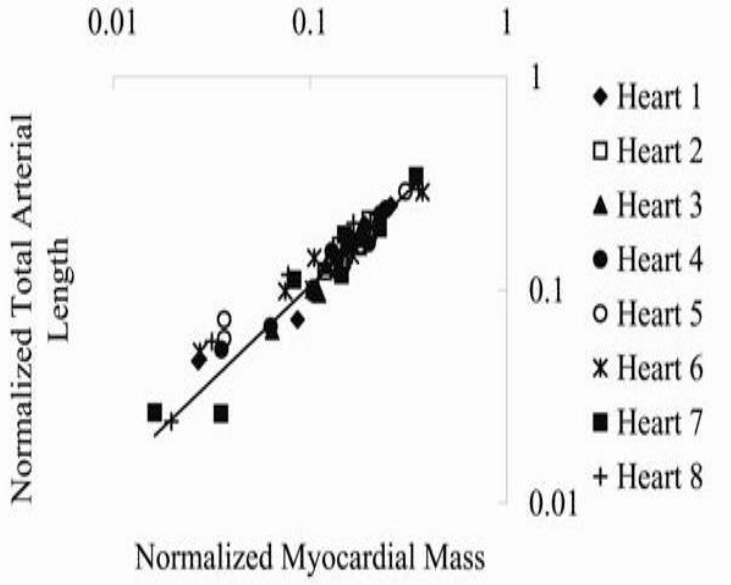


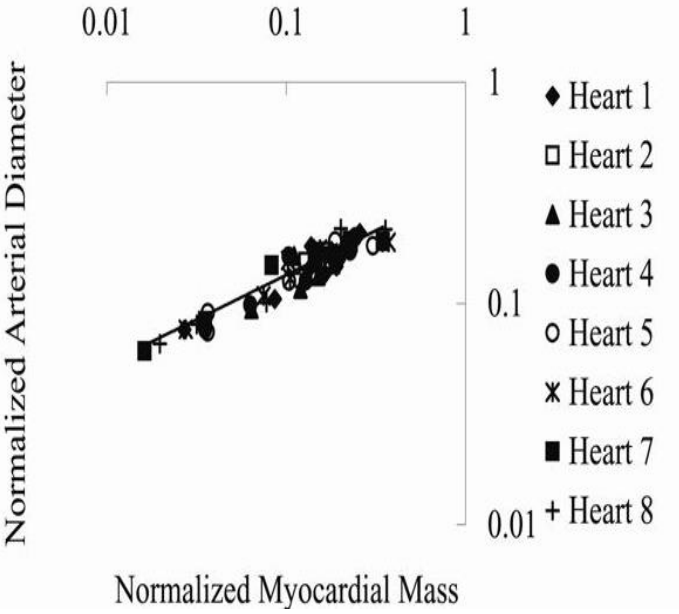


* 2.3

Structure-function scaling laws of vascular trees







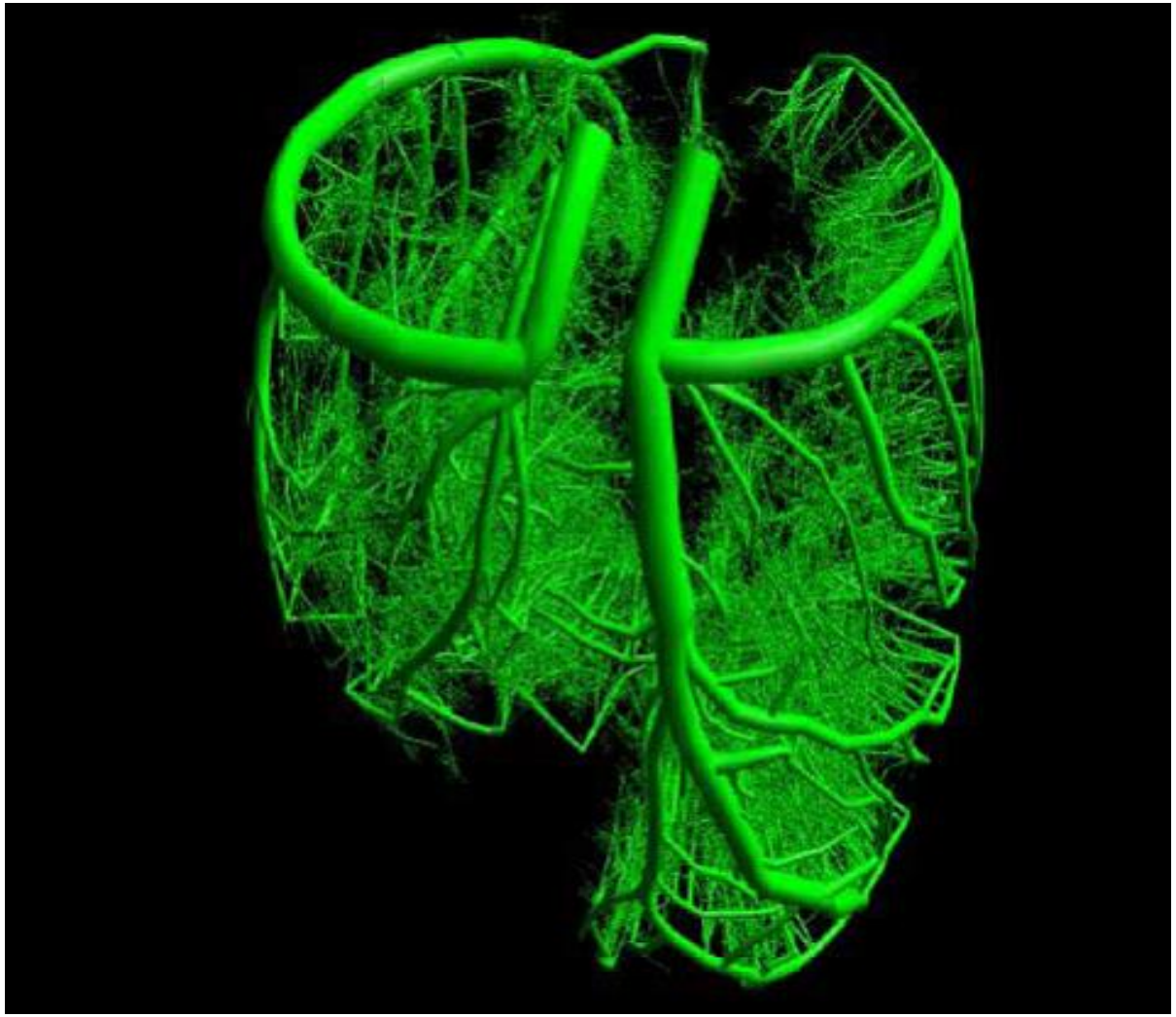
/ Flow

Myocardial mass

/ Length **/ Diameter**

Kassab, EBC 2009

Mathematical model of coronary arterial tree

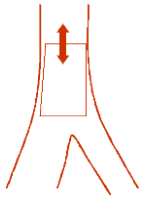
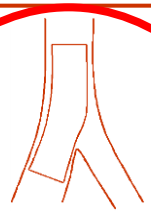
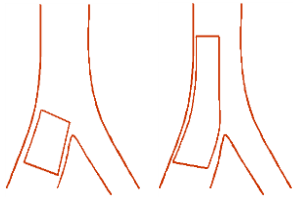
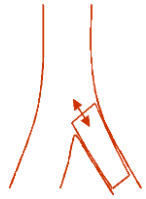
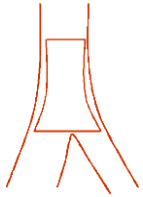
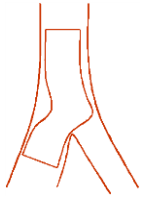
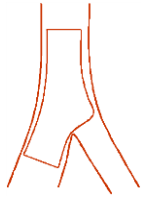
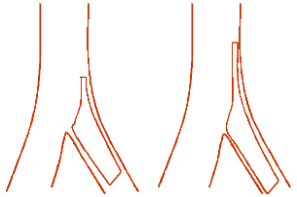
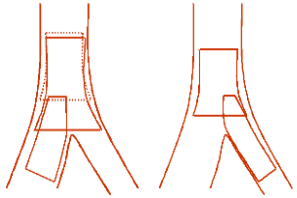
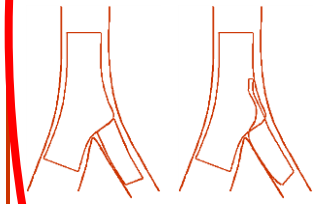
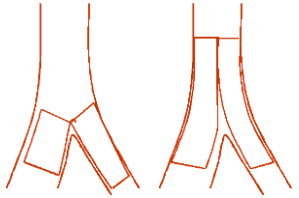
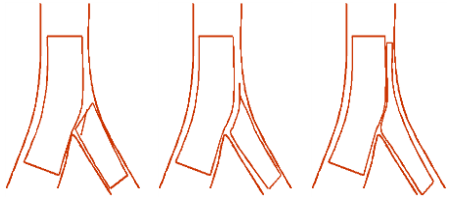
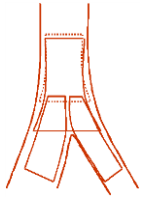
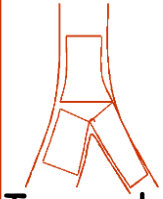


From G. Kassab

Provisional SB stenting

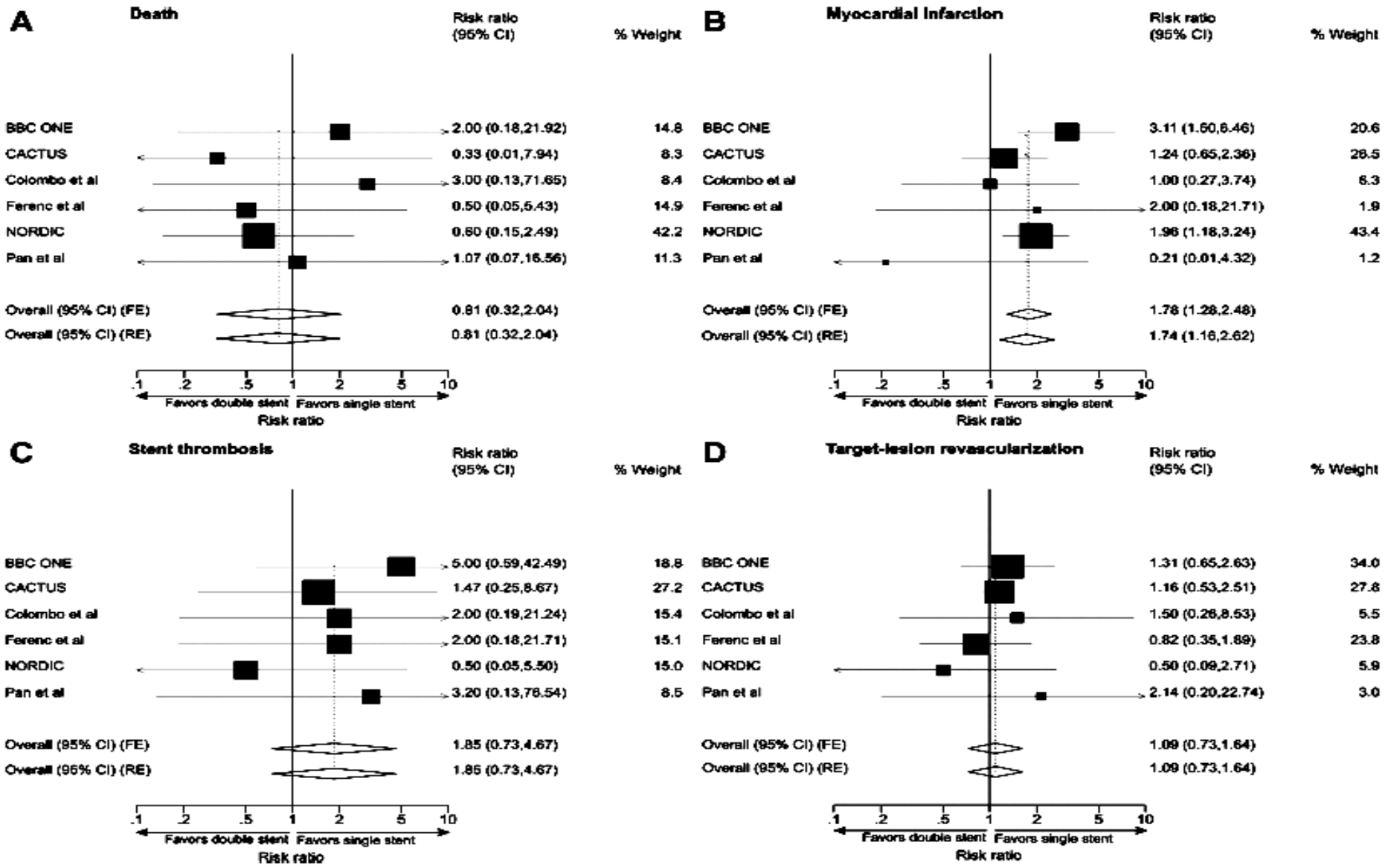
LAD2,LAD3,Dg2 0,1,0

EBC

	M Main prox. first	A Main Accross side first	D Distal first	S Side branch first
1st stent	 PM stenting	 MB stenting across SB	 DM stenting; Provisional SKS	 SB ostial stenting
After balloon	 Skirt	 MB stenting + SB balloon;  MB stenting + kissing		 SB minicrush; SB crush
2 stents	 Skirt + DM; Skirt + SB	 Elective T stenting; Internal crush; Culotte; TAP	 V stenting; SKS	 Syst. T Stenting; Minicrush; Crush
3 stents	 Extended V		 Trouser legs and seat	

Y. Louvard, CCI 2008 Feb 1;71(2):175-83.

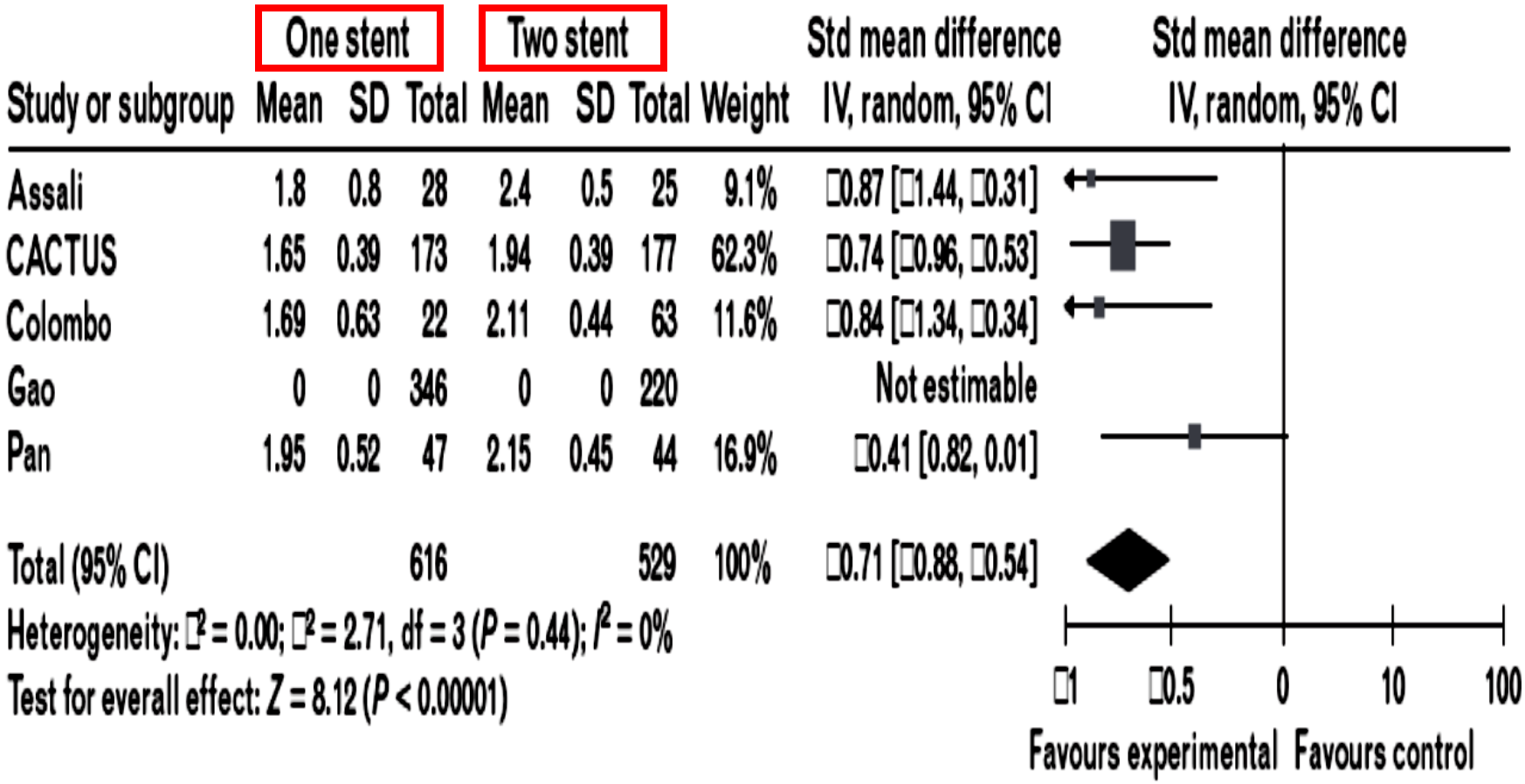
Double Vs Single Stenting for Coronary Bifurcation Lesions



Kastritsis Circ Cardiovasc Intervent. 2009;2:00-00

True coronary bifurcation lesions: meta-analysis and review of litterature

Postprocedural MLD of the side branch



Athappan, J Cardiovasc Med 11:103–110 Q 2010

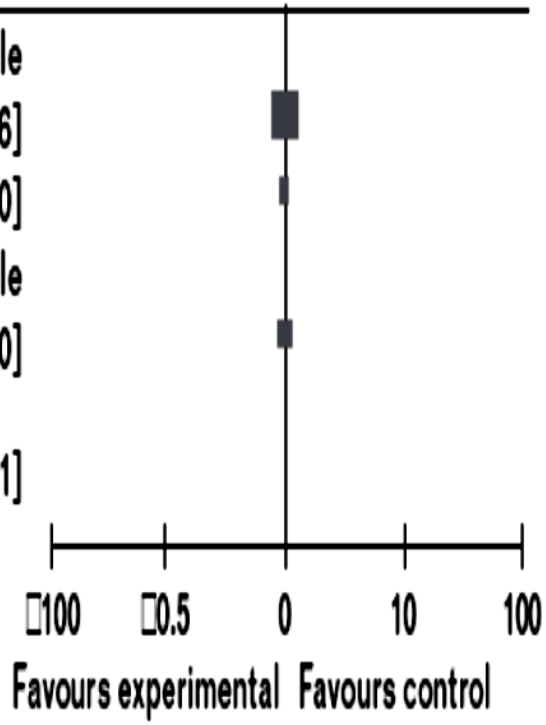
True coronary bifurcation lesions: meta-analysis and review of litterature

Follow-up MLD of the side branch

Study or subgroup	One stent Mean	SD	Total	Two stent Mean	SD	Total	Weight	Std mean difference IV, random, 95% CI
Assali	0	0	28	0	0	25		Not estimable
CACTUS	1.52	0.54	173	1.66	0.51	177	62.2%	□0.27 [□0.48, □0.06]
Colombo	1.42	0.5	22	1.59	0.61	63	16.0%	□0.29 [□0.78, □0.20]
Gao	0	0	346	0	0	220		Not estimable
Pan	1.78	0.42	47	1.73	0.71	44	21.8%	0.09 [□0.33, 0.50]
Total (95% CI)			616			529	100%	□0.19 [□0.40, 0.01]

Heterogeneity: $\square^2 = 0.01$; $\square^2 = 2.35$, df = 2 ($P = 0.31$); $I^2 = 15\%$

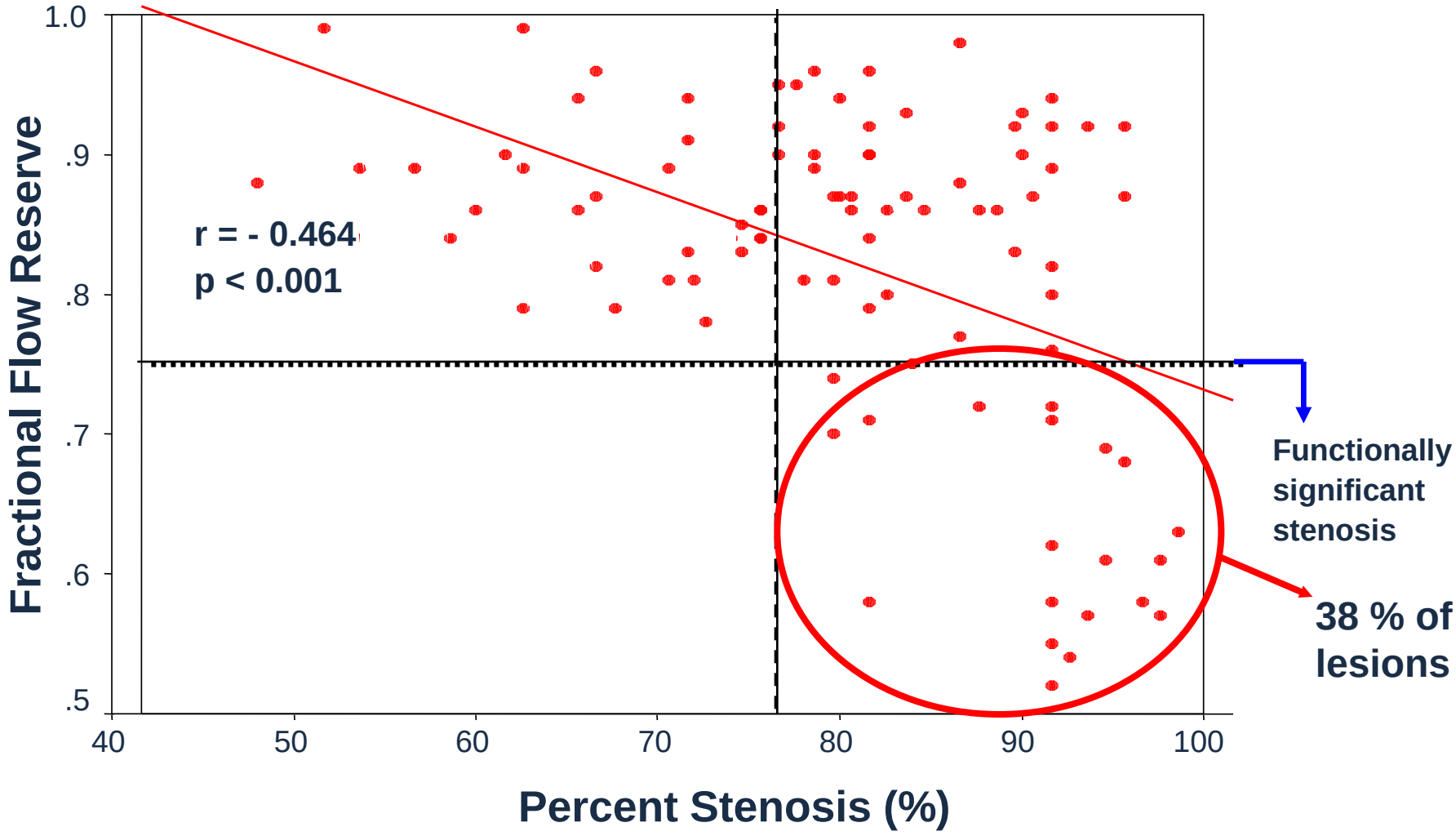
Test for everall effect: $Z = 1.85$ ($P < 0.06$)



Athappan, J Cardiovasc Med 11:103–110 Q 2010

Significant Post Stenting SB Stenosis:QCA vs FFR

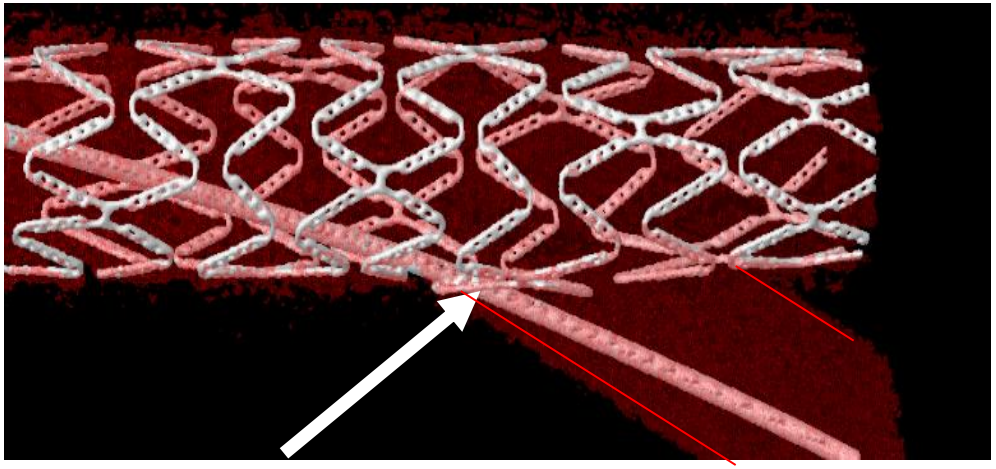
(jailed side branch lesions, n=94)

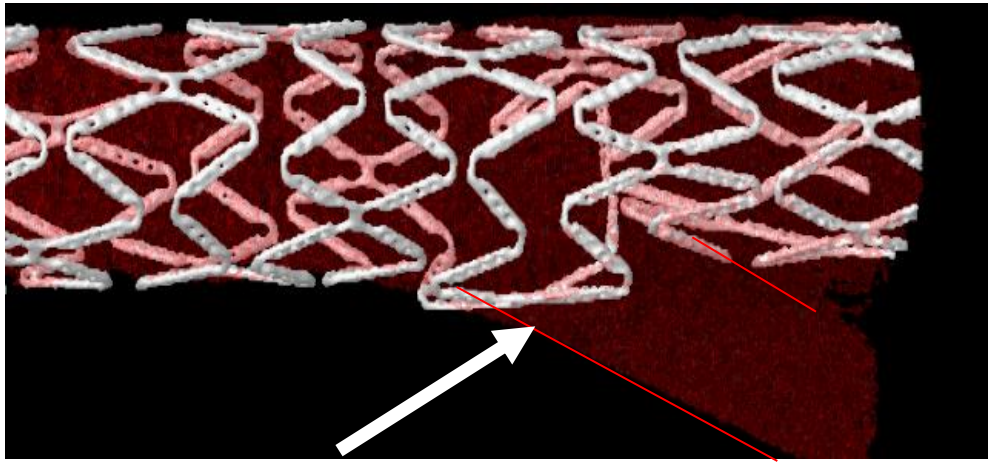


Bon-Kwon Koo et al JACC 2005; 46: 633-7

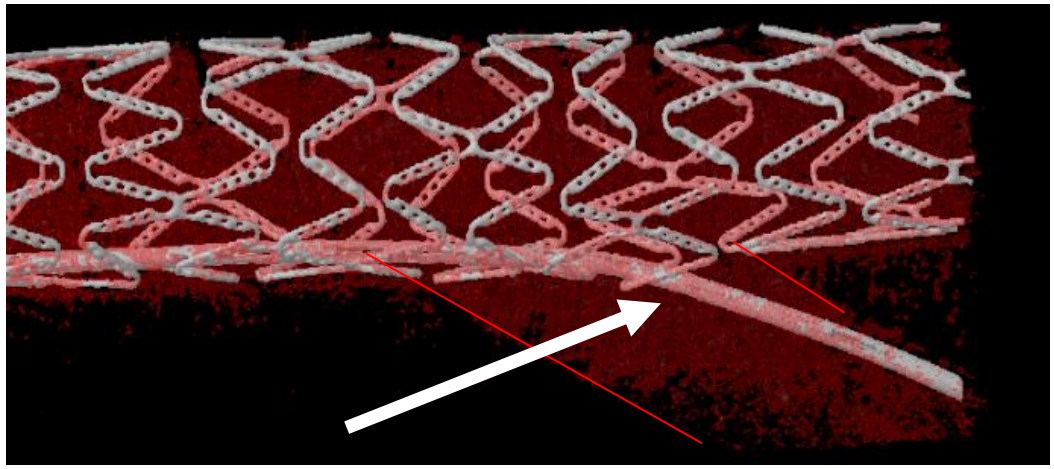
EBC

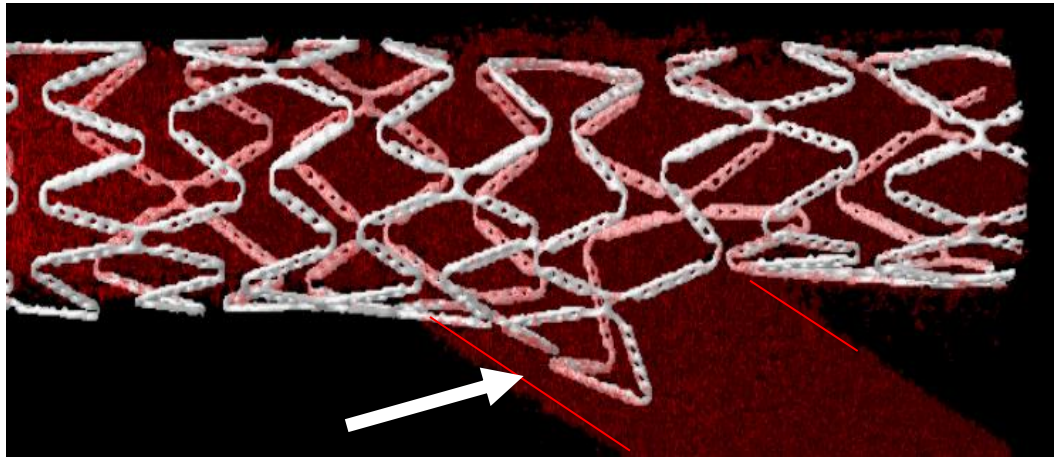
Proximal crossing



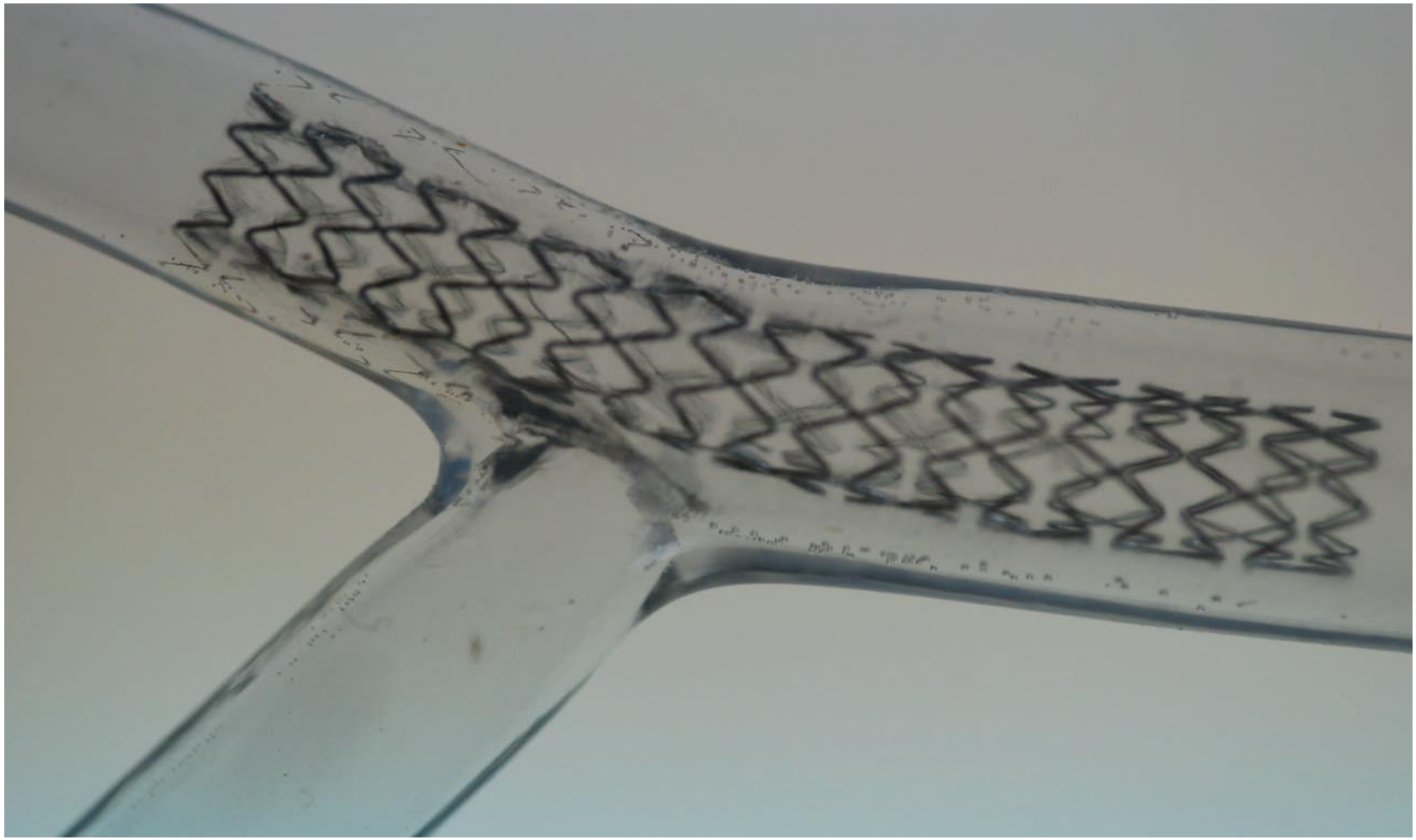


Distal crossing

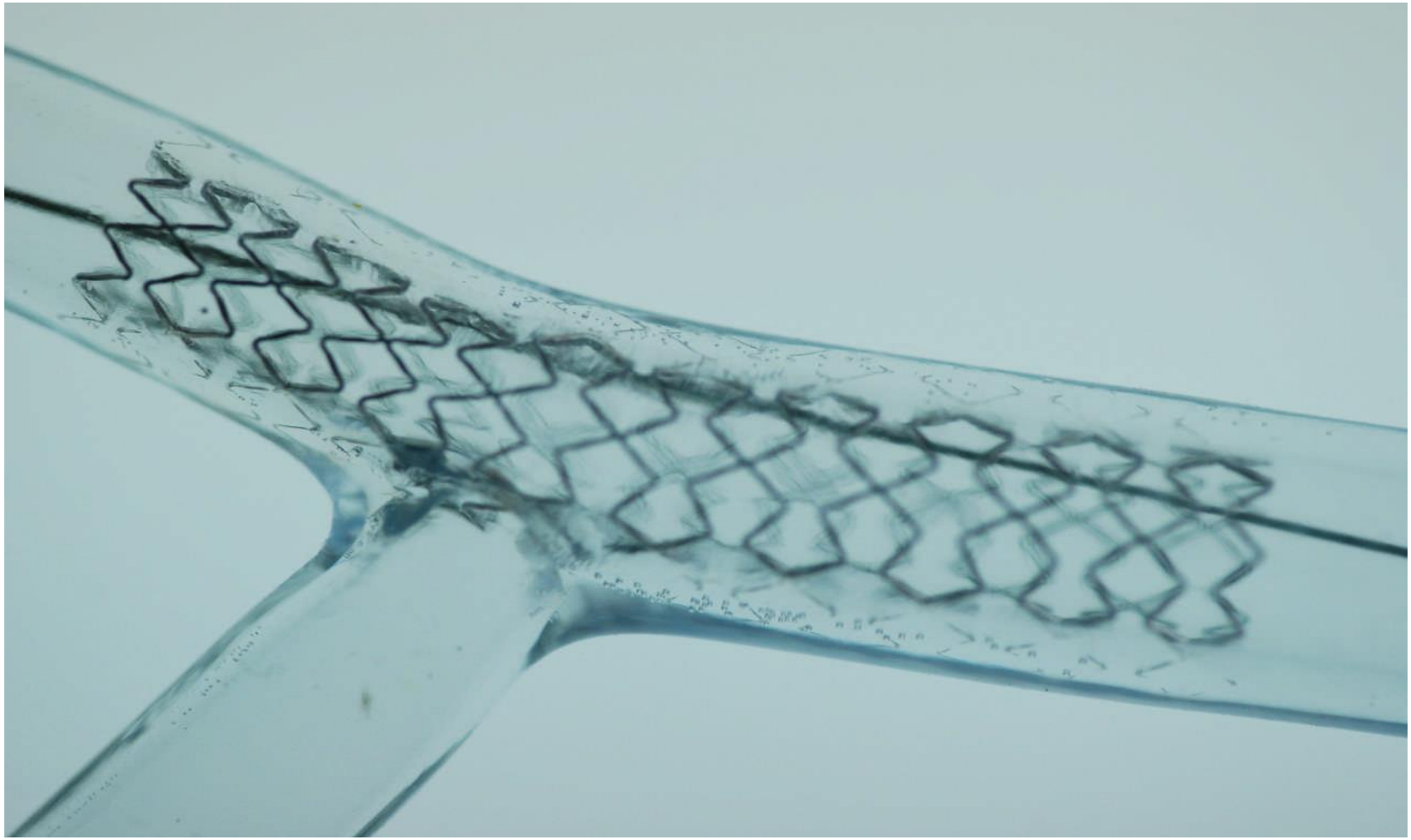




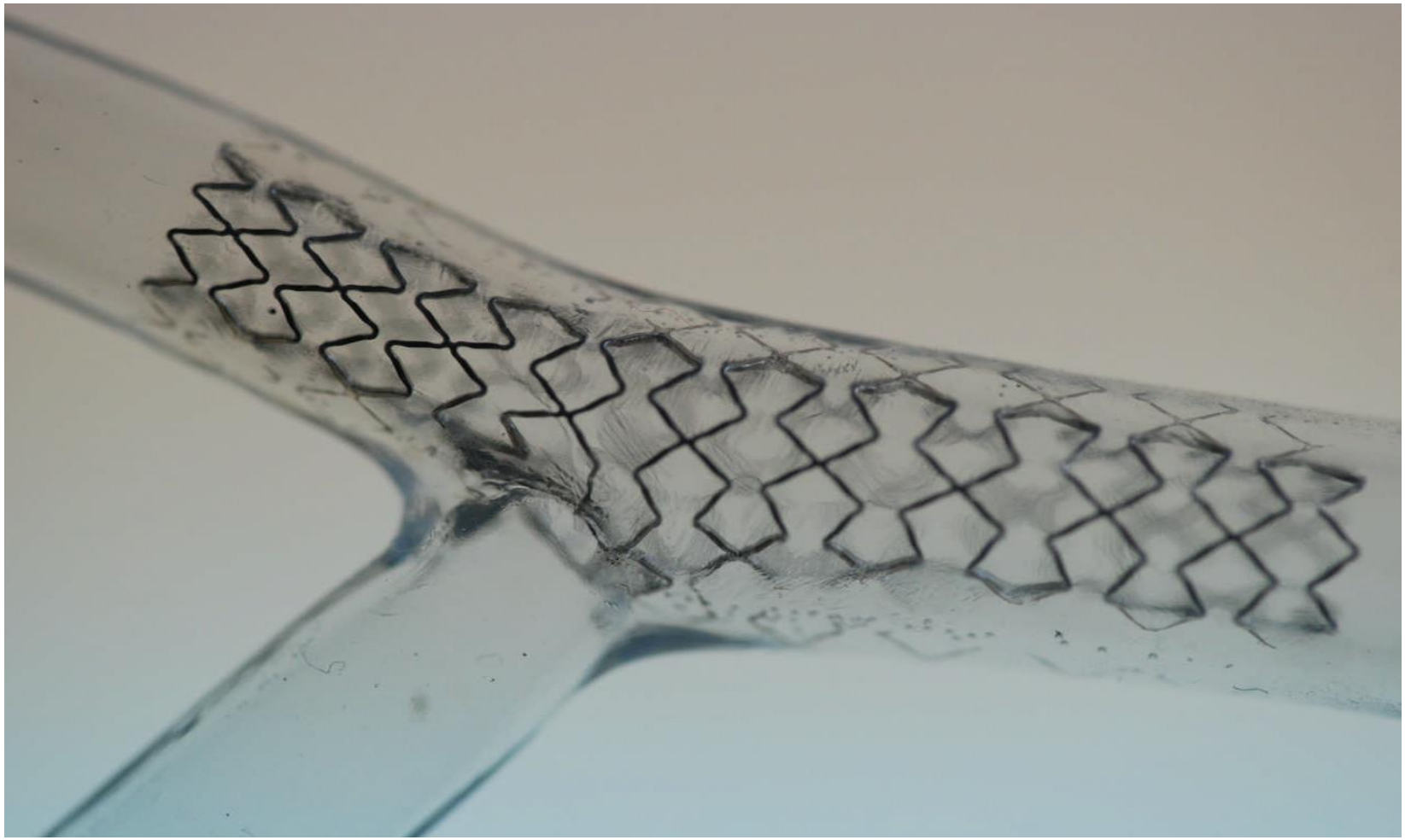
Nobori 3.5 x 24 at 12 ATM
Proximal vessel 4.5 mm, distal 3.5 mm



Nobori 3.5 x 24 at 12 ATM
Proximal vessel 4.5 mm, distal 3.5 mm
After POT technique using NC balloon 4.5 x 10



Nobori 3.5 x 24 at 12 ATM
Proximal vessel 4.5 mm, distal 3.5 mm
Final result after kissing



COBIS Registry

Independent Risk Factors for MACE and TLR

	HR (95%CI)	P value
MACE		
Final kissing ballooning	2.01 (1.29–3.13)	0.002
Use of paclitaxel-eluting stent	1.98 (1.34–2.92)	0.001
Stent length in the main vessel	1.02 (1.001–1.03)	0.03
TLR		
Final kissing ballooning	3.09 (1.84–5.16)	<0.001
Use of paclitaxel-eluting stent	2.28 (1.45–3.59)	<0.001
Stent length in the main vessel	1.02 (1.01–1.04)	0.01
Stent diameter in the main vessel	0.42 (0.20–0.89)	0.02

Gwon Circ J 2010 Sept 28

Nordic-Baltic Bifurcation Study III (6 m)

True Bifurcation Subgroup

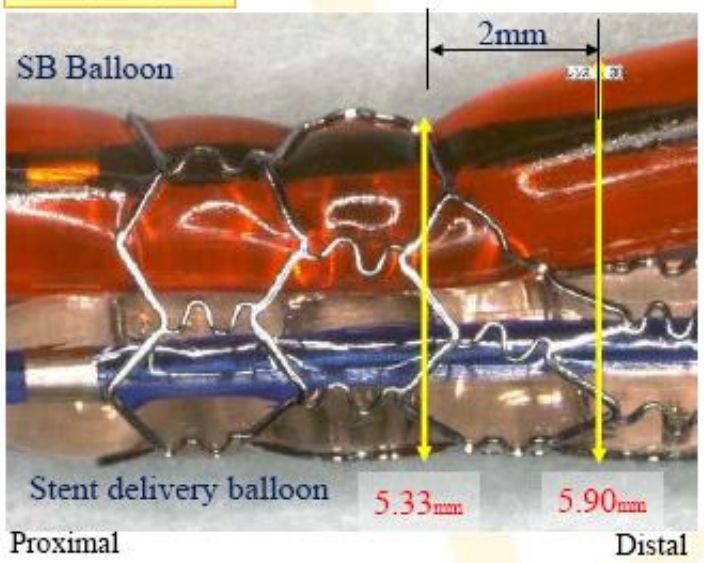
Medina 1,0,1 - 0,1,1 – 1,1,1

	FKBD (n=92)	No-FKBD (n=80)	p
8m SB ≥50% DS (%)	7.6	20.0	0.024

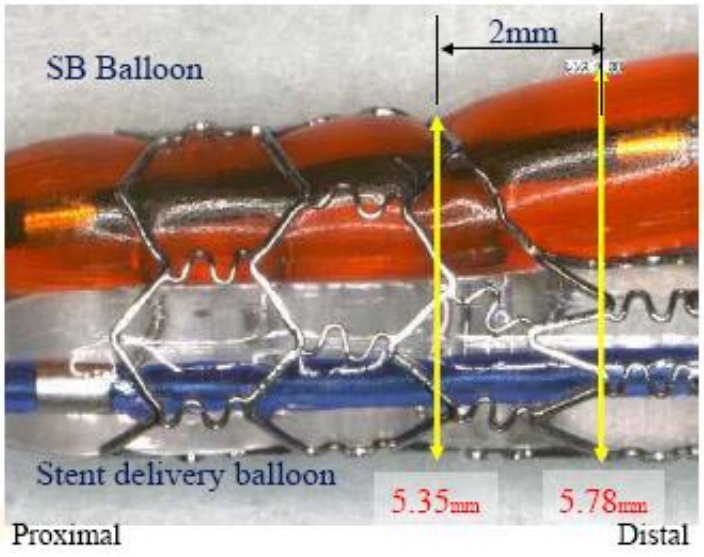
Non compliant high pressure balloons for kissing

Results

Cypher
(J&J)



Semi-Compliant Balloon
(Ryujin Plus, Terumo)

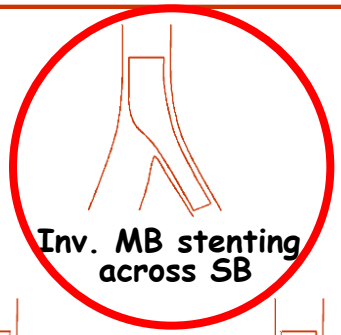
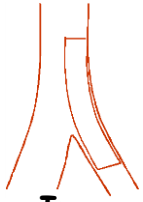
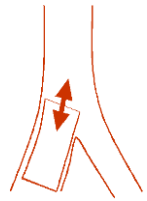
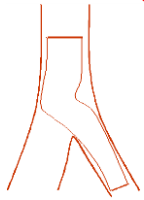
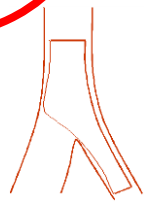
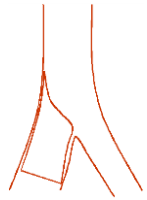
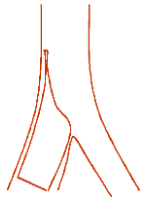
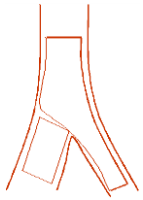
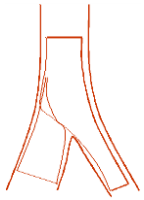
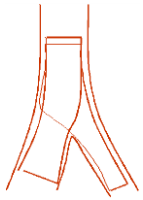
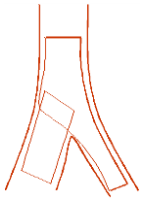
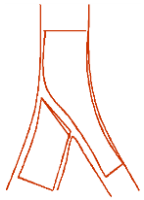
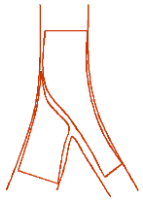
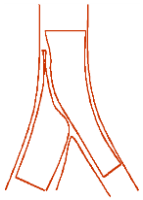


Non-Compliant Balloon
(Hiryu, Terumo)

Kinoshita, EBC 2009

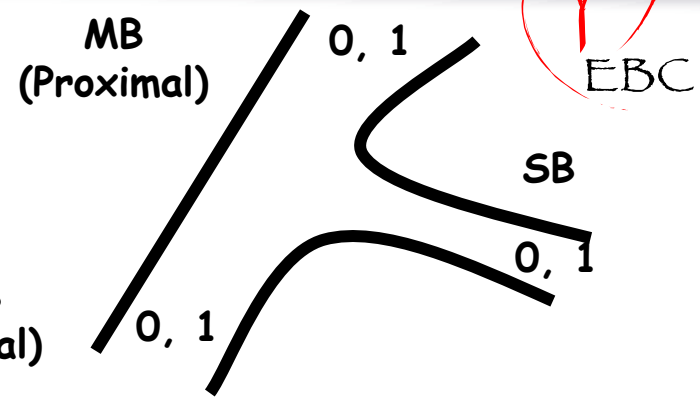
Jailed diagonal branch: LAD1,LAD1,Dg1 0,0,1

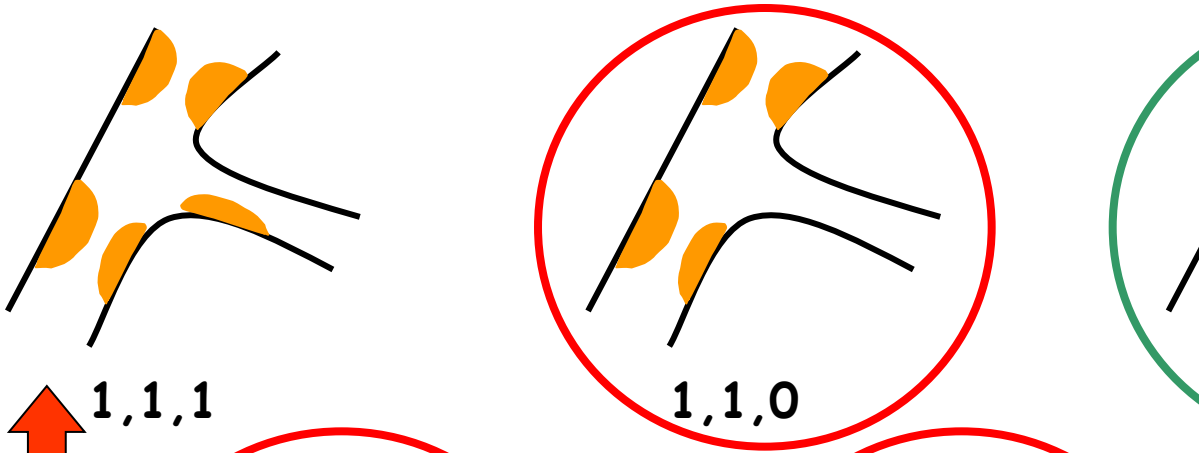
EBC

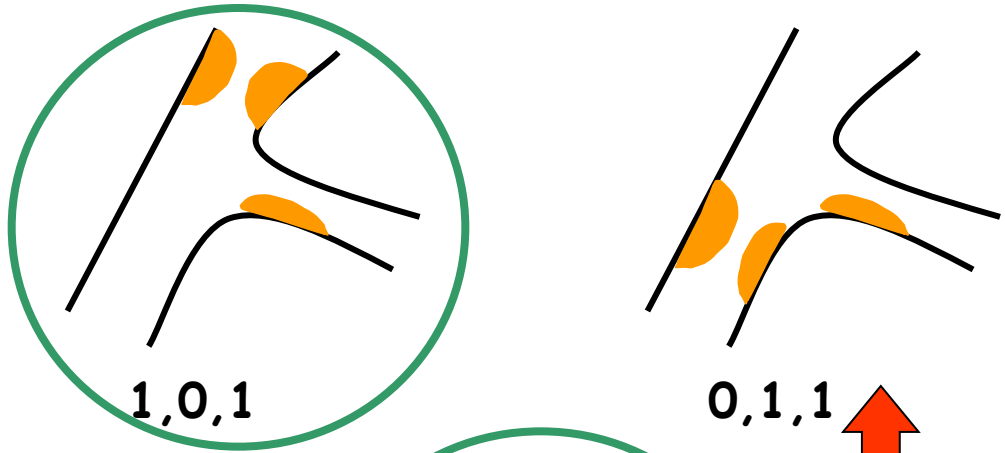
	M Main prox. first	A Main Accross Main first	D Double	S DM branch first
1st stent		 Inv. MB stenting across SB	 Inv. Provisional SKS	 DM ostial stenting
After balloon		 MB to SB stenting + DM balloon  MB to SB stenting + kissing		 DM minicrush  DM crush
2 stents		 Inv. Elective T stenting  Inv. Internal crush  Inv. Culotte  Inv. TAP		 Inv. Syst. T Stenting  Inv. Minicrush  Inv. Crush
3 stents				

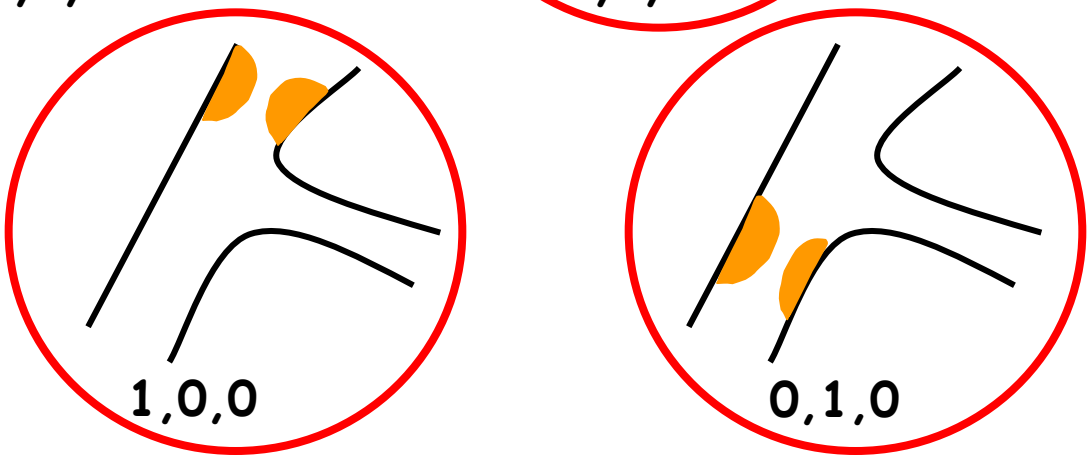
Y. Louvard, CCI 2008 Feb 1;71(2):175-83.

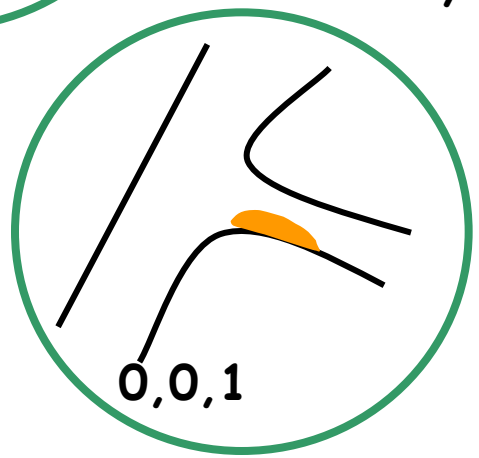
Medina Classification











Double stenting
LAD1,LAD2,Dg1 1,1,1

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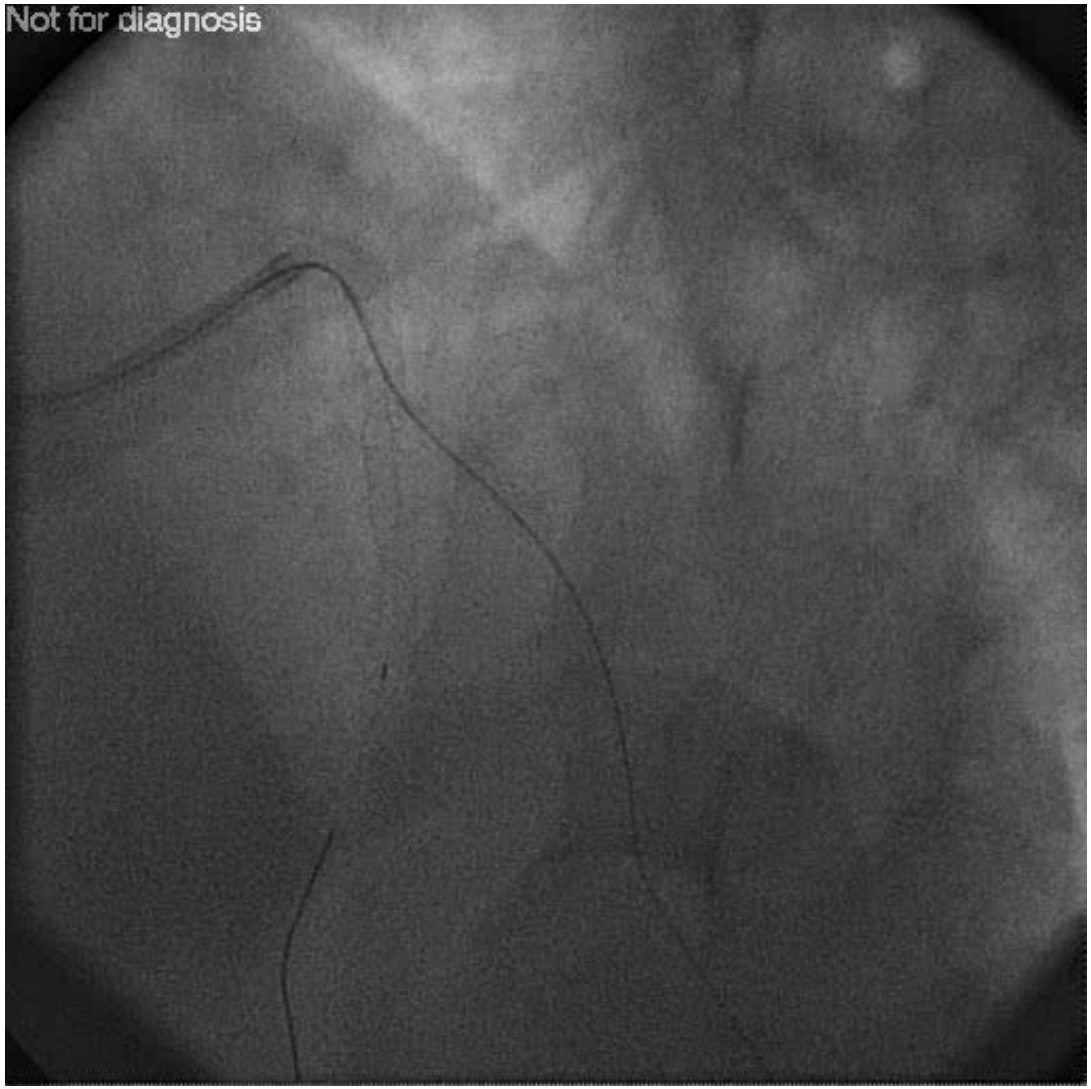
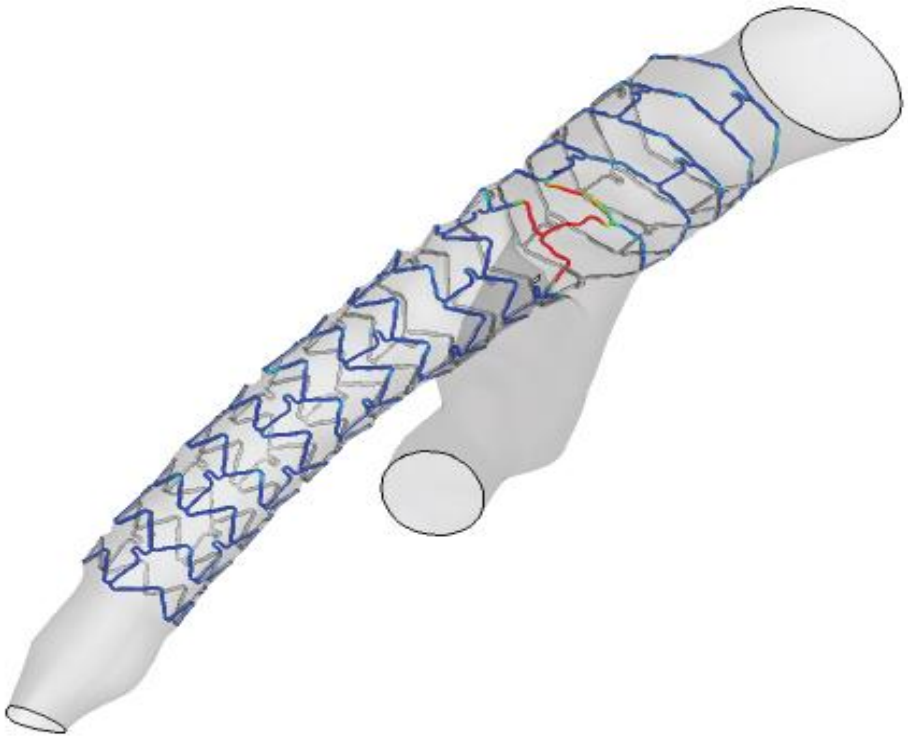


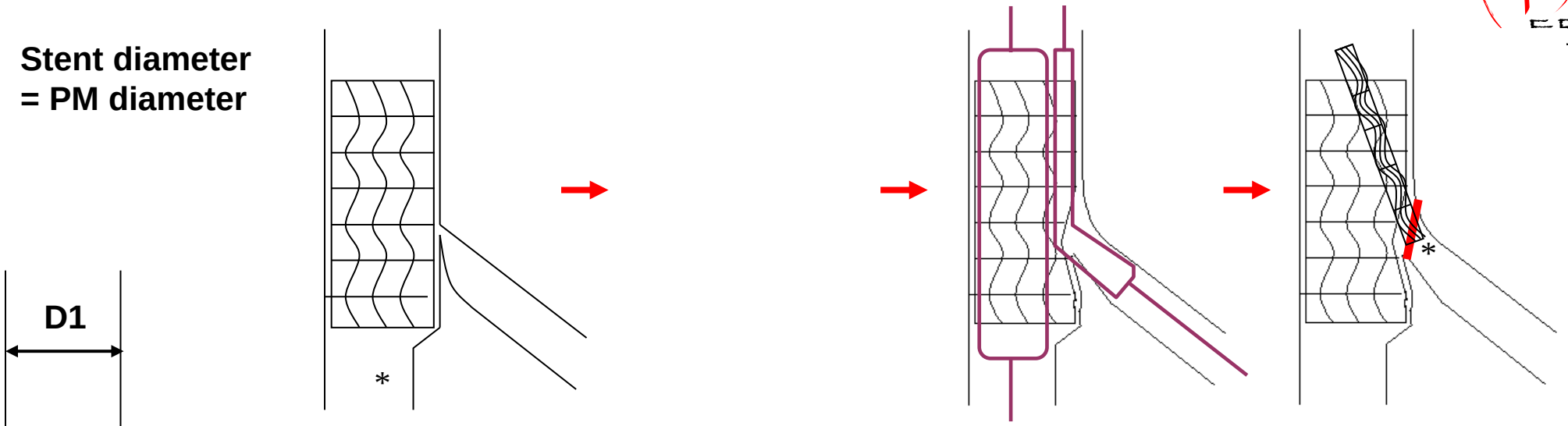
Strut apposition analysis



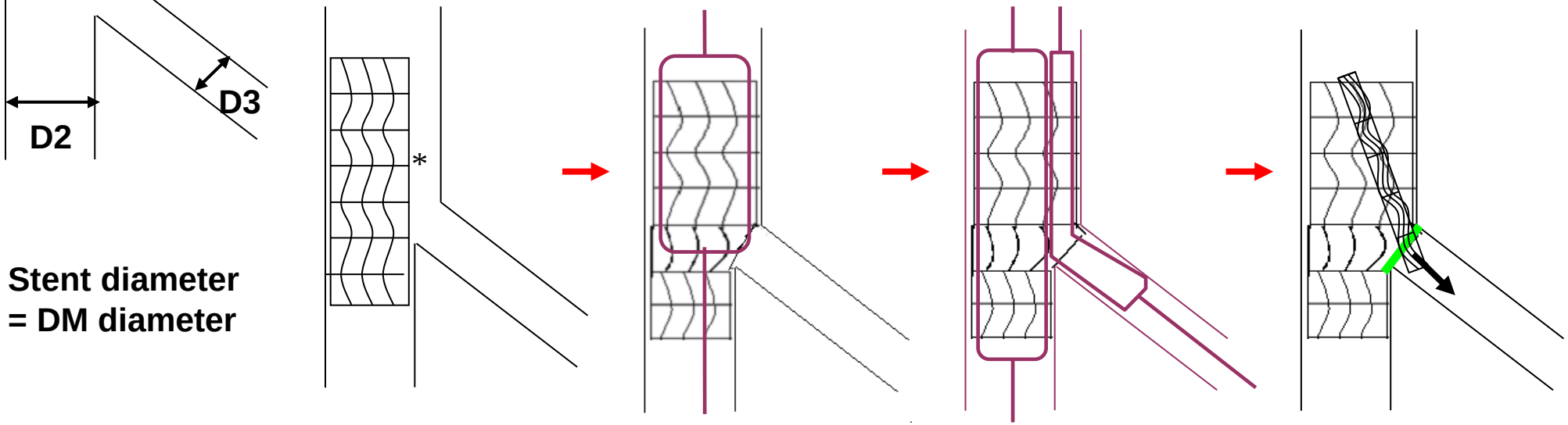
Strut-artery distance [mm]

From Peter Mortier

Stent diameter
= PM diameter



D1= (D2 + D3) 2/3



Stent diameter
= DM diameter

POT

Conclusions

- The provisional SB stenting strategy is the gold standard
  - For 1,1,0; 0,1,0; 1,0,1; 0,0,1
  - For 1,1,1; 0,1,1 and short SB stenosis
  - 3 segments with different diameters: POT

- For long SB stenosis, difficult SB access ?:
  - why not systematic SB stenting after MB stenting ?
  - Culotte / DK crush ?
  - systematic final Kissing

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