

Complex Bifurcation PCI
Co-organized by CIT Part II: Strategies and techniques

Why I Prefer Provisional Stenting and How to Rescue the Side Branch?

Y. Louvard, ICPS, Massy, Générale de Santé-Ramsay, France

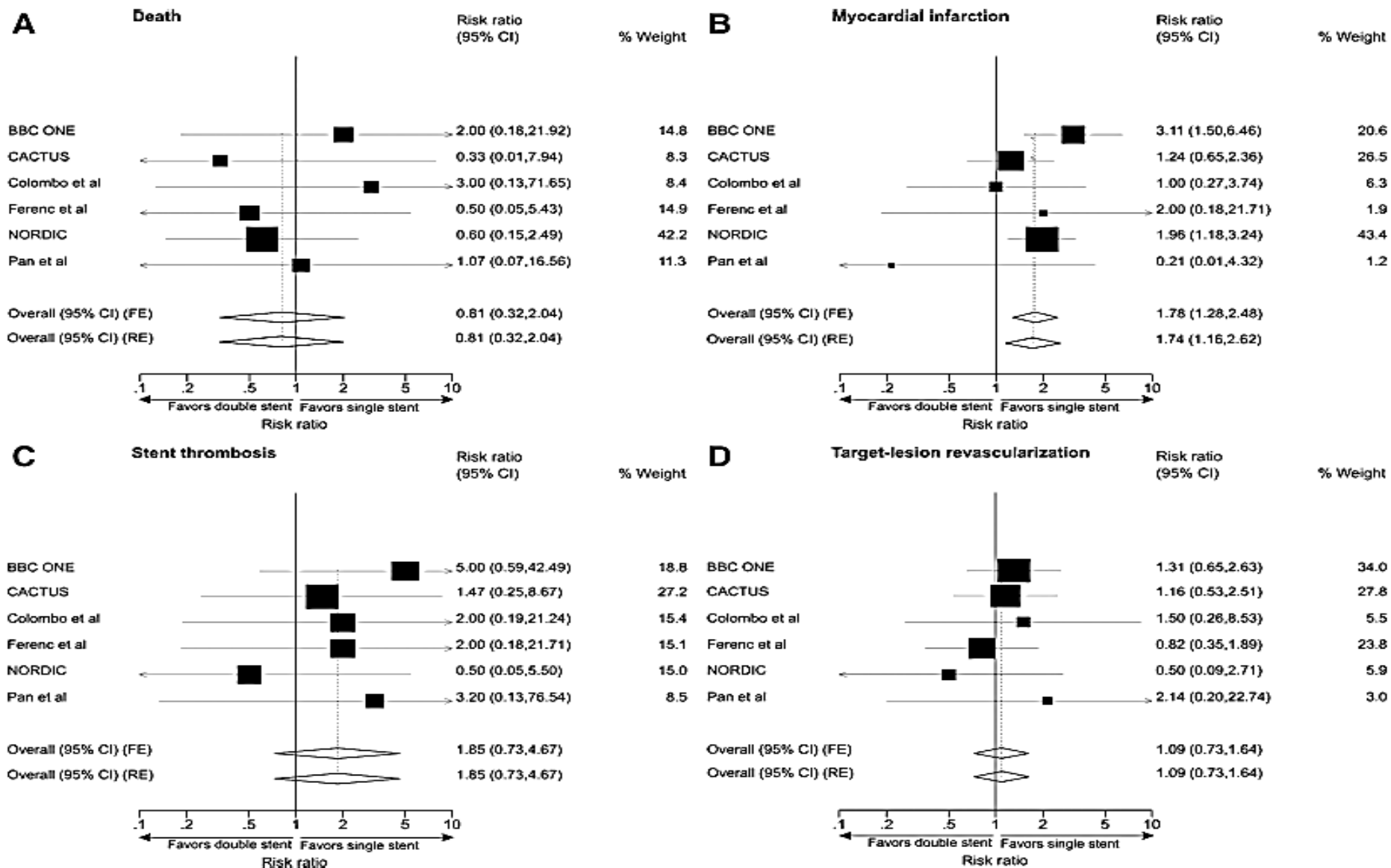
TCTAP 2016, Seoul, Korea

Simple vs complex, 1 vs 2 stents, provisional vs 2 stents, main first vs side first ...

Provisional versus 2 stents randomized trials

	Centers	Stent	1 / 2	True bif. %	SB	2 stents technique	Crossover 1:2 / 2:1
Pan 2004 AHJ	1	Cypher	47 / 44			Provisional	
Colombo 2004 Circ.	5	Cypher	23 / 63			Crush	51.2%
Nordic 2006 Circ.	28	Cypher	205 / 206		>2	Crush, Culotte, ...	4.3% / 4.9%
BBK 2008 EHJ	1	Cypher	101 / 101	68.2 / 68.3	>2.25	Provisional	18.8% / 3%
CACTUS 2009 Circ.	12	Cypher	173 / 177	100 / 100	>2.25	Crush	31% / -
BBC 1 2010 Circ.	20	Taxus	250 / 250	81 / 84	>2.25	Culotte, ..	3% / -
Lin 2010 Coron Art Dis	1	Taxus Cypher	54 / 54	100 / 100	>2.2	DK Crush, ...	16.7% / 5.6%
PERFECT 2015 JACCI	14	> 4	206 / 213	100 / 100	> 2	Mini Crush Kiss	25.9% / 1%
DKCRUSH-II 2011 JACC	7	Excel	185 / 185	100 / 100	>2.5, long L.	DK crush	28.6% / -
Nordic-Baltic IV 2013	16	Cypher Xience	221 / 229	100 / 100	>2.75	Culotte, ...	3.7% / 4%
EBC 2 2015	20	Nobori	103 / 97	100 / 100	> 2.5	Culotte	16% / 3%

Double Vs Single Stenting for Coronary Bifurcation Lesions



Provisional versus 2 stents randomized trials

	1 ary Endpoint	Syst. angio	Endpoint %	(Cardiac) death %	MI %	TVR %	TLR %	Rest.	ST
Nordic 2006 Circ.	C. death MI ST TVR 6 m	6 m	2.9 3.4	1 1	0 0.5	1.9 1.9			0.5 0
BBK 2008 EHJ	In segments SB % 9 m	9 m		2 1	1 2		10.9 8.9	9.4 / 12.5	Def 1 1.2
CACTUS 2009 Circ.	C. death MI ST TVR 6 m	8 m	15 15.8	0.5 0	8.6 10.7	6.2 6.8			Def 1.1 1.7
BBC 1 2010 Circ.	Death MI TVF 9 m	No	8 15.1	2 1	3.6 11.2	5.5 7.2			1 5
Lin 2010 Coron Art Dis	C. death MI ST TVR 8 m	8 m	38.9 11	0 0	1.9 1.9		26.9 6.4		1.9 0
PERFECT 2015 JACCI	% restenosis 2 branch	8 m	SB 8.3/3.9 MB 4.8/5.2	0.5 0.9	14.1 14.1	3.4 2.9	3.4 1.9	11 8.4	0 0.5
DKCRUSH-II 2011 JACC	C. death MI TVR 12 m	8 m	17.3 10.3	1.1 1.1	2.2 3.2	14.6 / 6.5	13 4.3		Def 0.5 2.2
Nordic-Baltic IV 2013	C. death non procedure MI TLR Def. ST 6 m	8 m	4.6 1.8	0 0	1.8 0.9		3.2 1.3		0.9 0.4
EBC 2 2015	Death MI TVR 12 m	No	8 10	2 1	5 10	3 1			1 3

Different for true bifurcation lesions ?

Provisional versus 2 stents randomized trials

	Centers	Stent	1 / 2	True bif. %	SB	2 stents technique	Crossover 1:2 / 2:1
Pan 2004 AHJ	1	Cypher	47 / 44			Provisional	
Nordic 2006 Circ.	28	Cypher	205 / 206		>2	Crush, Culotte, ...	4.3% / 4.9%
BBK 2008 EHJ	1	Cypher	101 / 101	68.2 / 68.3	>2.25	Provisional	18.8% / 3%
CACTUS 2009 Circ.	12	Cypher	173 / 177	100 / 100	>2.25	Crush	31% / -
BBC 1 2010 Circ.	20	Taxus	250 / 250	81 / 84	>2.25	Culotte, ..	3% / -
Lin 2010 Coron Art Dis	1	Taxus Cypher	54 / 54	100 / 100	>2.2	DK Crush, ...	16.7% / 5.6%
PERFECT 2015 JACCI	14	> 4	206 / 213	100 / 100	> 2	Mini Crush Kiss	25.9% / 1%
DKCRUSH-II 2011 JACC	7	Excel	185 / 185	100 / 100	>2.5, long L.	DK crush	28.6% / -
Nordic-Baltic IV 2013	16	Cypher Xience	221 / 229	100 / 100	>2.75	Culotte, ...	3.7% / 4%
EBC 2 2015	20	Nobori	103 / 97	100 / 100	> 2.5	Culotte	16% / 3%

Provisional versus 2 stents randomized trials

	Centers	Stent	1 / 2	SB stenosis	SB	2 stents technique	Crossover 1:2 / 2:1
Pan 2004 AHJ	1	Cypher	47 / 44			Provisional	
Nordic 2006 Circ.	28	Cypher	205 / 206		>2	Crush, Culotte, ...	4.3% / 4.9%
BBK 2008 EHJ	1	Cypher	101 / 101		>2.25	Provisional	18.8% / 3%
CACTUS 2009 Circ.	12	Cypher	173 / 177	61% / 69%	>2.25	Crush	31% / -
BBC 1 2010 Circ.	20	Taxus	250 / 250		>2.25	Culotte, ..	3% / -
Lin 2010 Coron Art Dis	1	Taxus Cypher	54 / 54	70% / 70%	>2.2	DK Crush, ...	16.7% / 5.6%
PERFECT 2015 JACCI	14	> 4	206 / 213	53% / 57%	> 2	Mini Crush Kiss	25.9% / 1%
DKCRUSH-II 2011 JACC	7	Excel	185 / 185	63% / 63%	>2.5, long L.	DK crush	28.6% / -
Nordic-Baltic IV 2013	16	Cypher Xience	221 / 229	44% / 47%	>2.75	Culotte, ...	3.7% / 4%
EBC 2 2015	20	Nobori	103 / 97	? / ?	> 2.5	Culotte	16% / 3%

Different for large SB bifurcation lesions ?

Provisional versus 2 stents randomized trials

	Centers	Stent	1 / 2	True bif. %	SB	2 stents technique	Crossover 1:2 / 2:1
Pan 2004 AHJ	1	Cypher	47 / 44			Provisional	
Nordic 2006 Circ.	28	Cypher	205 / 206		>2	Crush, Culotte, ...	4.3% / 4.9%
BBK 2008 EHJ	1	Cypher	101 / 101	68.2 / 68.3	>2.25	Provisional	18.8% / 3%
CACTUS 2009 Circ.	12	Cypher	173 / 177	100 / 100	>2.25	Crush	31% / -
BBC 1 2010 Circ.	20	Taxus	250 / 250	81 / 84	>2.25	Culotte, ..	3% / -
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Nordic-Baltic IV 2013	16	Cypher Xience	221 / 229	100 / 100	>2,75	Culotte, ...	3.7% / 4%
EBC 2 2015	20	Nobori	103 / 97	100 / 100	> 2.5	Culotte	16% / 3%

Provisional versus 2 stents randomized trials

	Centers	Stent	1 / 2	True bif. %	SB QCA diameter	2 stents technique	Crossover 1:2 / 2:1
Pan 2004 AHJ	1	Cypher	47 / 44			Provisional	
Nordic 2006 Circ.	28	Cypher	205 / 206		2.24 / 2.28	Crush, Culotte, ...	4.3% / 4.9%
BBK 2008 EHJ	1	Cypher	101 / 101	68.2 / 68.3	2.4 / 2.4	Provisional	18.8% / 3%
CACTUS 2009 Circ.	12	Cypher	173 / 177	100 / 100	2.16 / 2.30	Crush	31% / -
BBC 1 2010 Circ.	20	Taxus	250 / 250	81 / 84		Culotte, ..	3% / -
Lin 2010 Coron Art Dis	1	Taxus Cypher	54 / 54	100 / 100	2.8 / 2.8	DK Crush, ...	16.7% / 5.6%
PERFECT 2015 JACCI	14	> 4	206 / 213	100 / 100	2.2 / 2.2	Mini Crush Kiss	25.9% / 1%
DKCRUSH-II 2011 JACC	7	Excel	185 / 185	100 / 100	2.3 / 2.4	DK crush	28.6% / -
Nordic-Baltic IV 2013	16	Cypher Xience	221 / 229	100 / 100	2.4 / 2.5	Culotte, ...	3.7% / 4%
EBC 2 2015	20	Nobori	103 / 97	100 / 100	? / ?	Culotte	16% / 3%

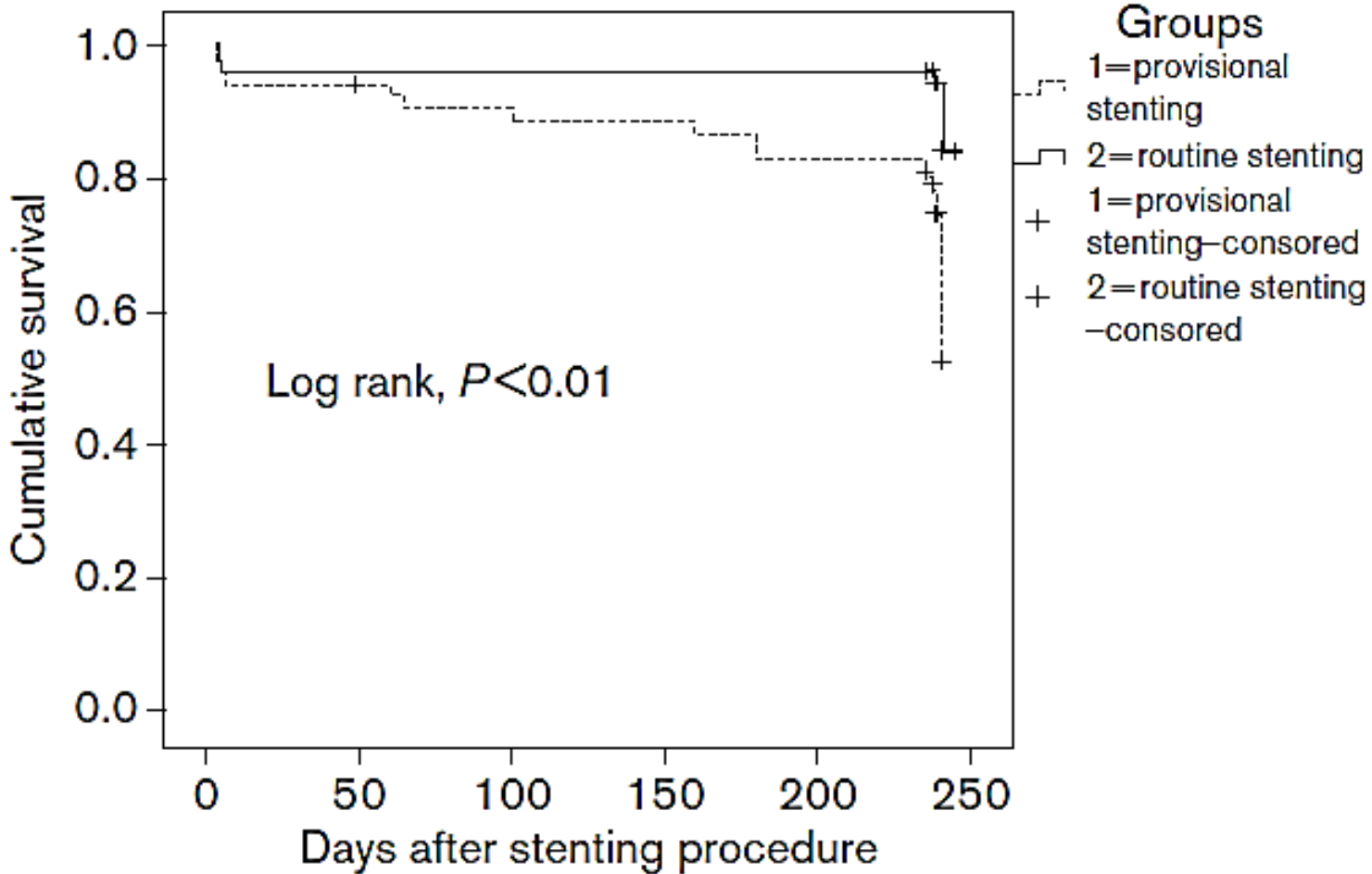
Influence of systematic angiographic control before clinical end-point

Provisional versus 2 stents randomized trials

	1 ary Endpoint	Syst. angio	Endpoint %	(Cardiac) death %	MI %	TVR %	TLR %	Rest.	ST
Nordic 2006 Circ.	C. death MI ST TVR 6 m	6 m	2.9 3.4	1 1	0 0.5	1.9 1.9			0.5 0
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EBC 2 2015	Death MI TVR 12 m	No	8 10	2 1	5 10	3 1			1 3

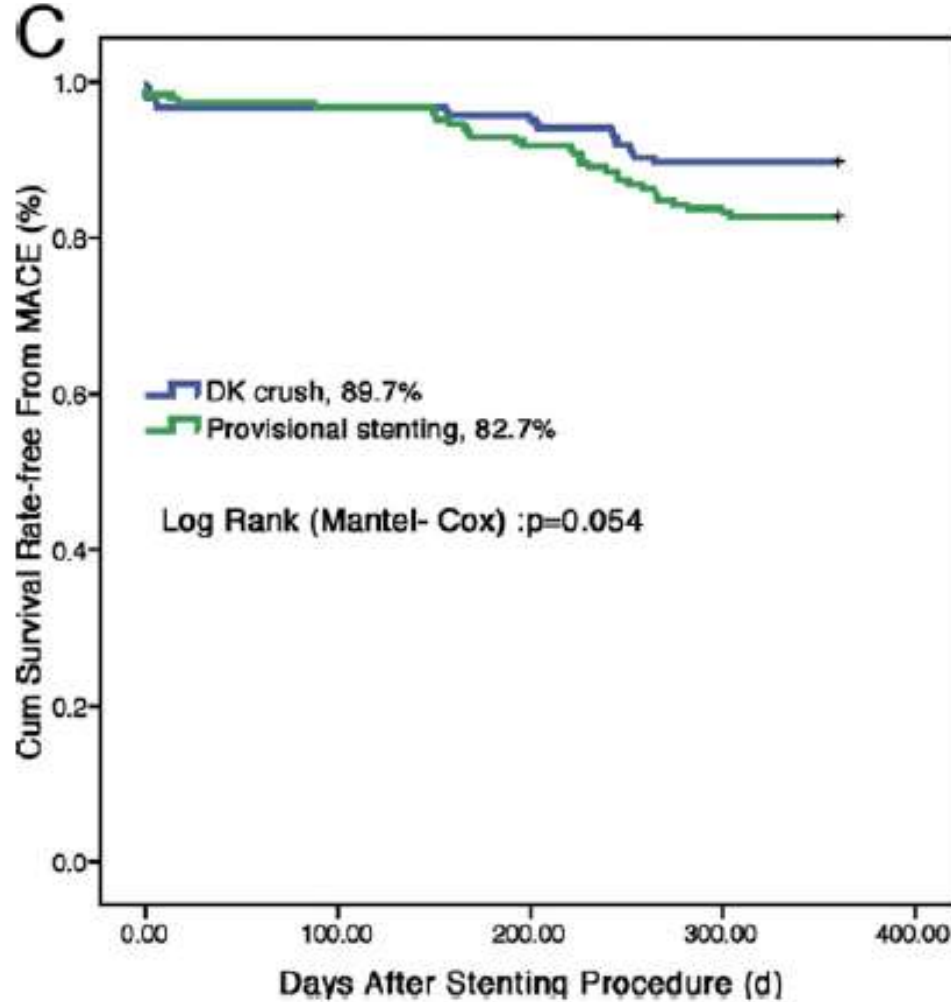
Choice of stenting strategy in true coronary artery bifurcation lesions

Survival rate-free from MACE



Randomized study comparing Double Kissing Crush with Provisional Stenting for treatment of coronary bifurcation lesions: DK-CRUSH-II

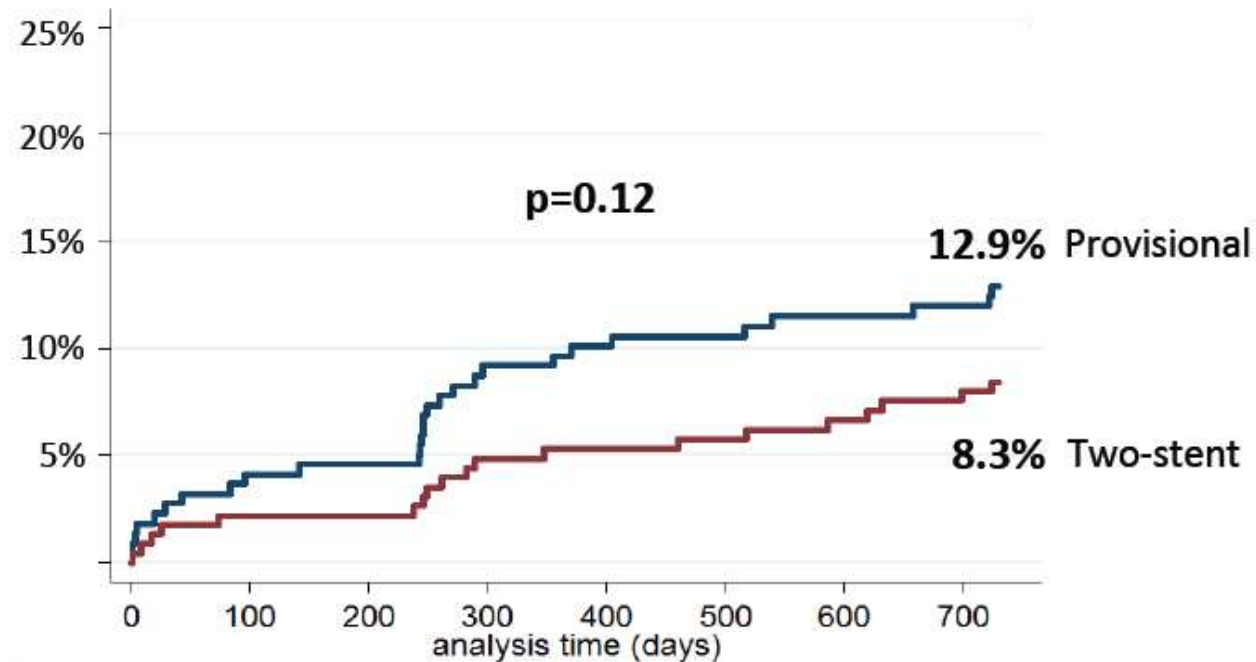
Comparison of Survival Rate Free From MACE Between DK Crush and PS Groups





Nordic-Baltic Bifurcation Study IV

Two-year MACE



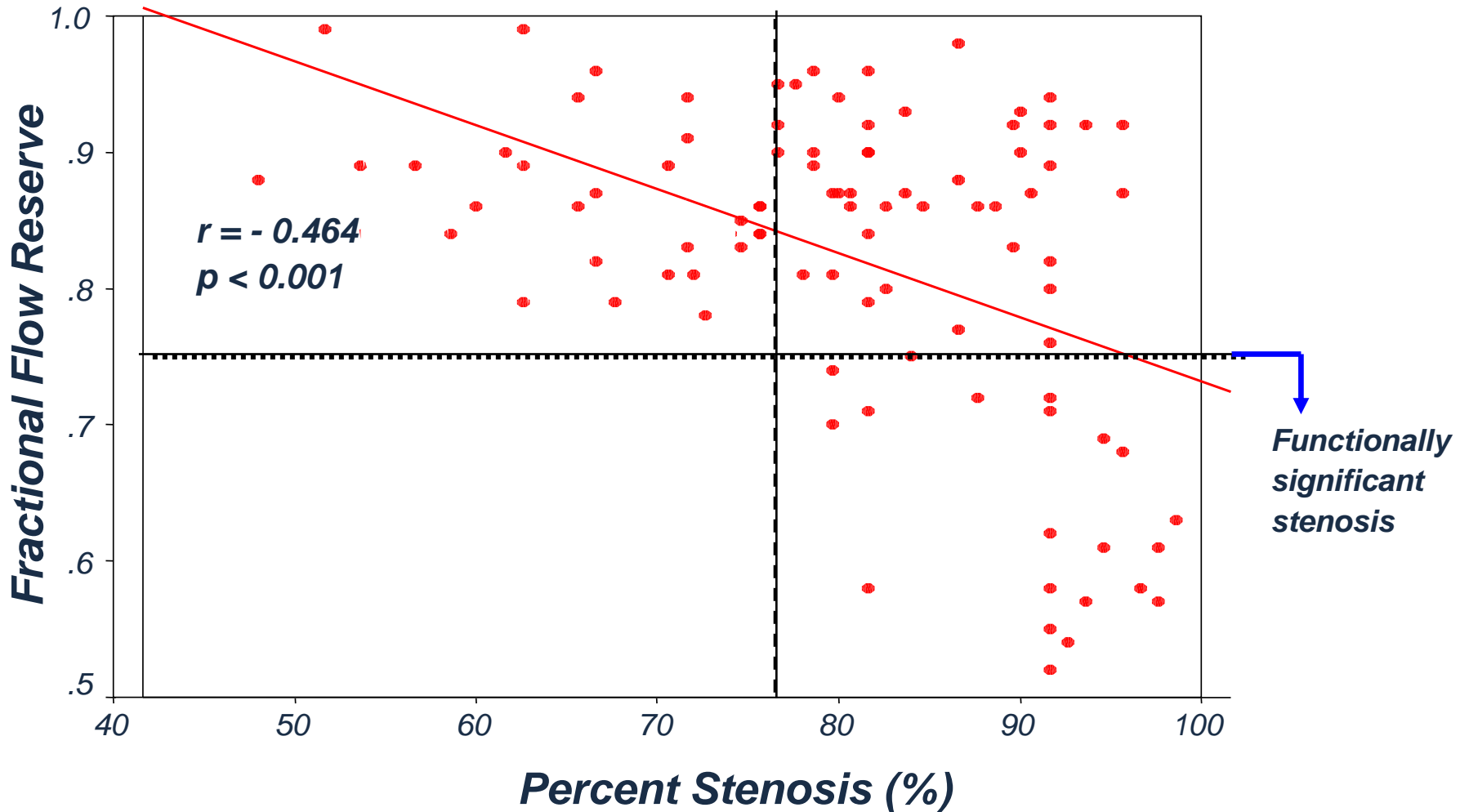
Number at risk	0	100	200	300	400	500	600	700
Two-stent tech.	228	221	221	214	212	211	209	206
Provisional tech.	218	209	208	196	194	192	189	187

MACE: cardiac death, non-procedural myocardial infarction, target lesion revascularization and definite stent thrombosis



Significant Post Stenting SB Stenosis: QCA vs FFR

(jailed side branch lesions, n=94)



**1 versus 2 stents ? Provisional vs versus 2 stents ?
Main first vs side first ? ...**

~~Provisional~~ 1 versus 2 stents randomized trials

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Stent thrombosis: still a concern ?

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CACTUS 2009 Circ.	C. death MI ST TVR 6 m	8 m	15 15.8	0.5 0	8.6 10.7	6.2 6.8			Def 1.1 1.7
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EBC 2 2015	Death MI TVR 12 m	No	8 10	2 1	5 10	3 1			1 3

Are the datas still pertinent ?

Provisional versus 2 stents randomized trials

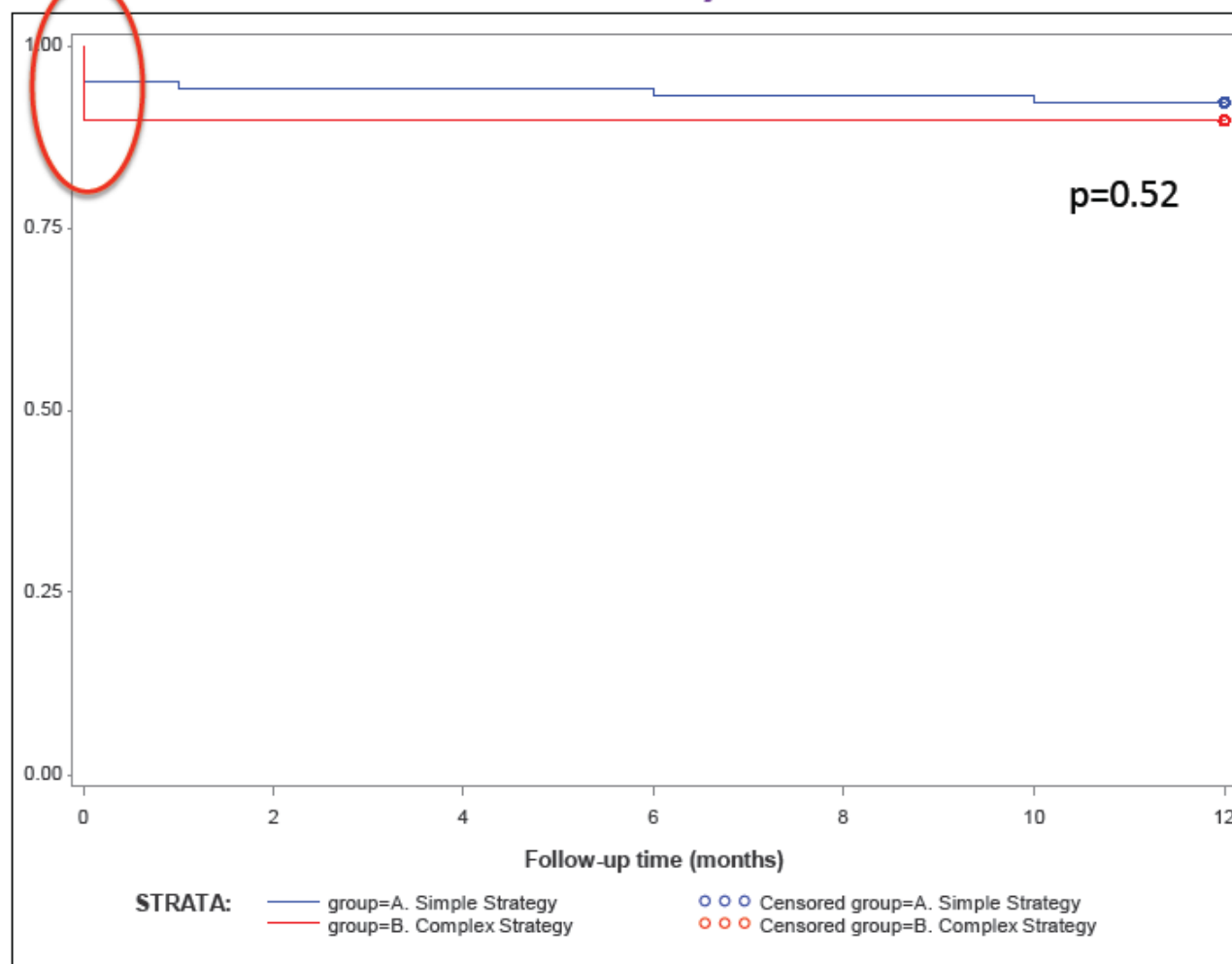
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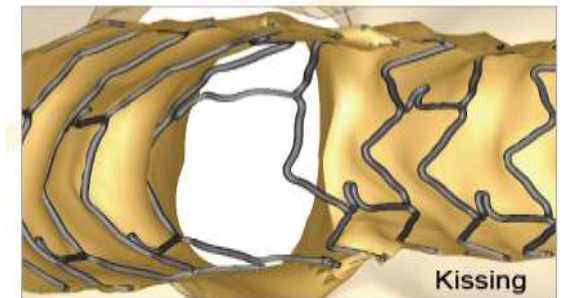
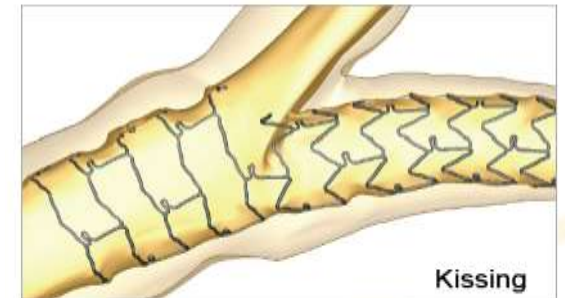
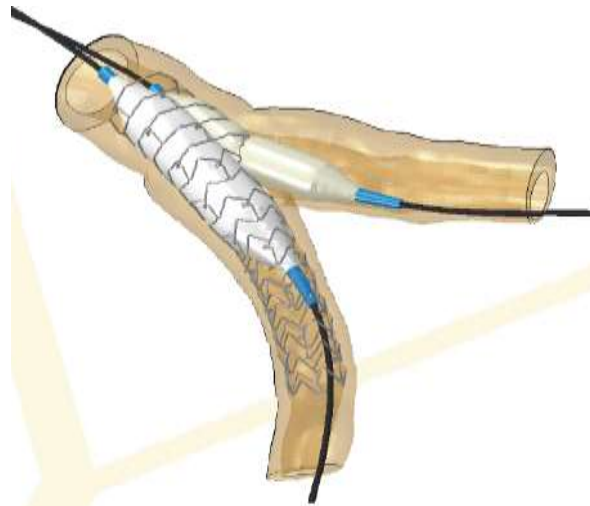
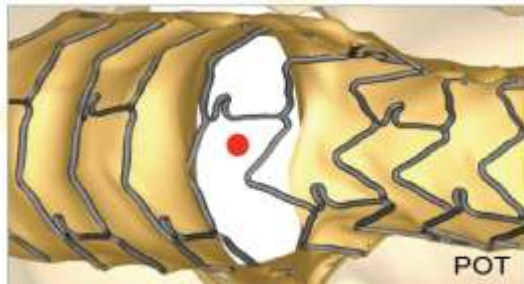
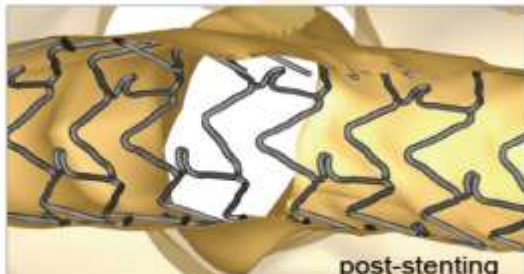
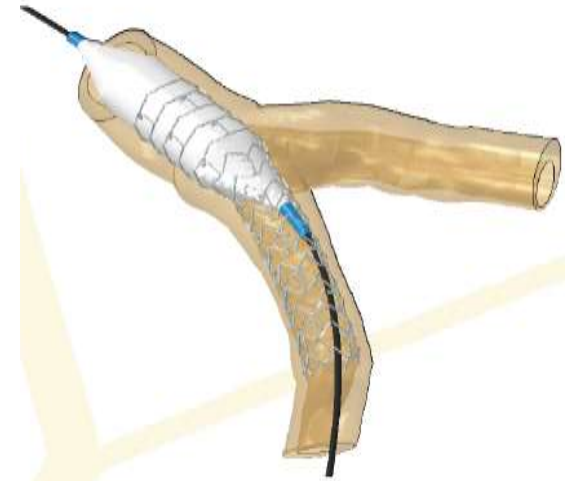
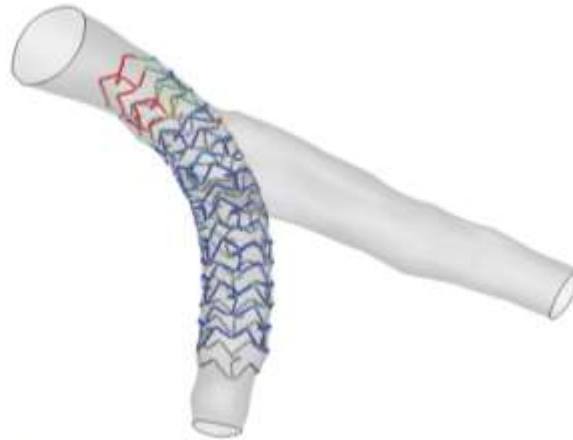
« Modern » datas: DK-Crush II and EBC 2

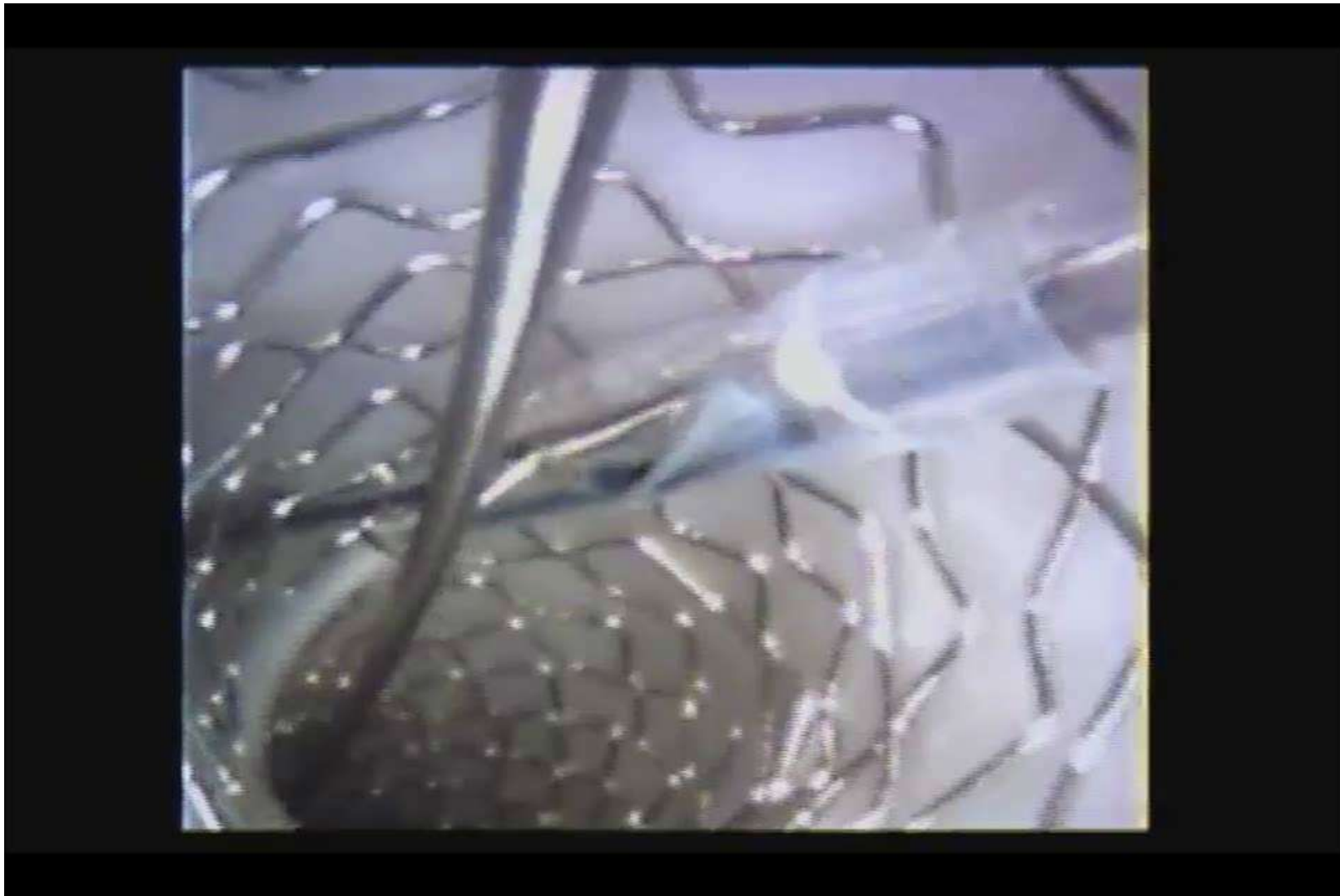
euro
PCR
2015

The EBC TWO Trial

12 M Outcome : Death, MI and TVR at 12





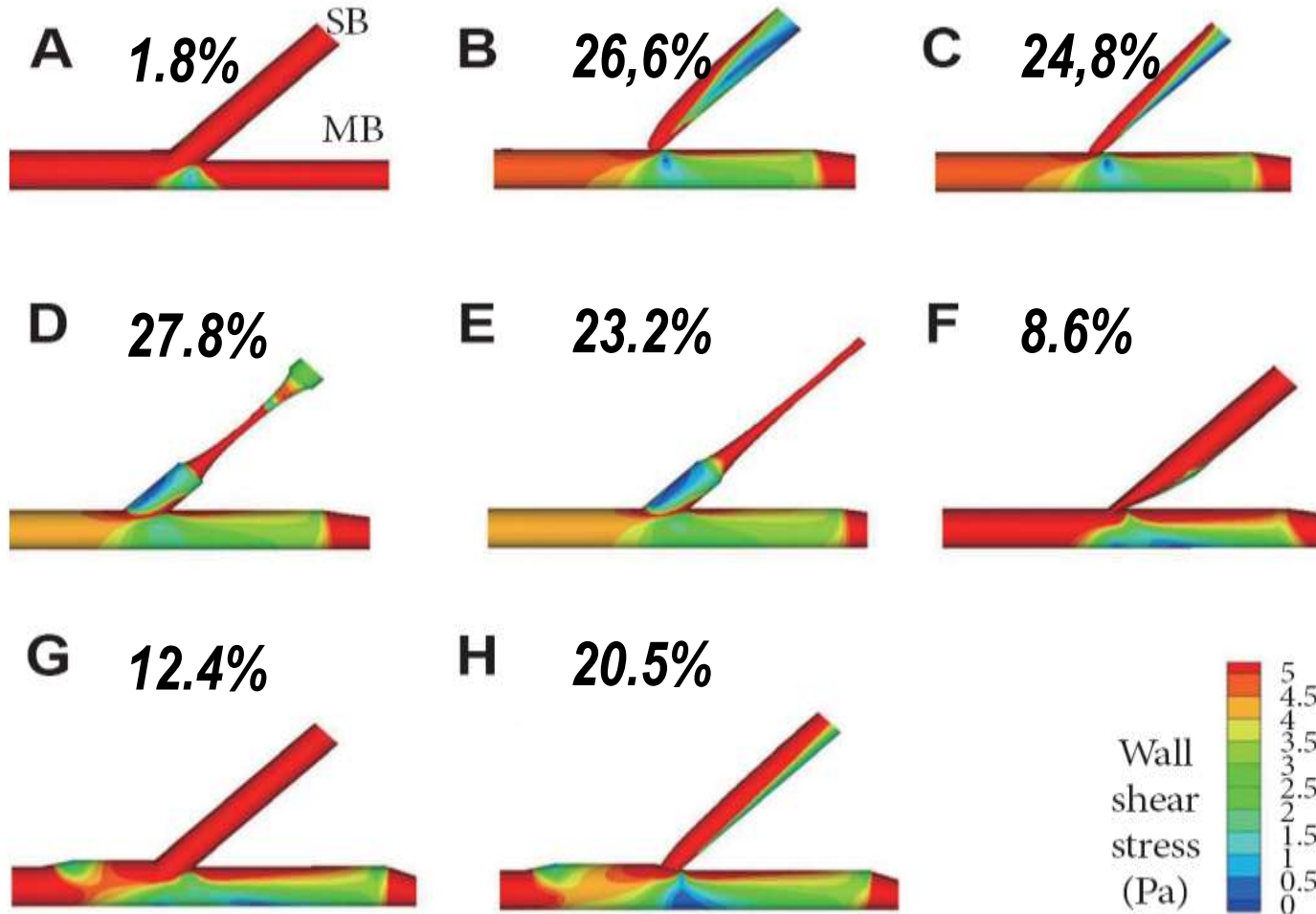


3 principles for bifurcation stenting

- **Minimize stent number**
- **1 well apposed stent layer**
- **Respect the bifurcation functional anatomy**

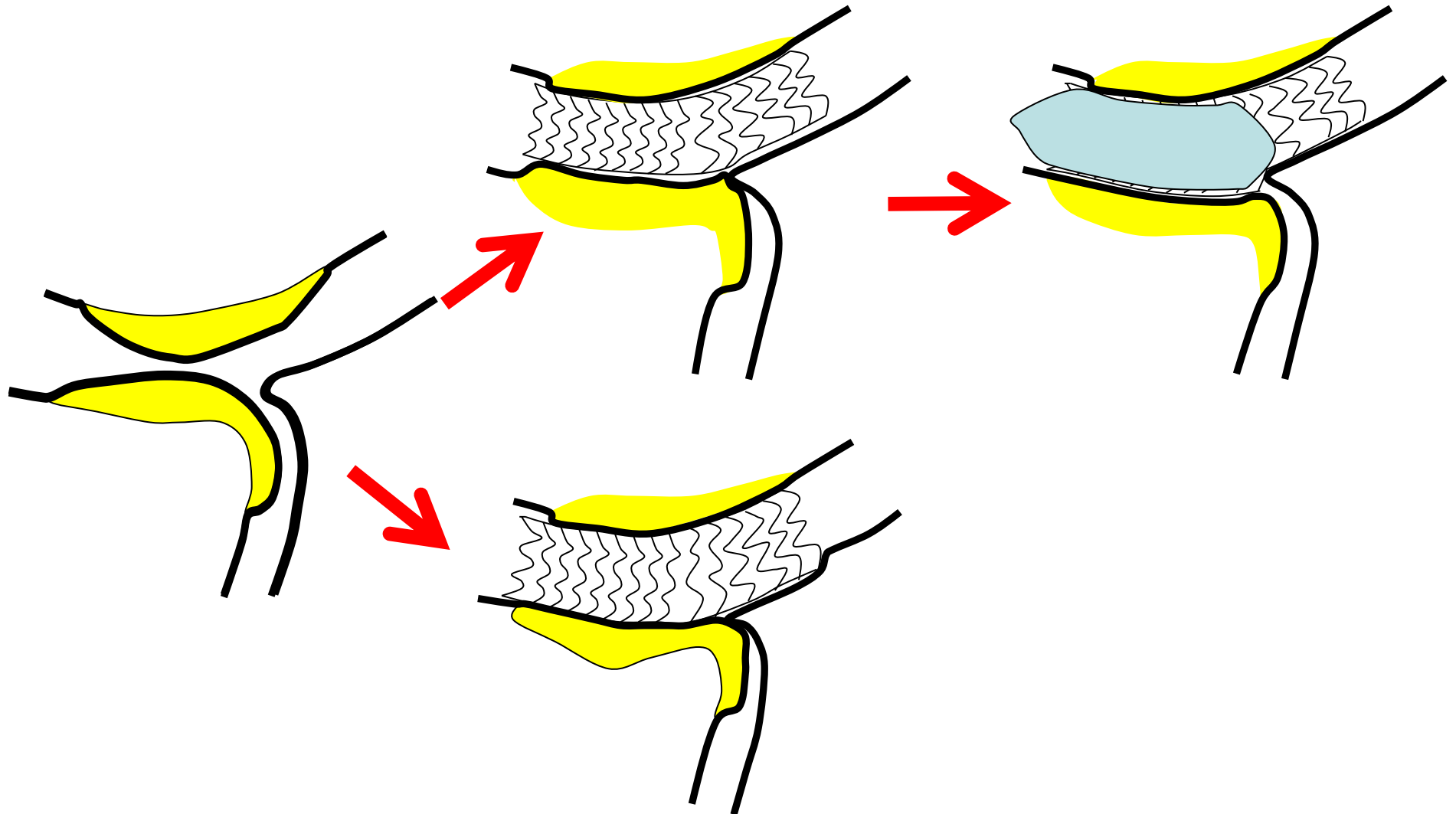
Evaluation of Local Flow Conditions in Jailed Side Branch Lesions Using Computational Fluid Dynamics

Area of low WSS (<4 Pa) in 8-computational bifurcation models



How to Rescue the Side Branch?

POT (Proximal Optimisation Technique)



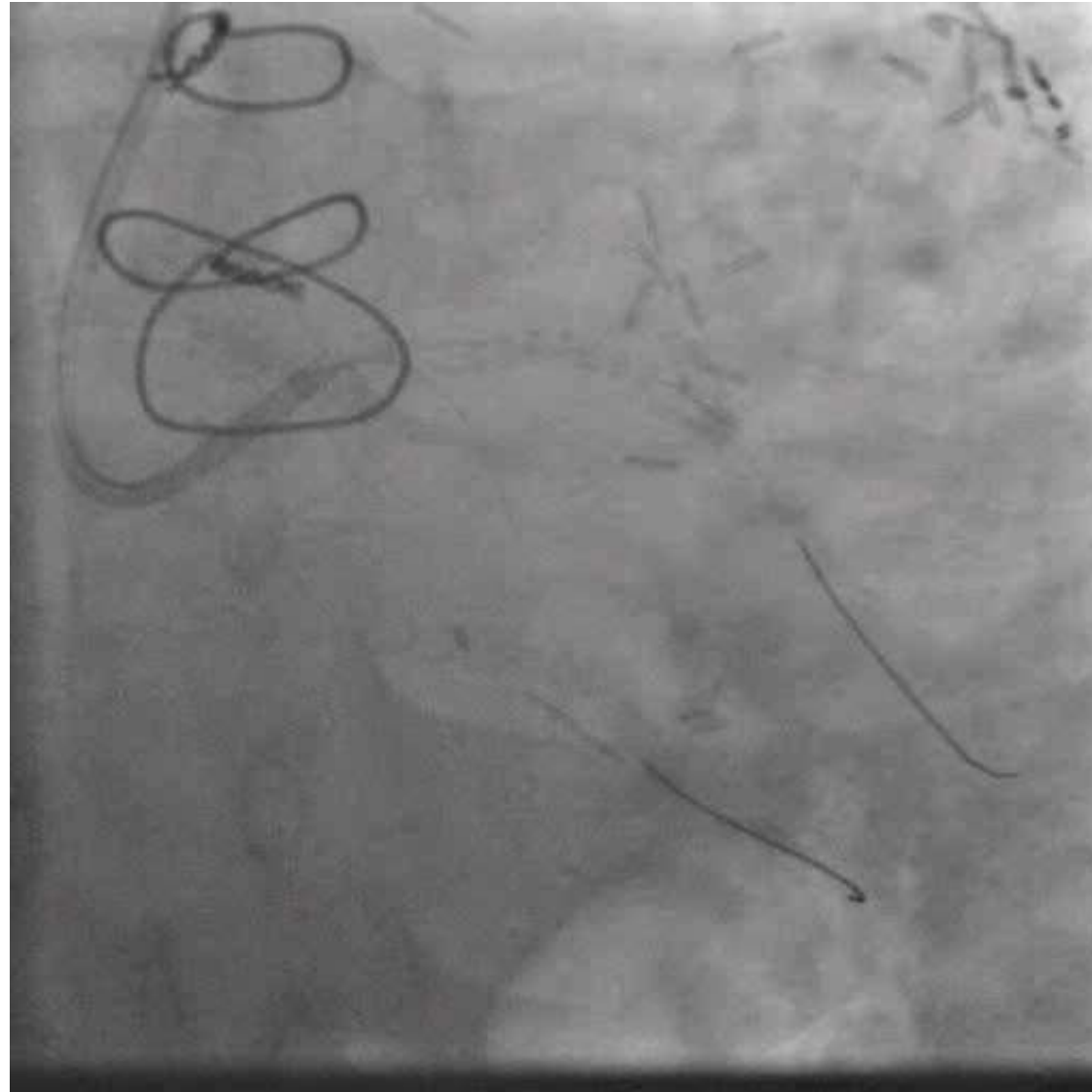
POT to reopen the SB



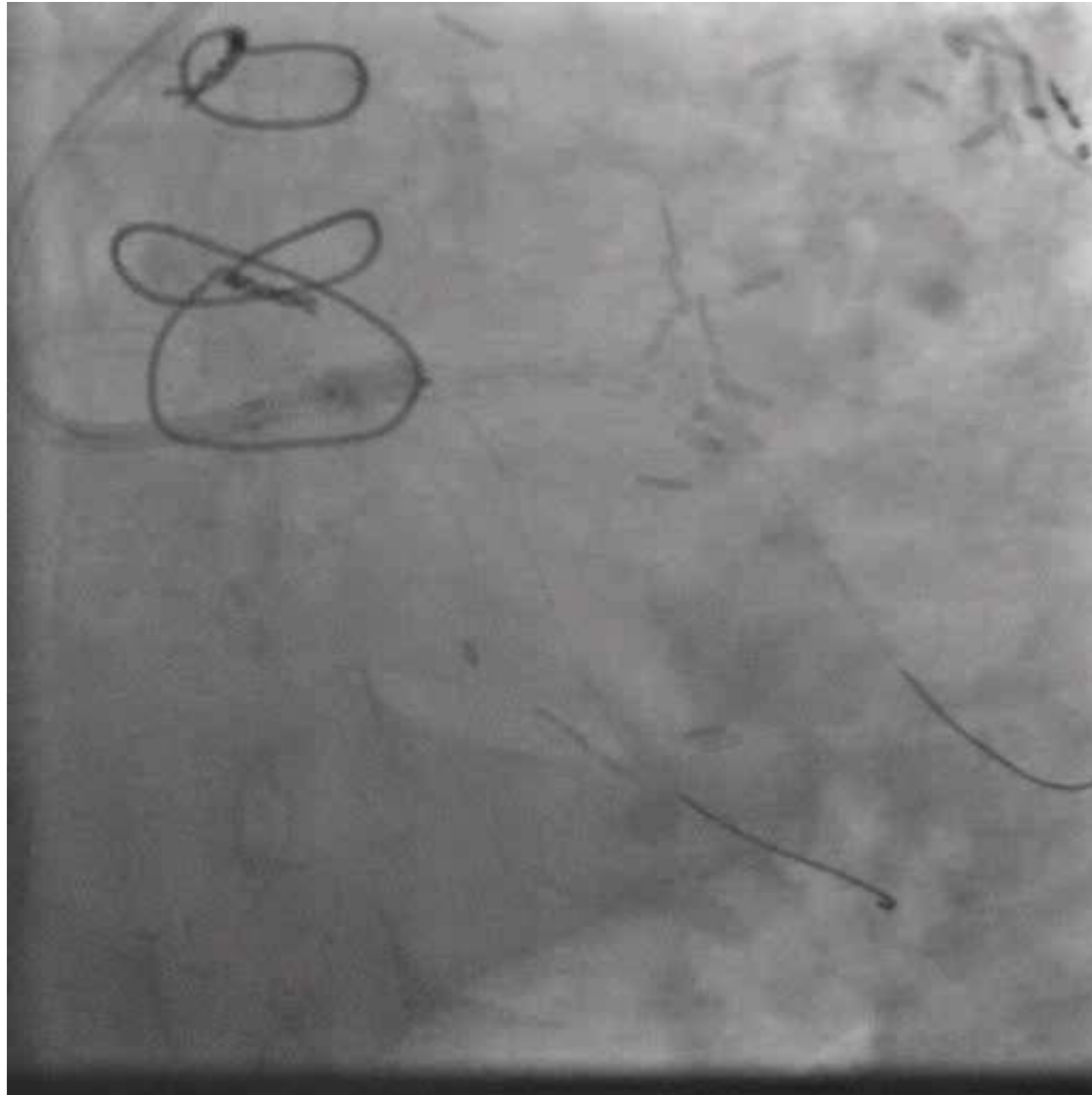
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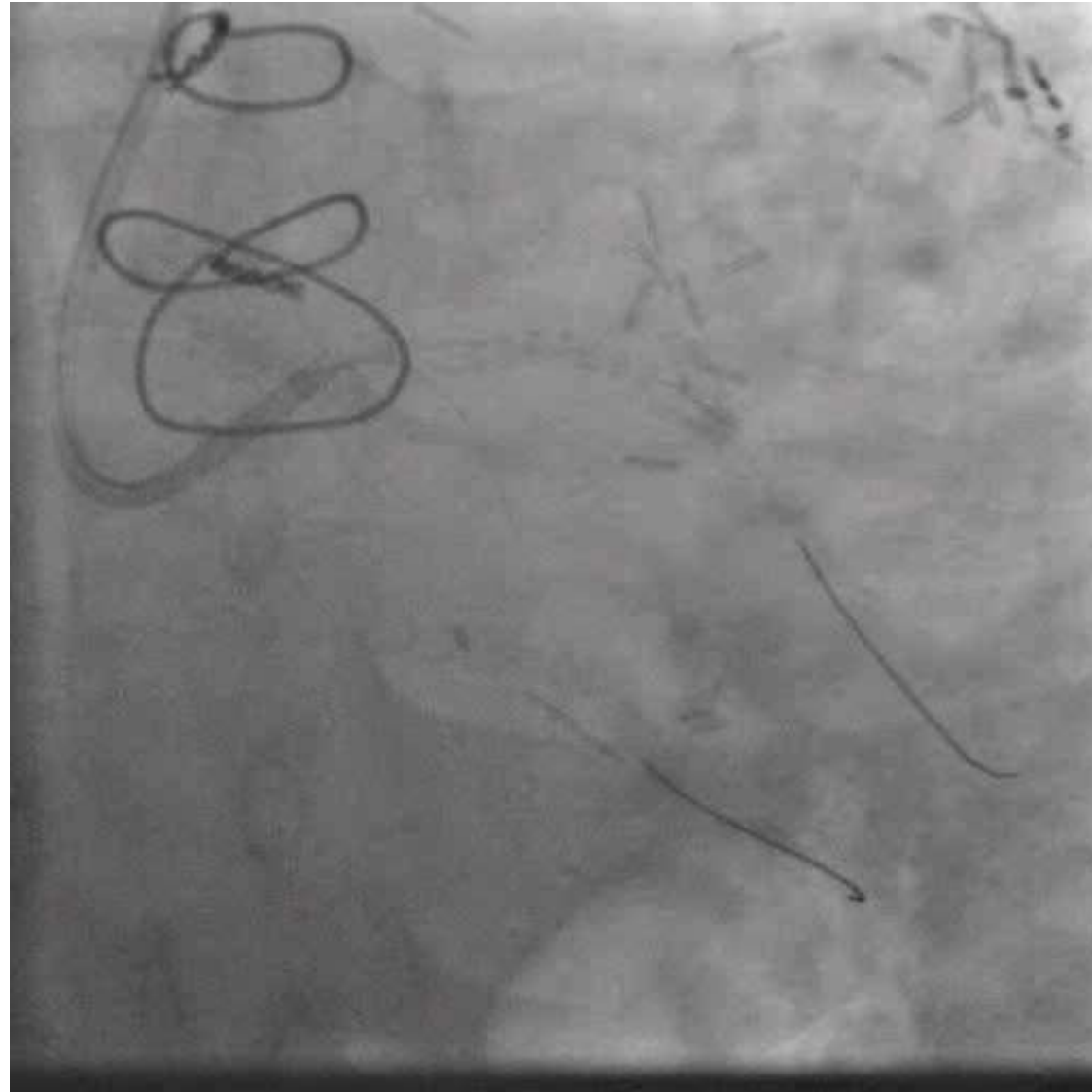
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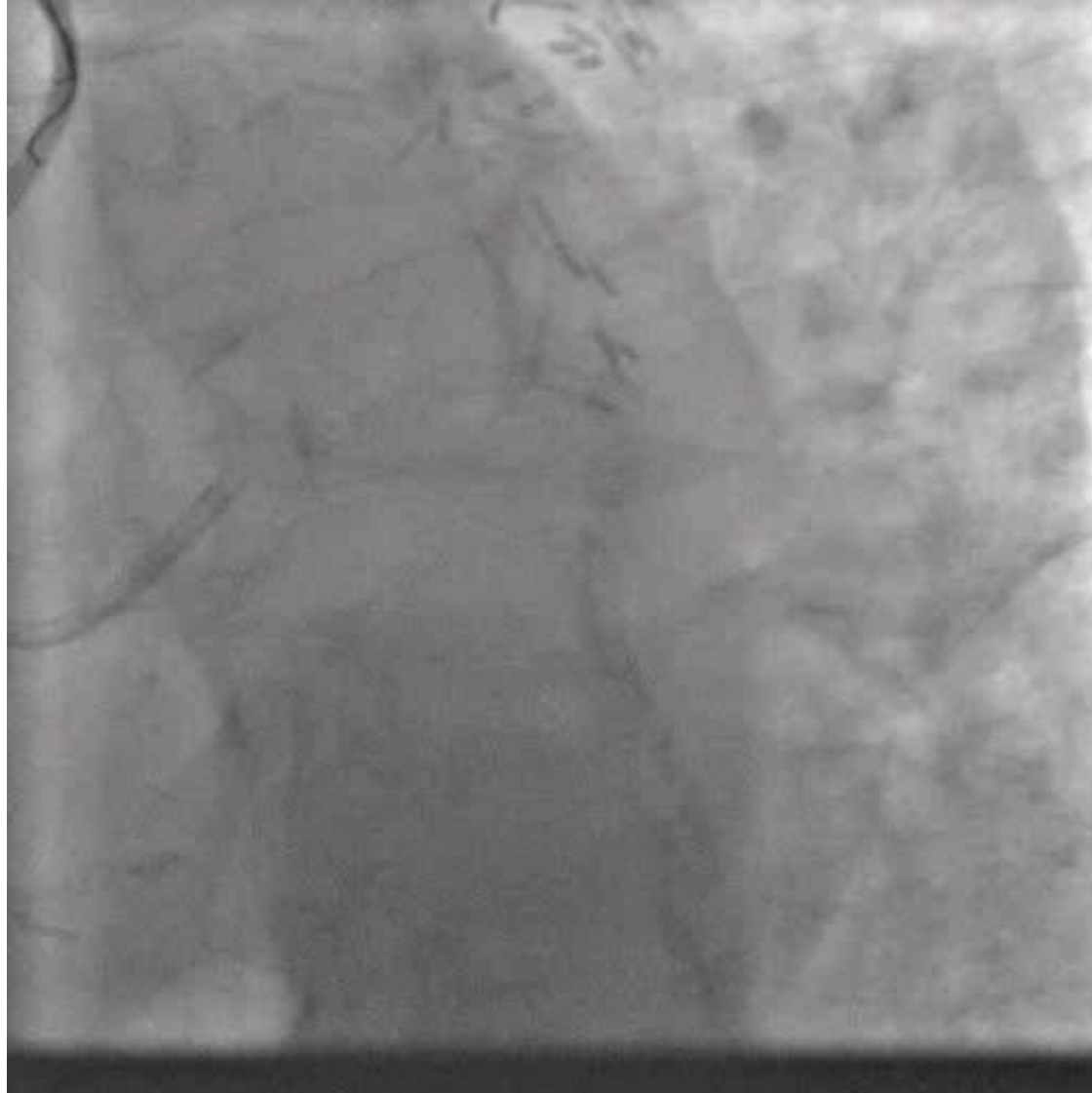
POT to reopen the SB



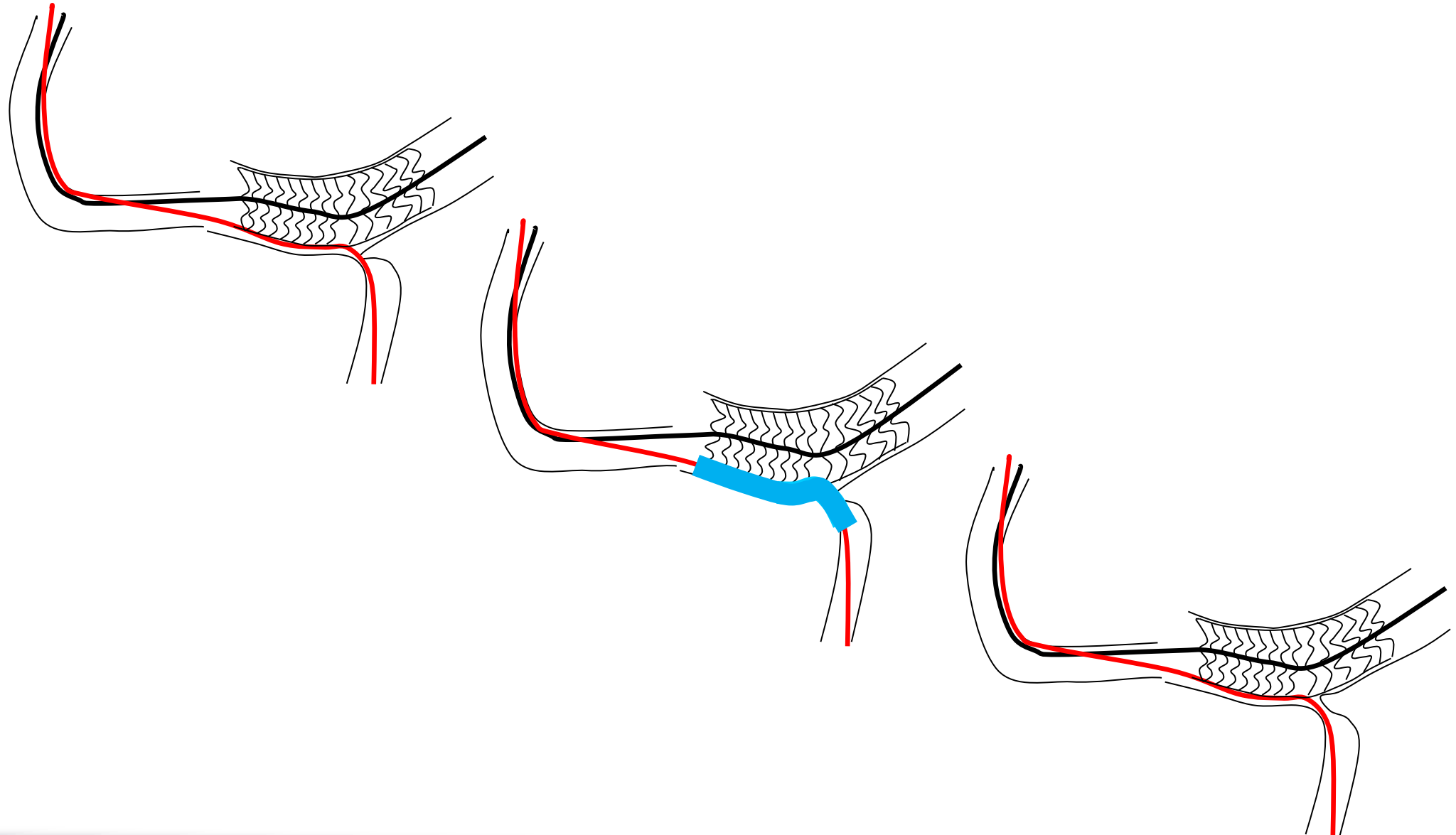
POT to reopen the SB



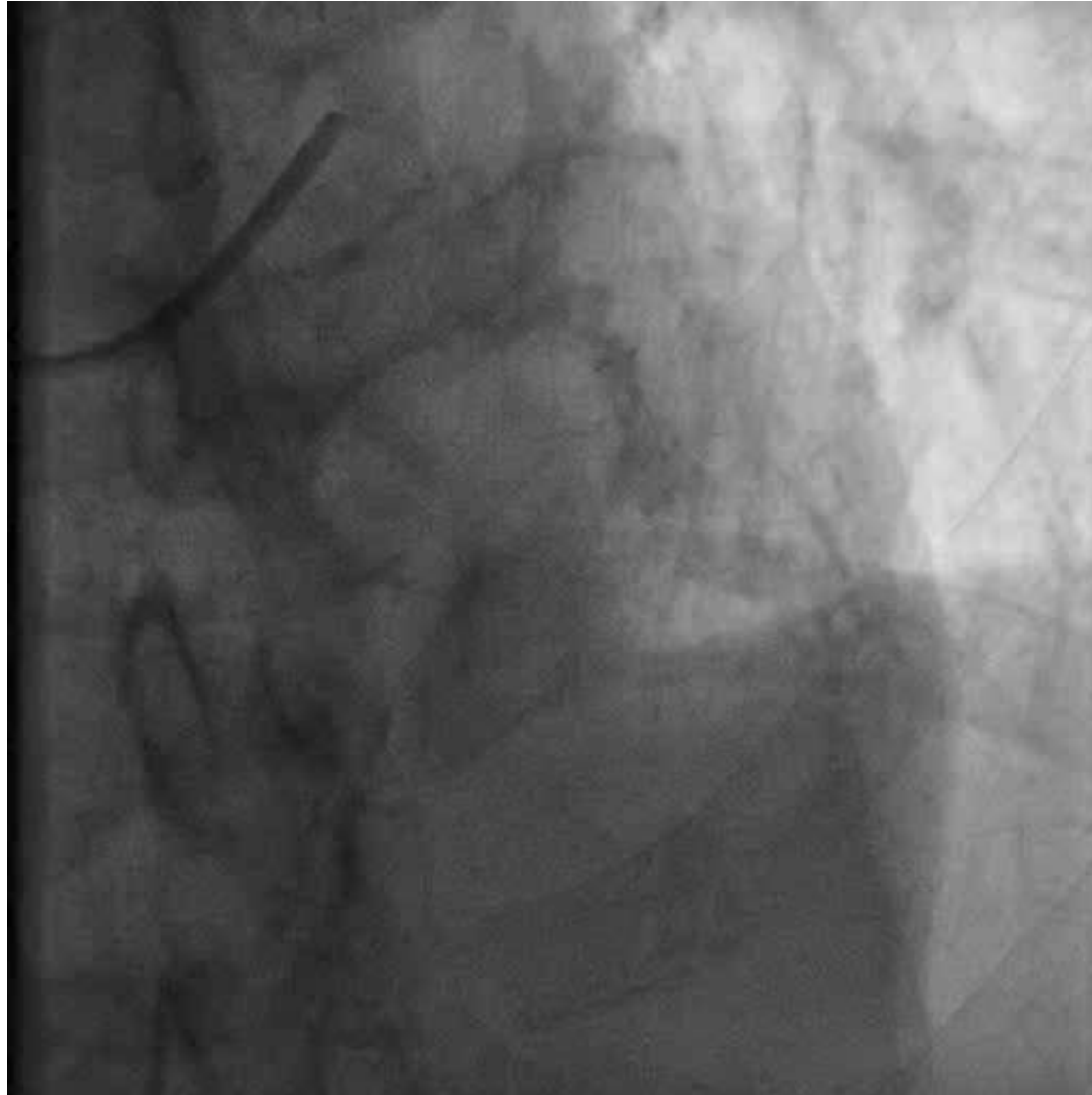
POT to reopen the SB



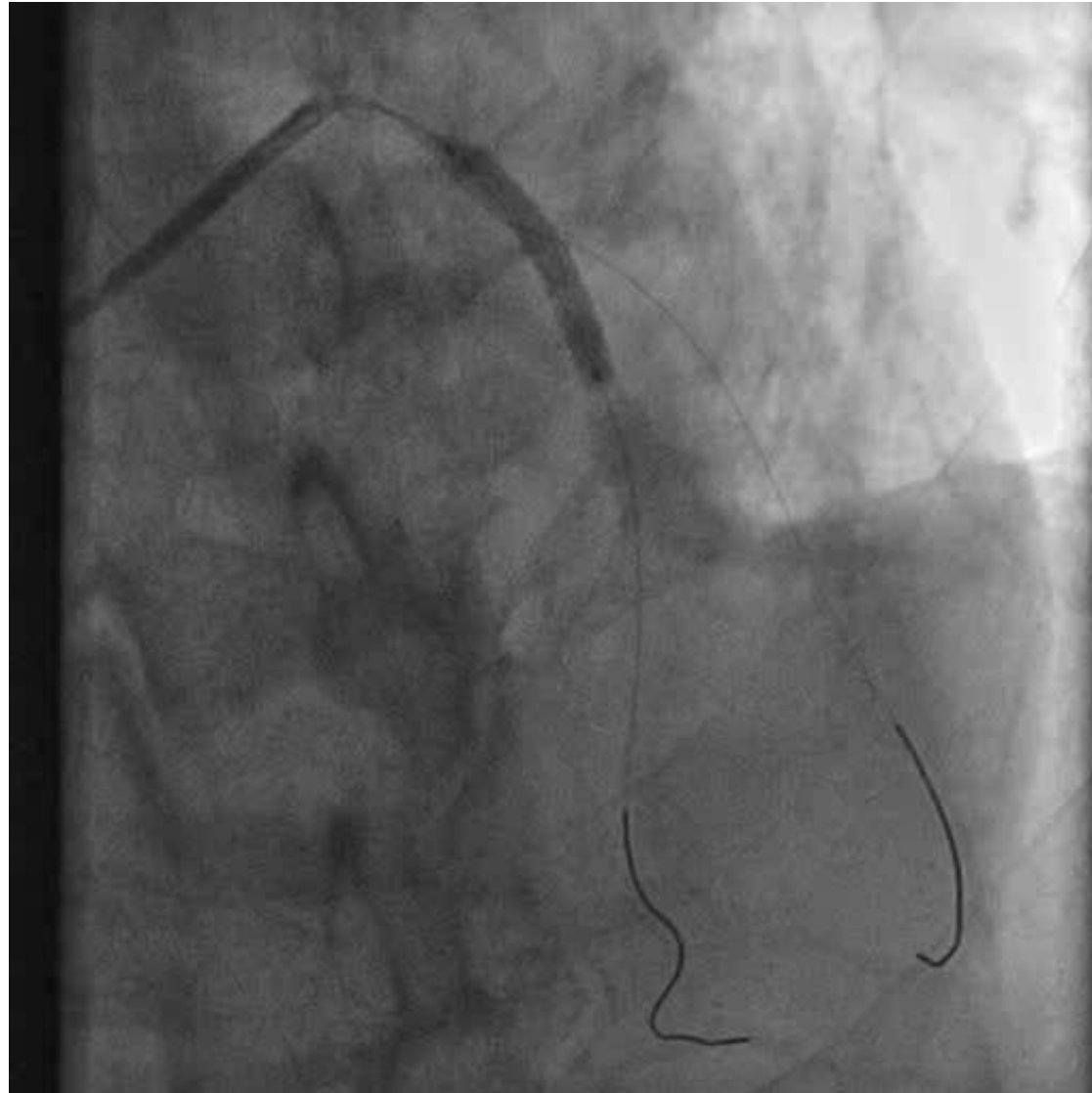
SB salvage



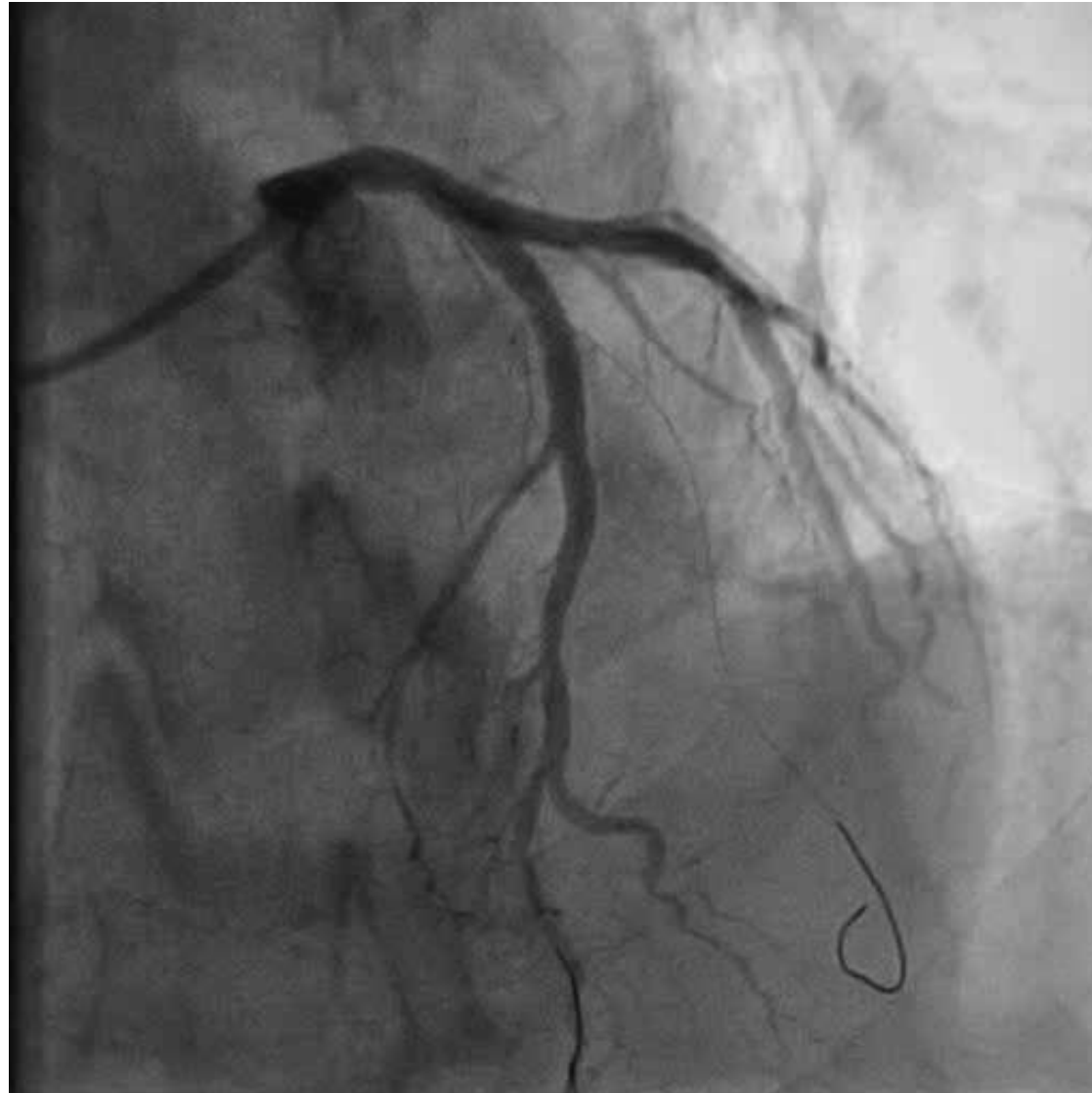
SB salvage technique



SB salvage technique



SB salvage technique



SB salvage technique



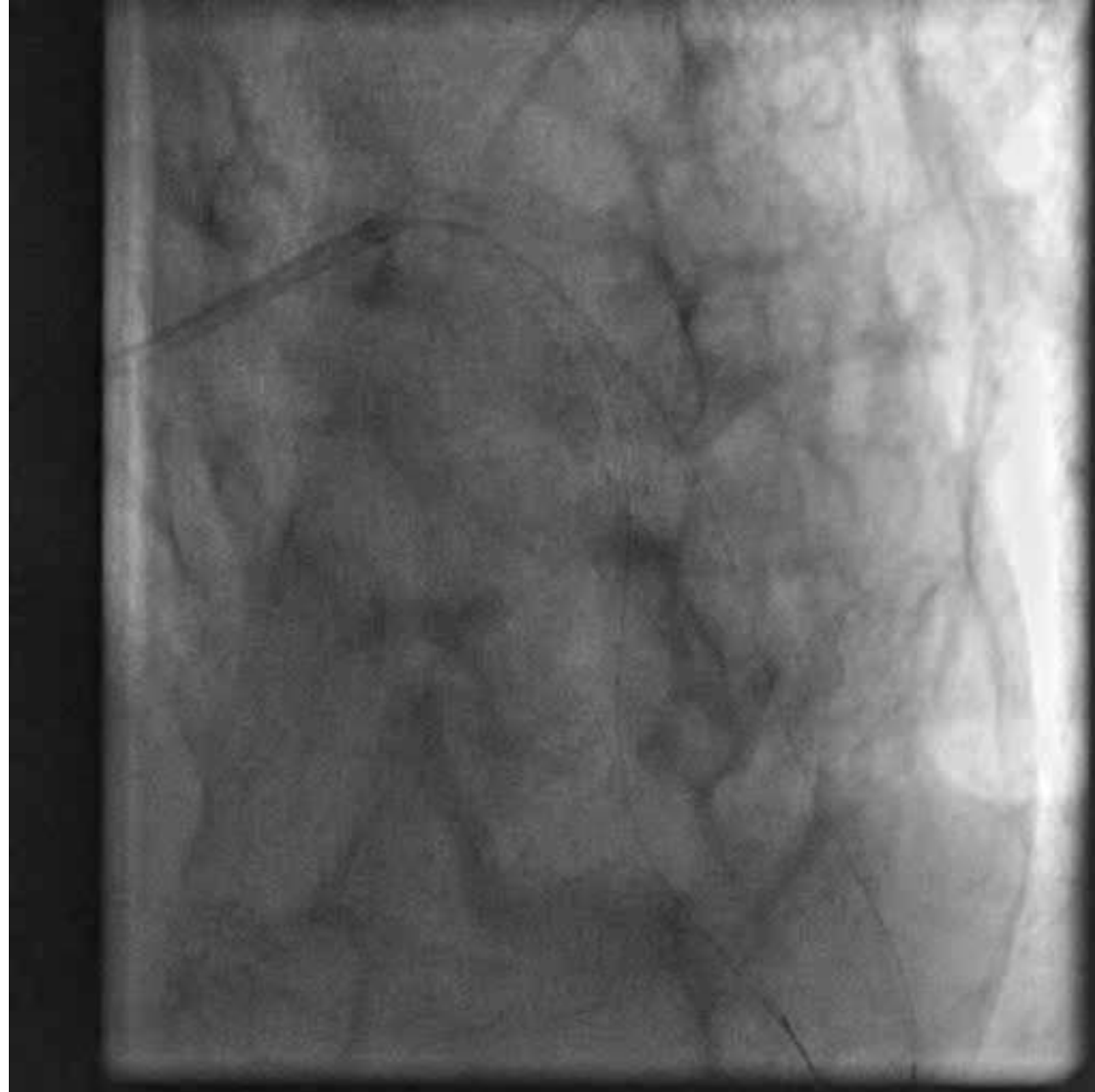
SB salvage technique



SB salvage technique



SB salvage technique



First conclusion

- Analysis of randomized trials remain **very difficult** (even without consideration of stent properties, Kissing, POT, DAPT status before endpoints ...)
- With Cypher/Taxus stents in any type of small SB (<2.4 mm by dedicated QCA) bifurcation lesions, **single stenting** is the best (SB stent for salvage only)
- In bigger SB with long lesion where a **poor result in the SB can lead to ischemia driven TLR** a true provisional stenting strategy and modern double stenting techniques beginning with SB are probably equally effective to prevent reintervention
- **Stent thrombosis risk with systematic double stenting**, even unfrequent, remains a concern (killer!).