Functional guidance in bifurcation

What are the clinical evidences

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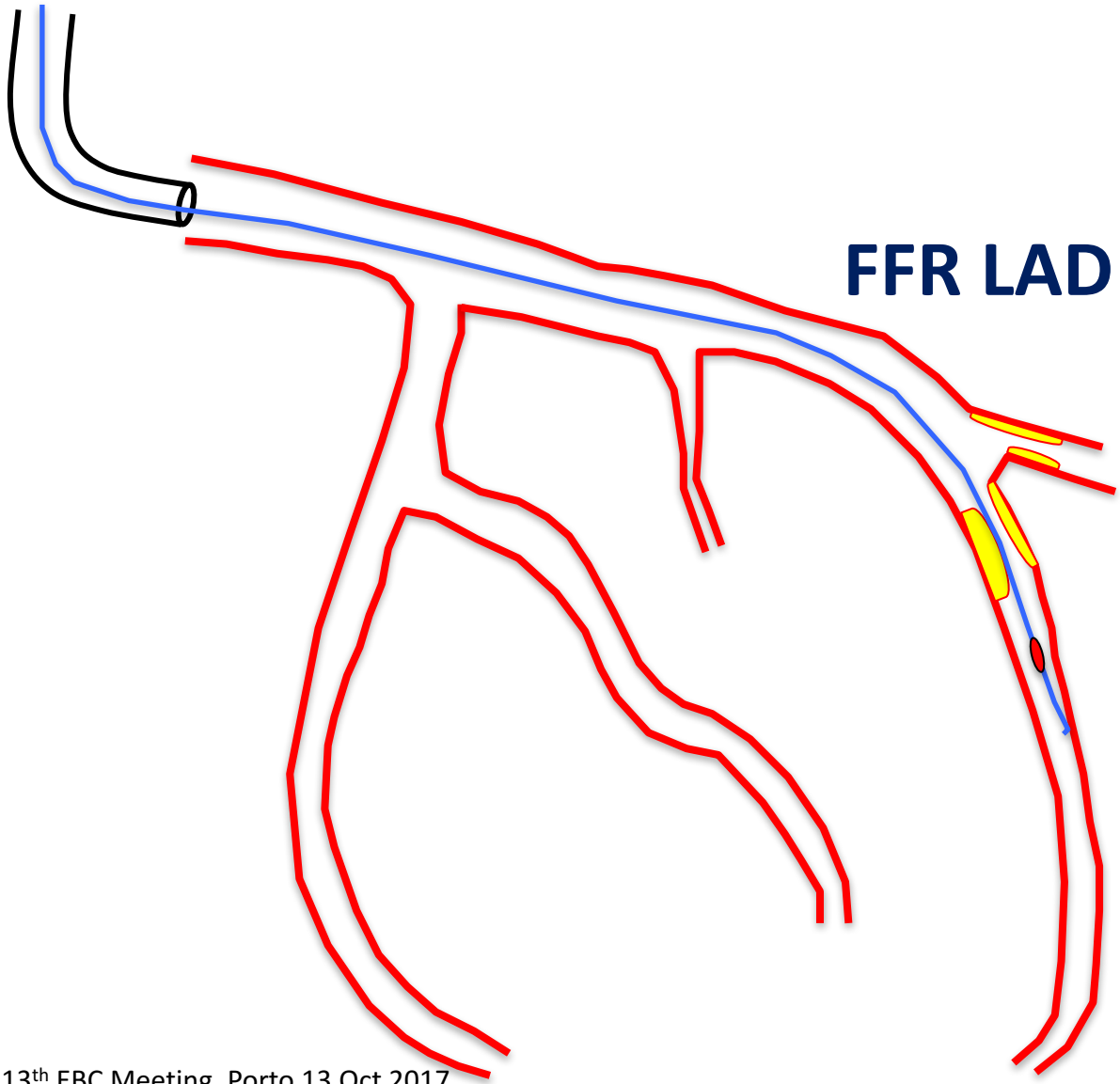
At the time of CAG

How to assess FFR in bifurcation

At baseline



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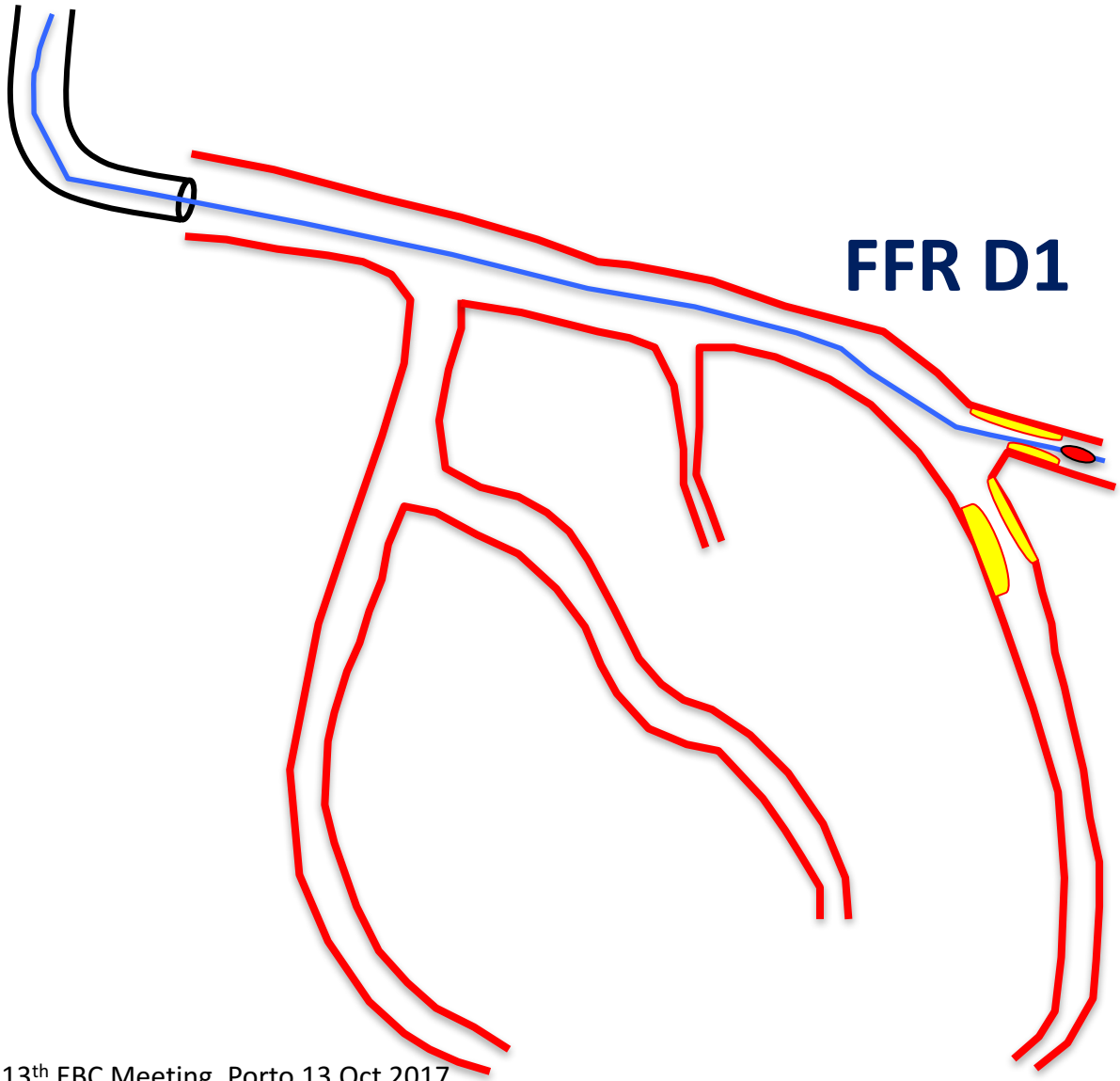
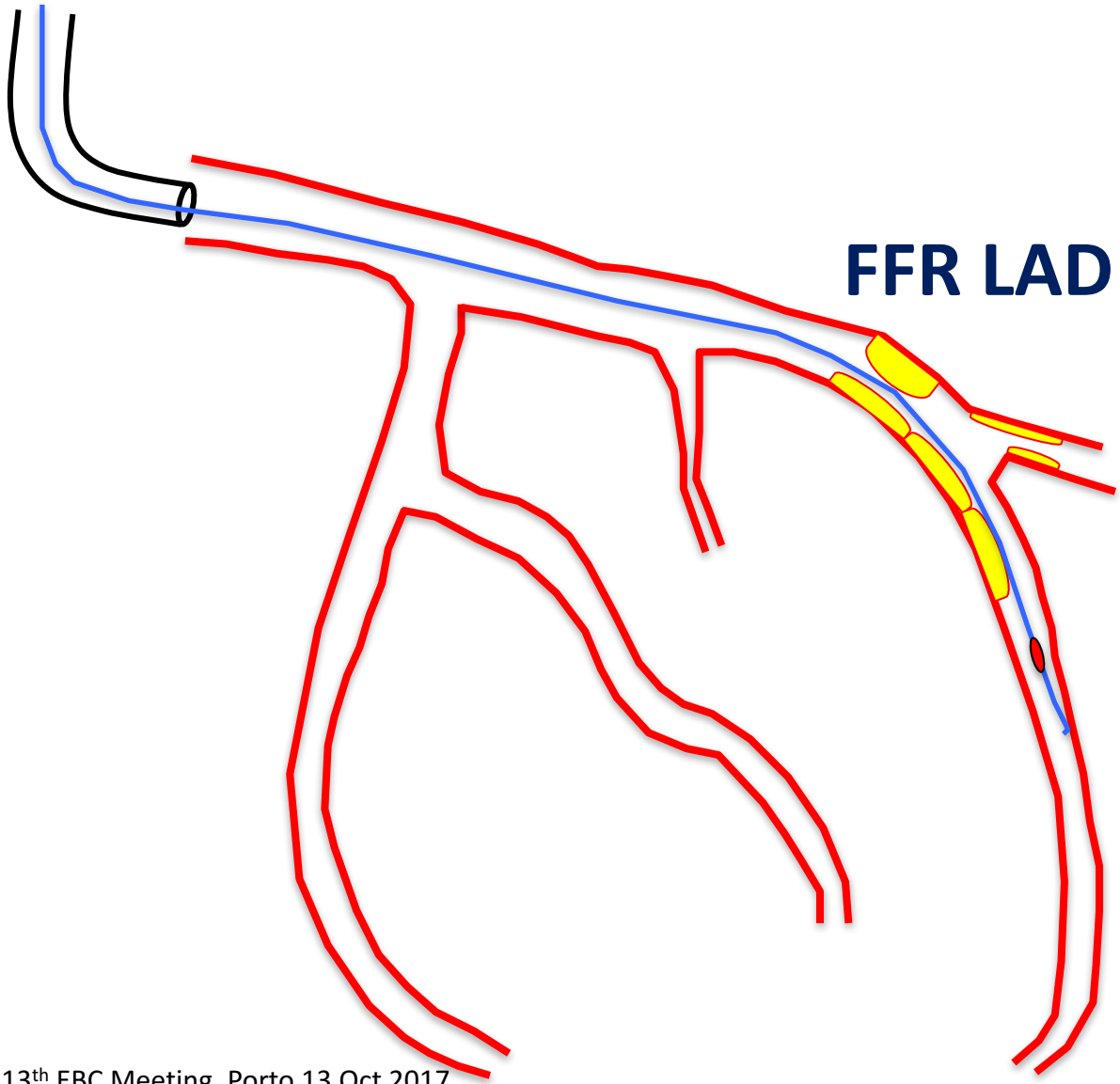


➔ same as in other vessels

How to assess FFR in bifurcation

At baseline



How to assess FFR in bifurcation

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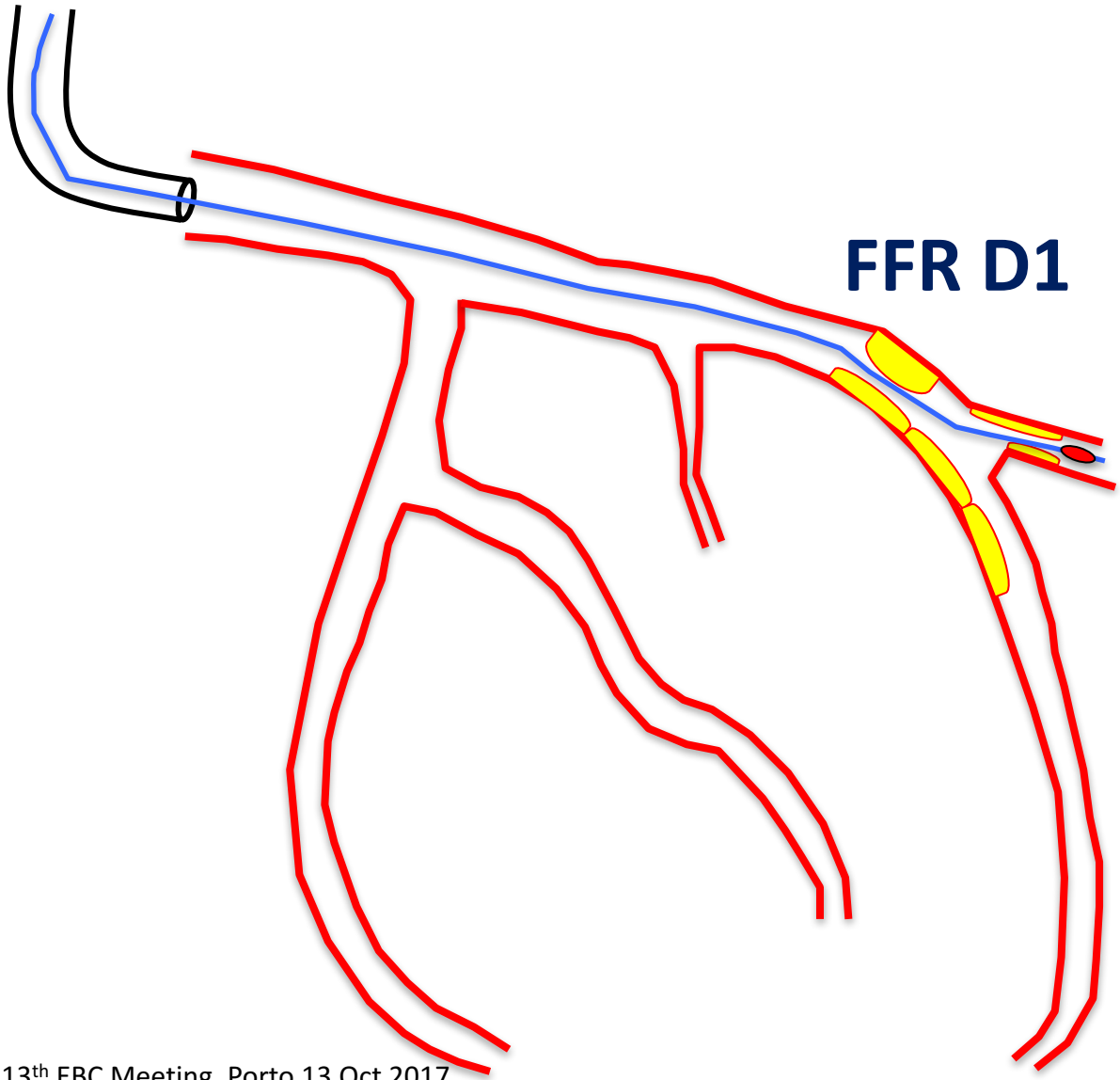
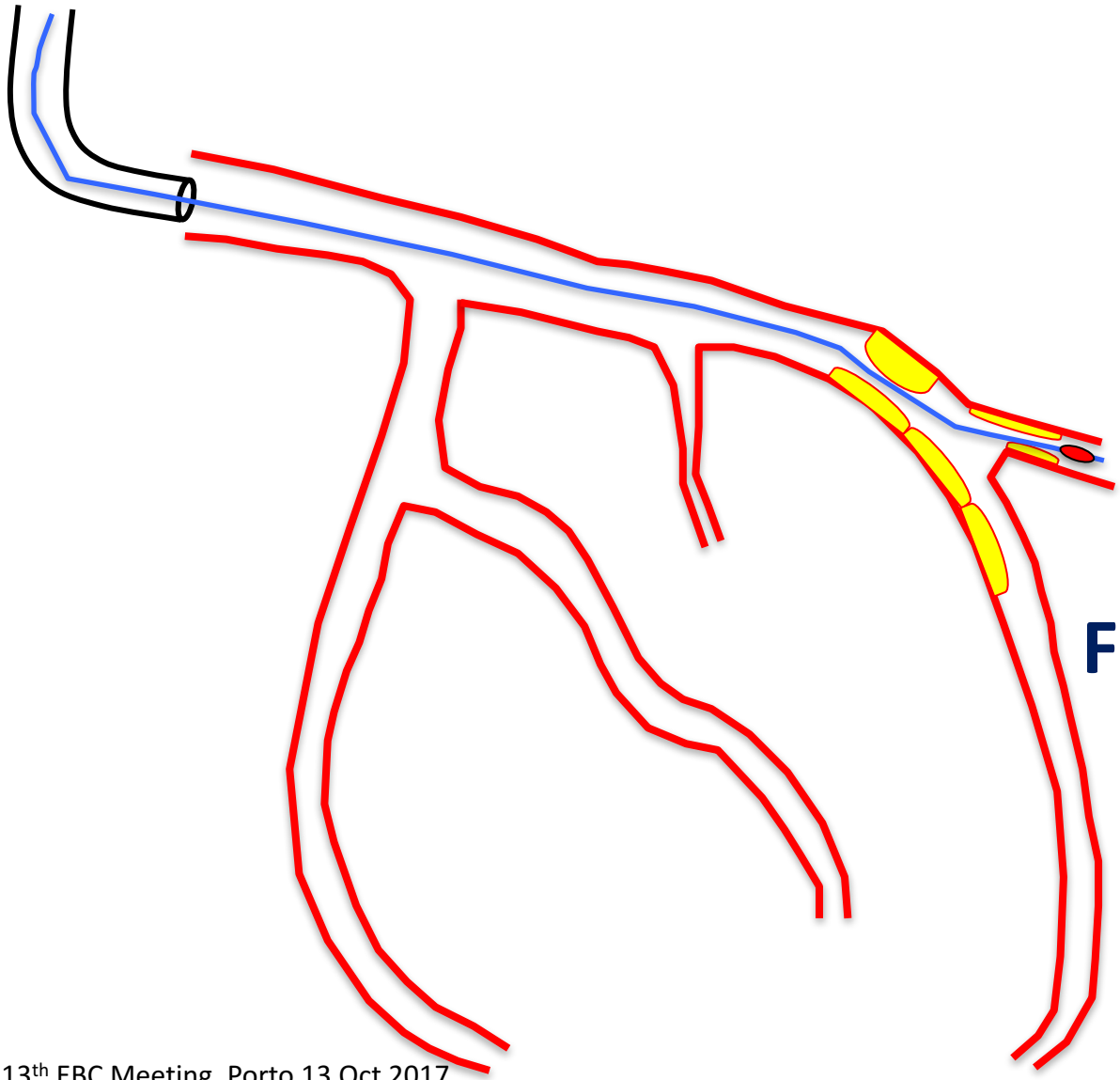


➔ FFR in LAD prox + D1

How to assess FFR in bifurcation

At baseline



FFR D1 ≤ 0.80

FFR LAD ≤ 0.80

Prov. St. **2 St.**

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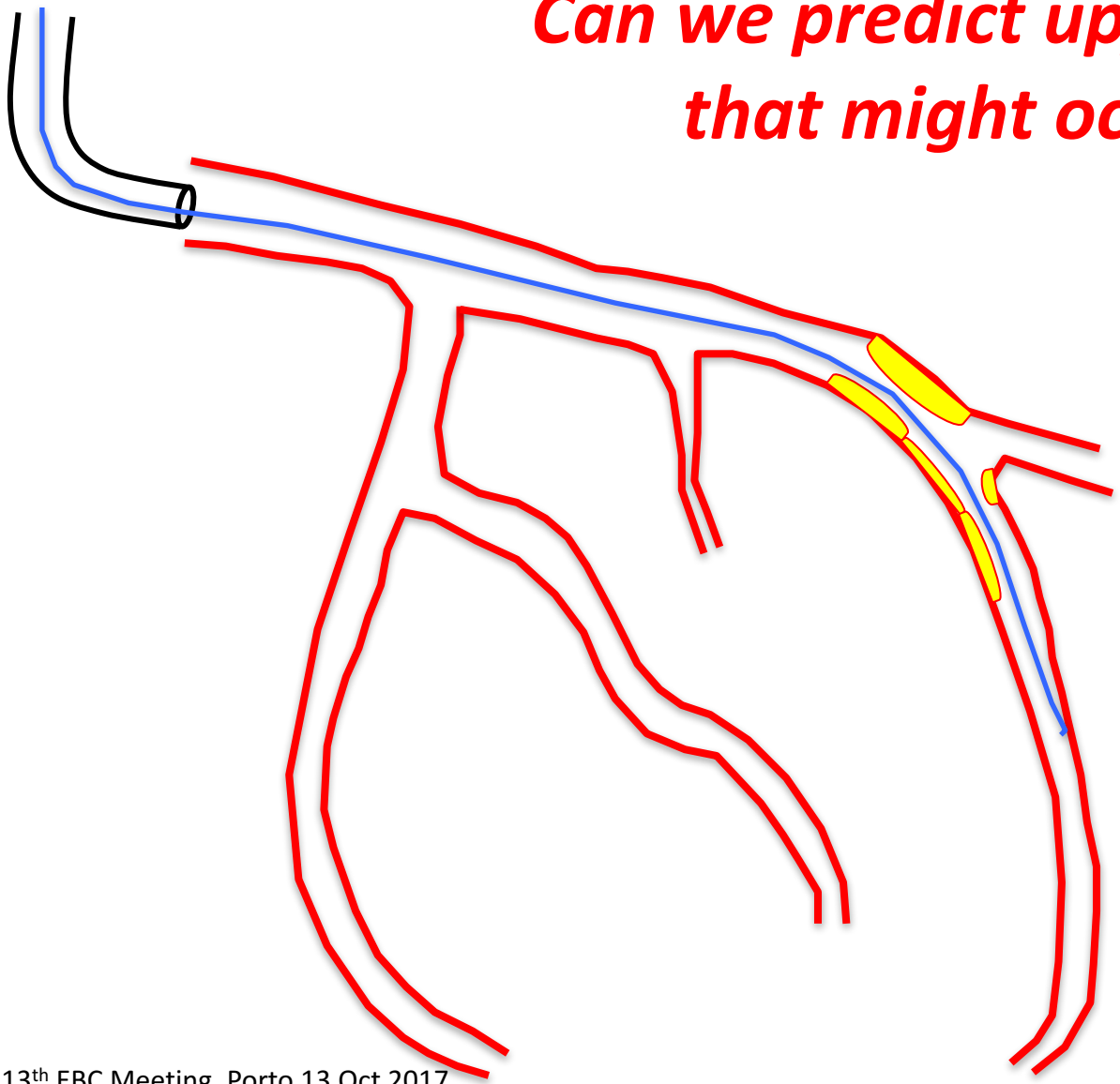
At the time of PCI

How to assess FFR in bifurcation

Can we predict upfront FFR changes that might occur in the SB after stenting the MB?



FFR D1 > 0.80

How to assess FFR in bifurcation

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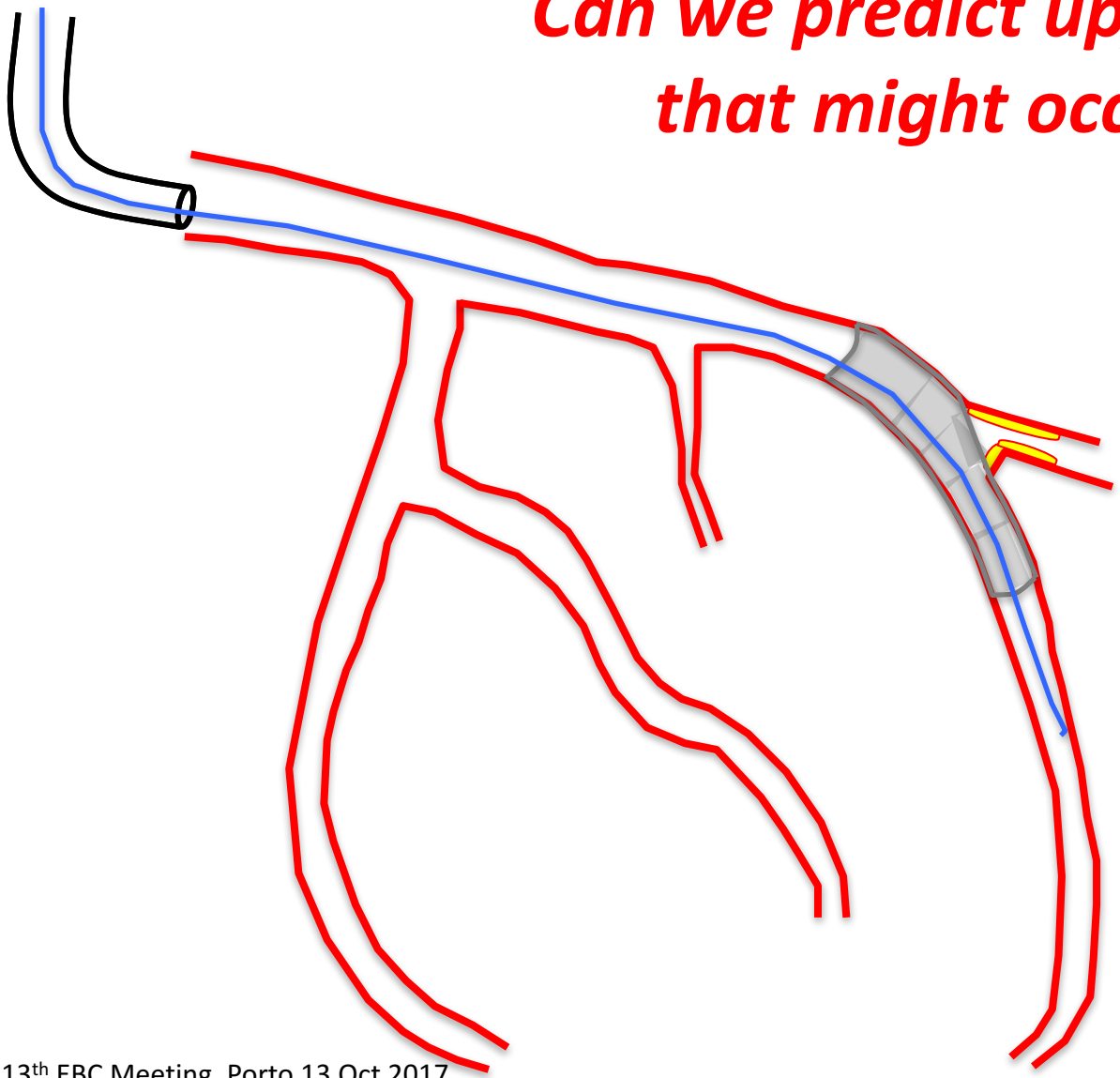
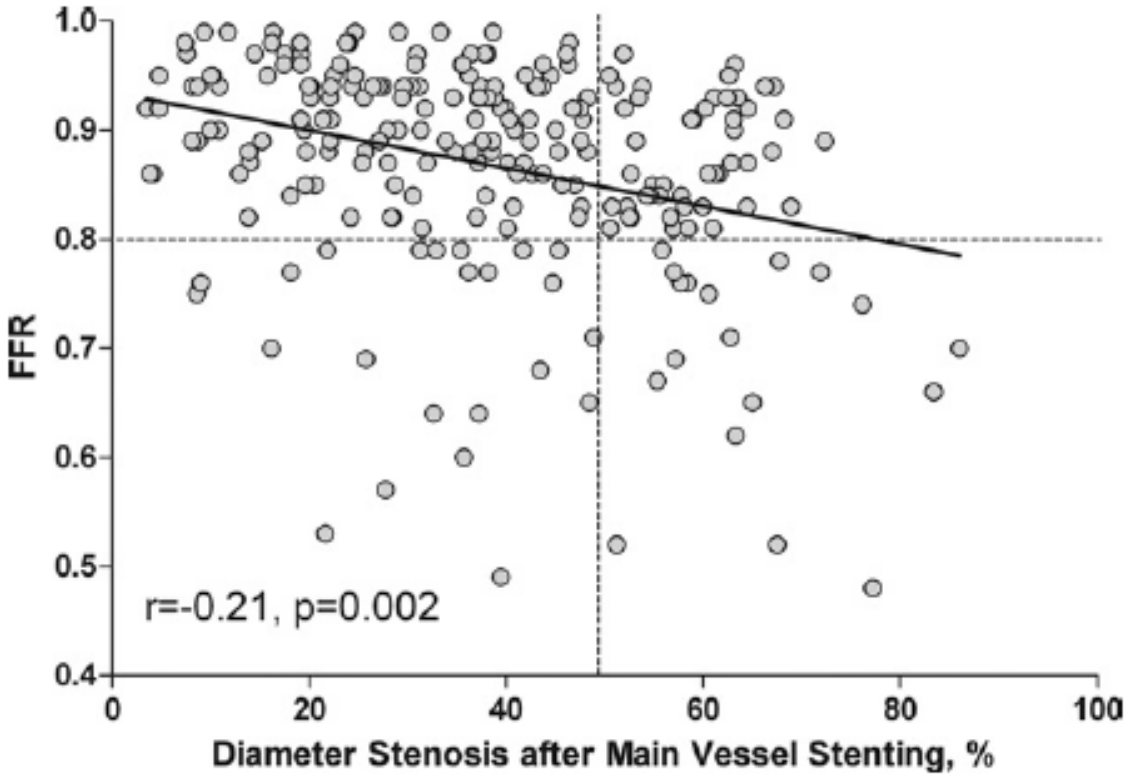


FFR D1 = ???

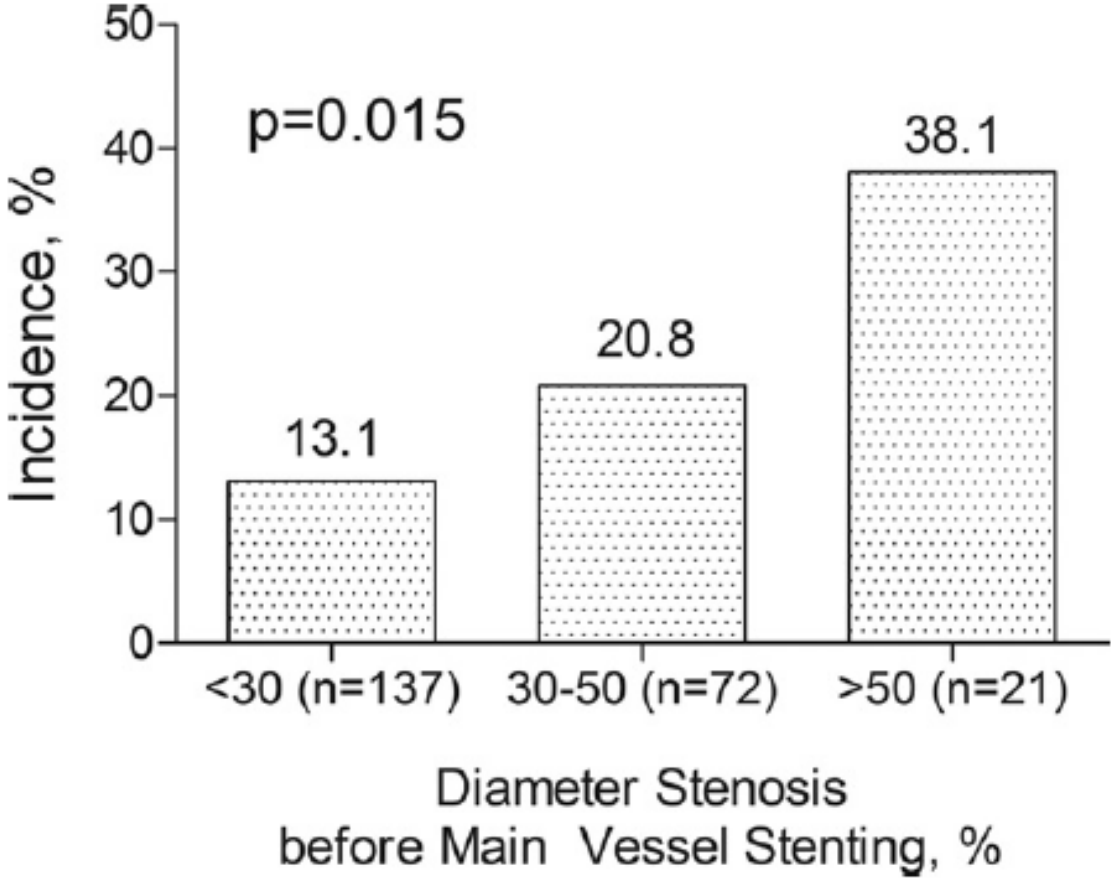
Stenosis severity of SB *before* vs. FFR *after* stenting MB



Only 18% of the SB showed FFR≤0.80 after MB stenting

Ahn J-M, JACC Cardiovasc Intv 2012

Incidence of FFR≤0.80 *after* vs. stenosis severity *before* MB stenting



%DS = O.R. 1.04 (1.02-1.06) predicted FFR ≤ 0.80

Ahn J-M, JACC Cardiovasc Intv 2012

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At the time of PCI

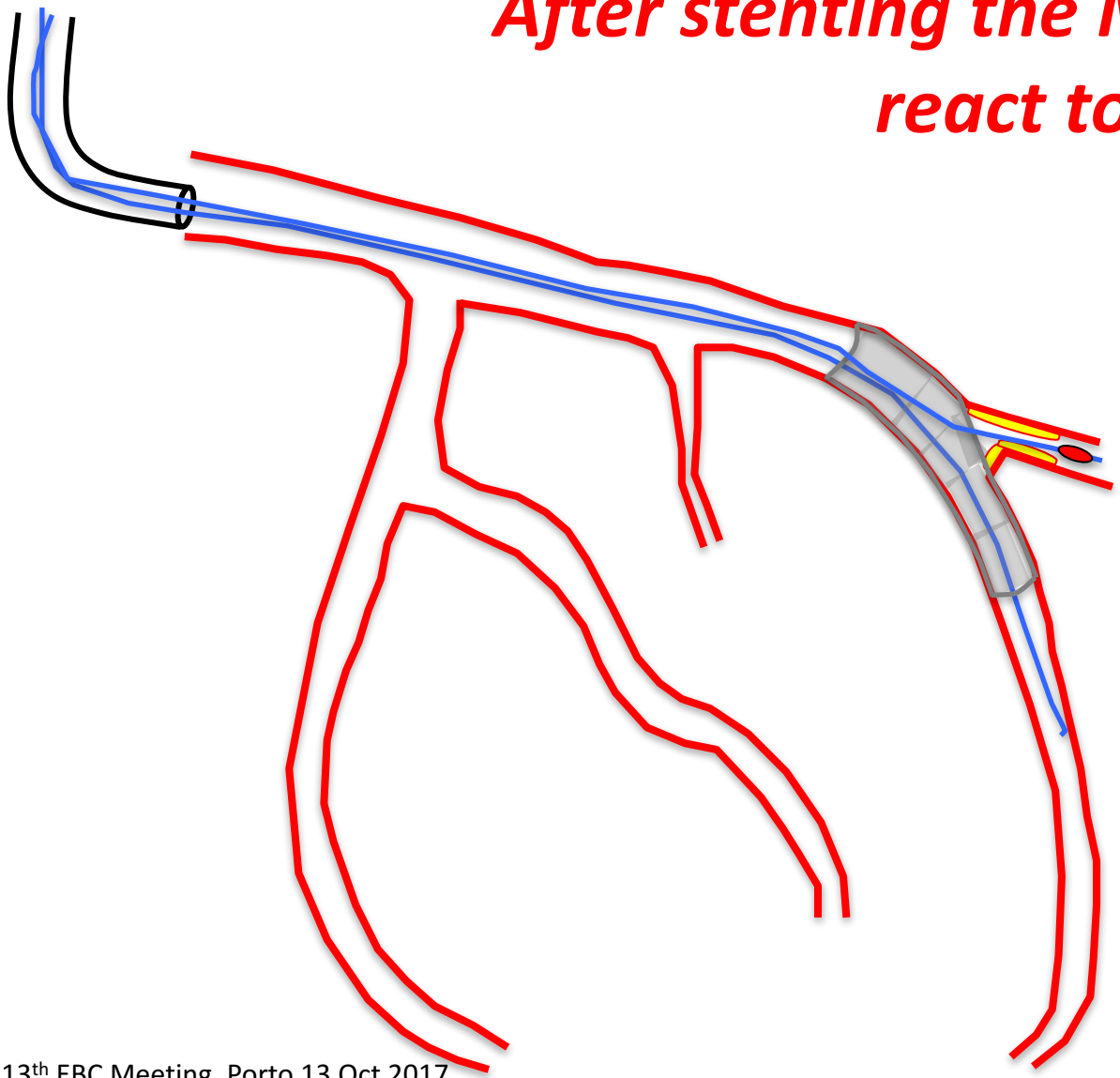
Can we predict FFR changes in the SB after MB stenting?

Yes, but … weakly and only in presence of SB DS > 50%

… where you might want to do 2S strategy anyhow!

How to assess FFR in bifurcation

After stenting the MB, do we need to react to any plaque shift?



FFR D1 = ???

How to assess FFR in bifurcation

After stenting the MB, do we need to react to any plaque shift?

- Only 18% of the SB showed FFR≤0.80 after MB stenting ➔ Ahn et al. 2012

How to assess FFR in bifurcation

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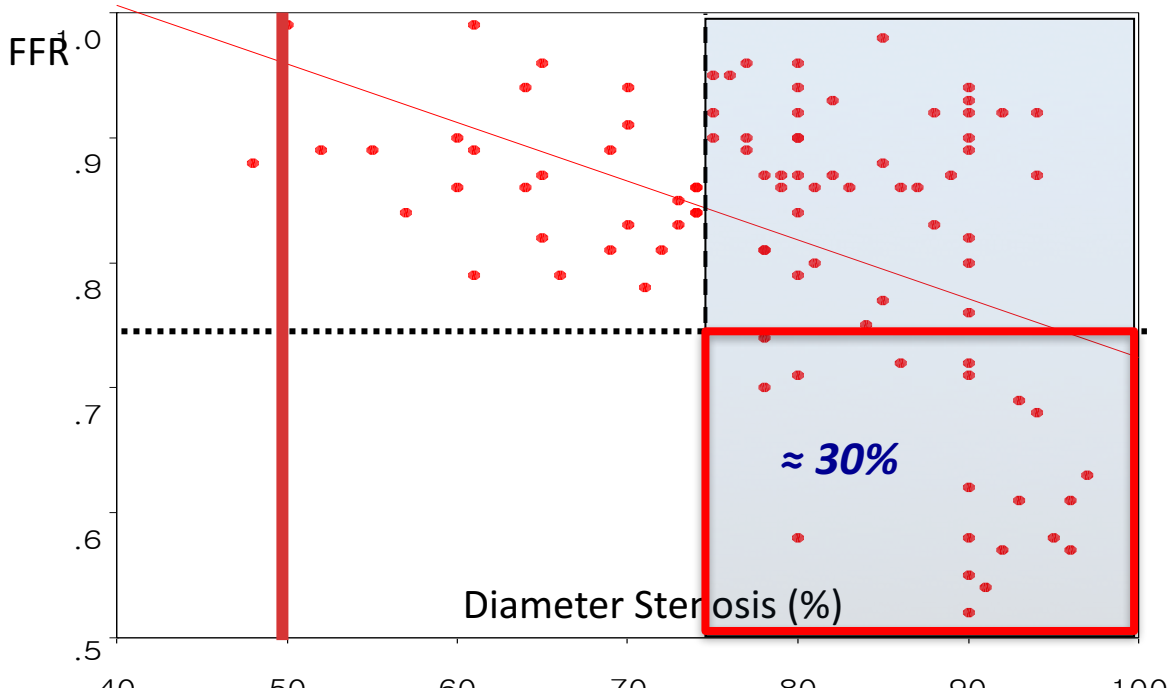
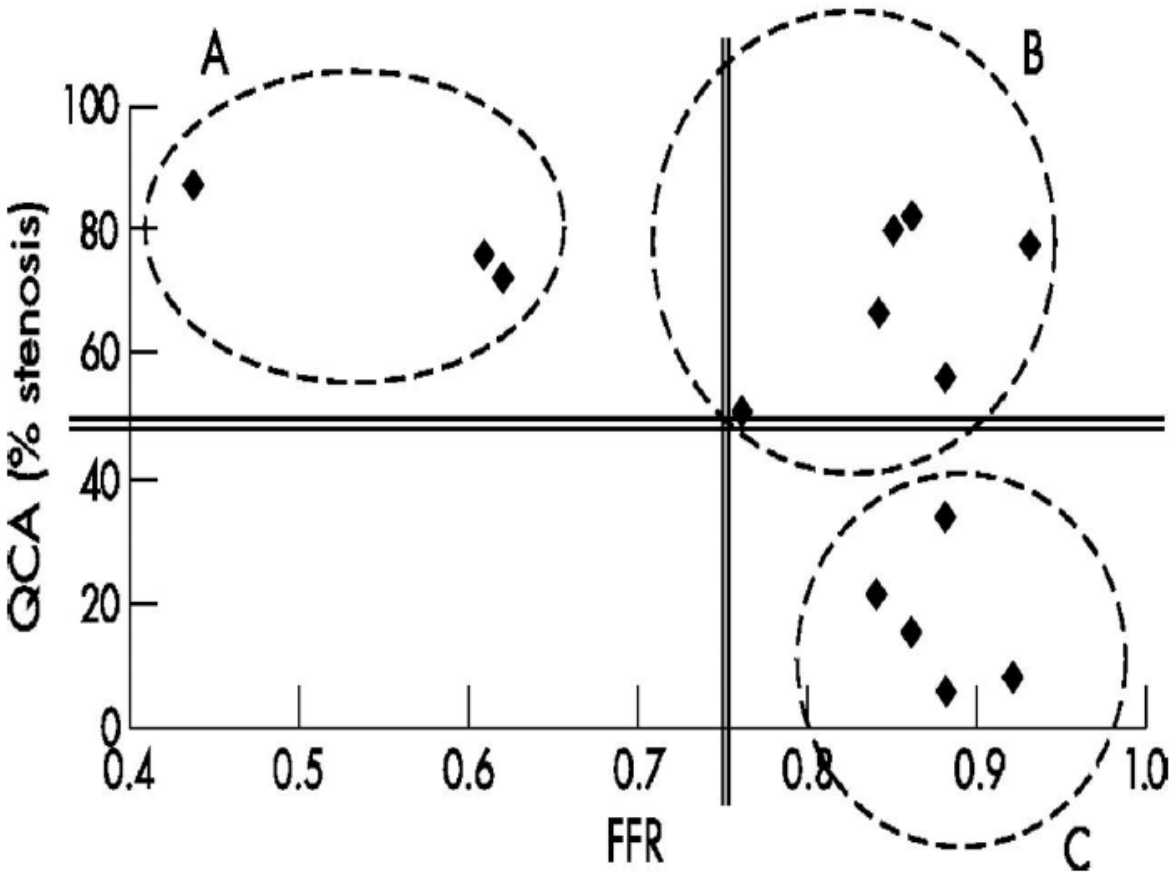


The angio cut-off value for (jailed) side branches is 75% DS

Koo et al., JACC 2005

How to assess FFR in bifurcation

After stenting the MB, do we need to react to any plaque shift?



Bellenger NG et al., Heart 2007

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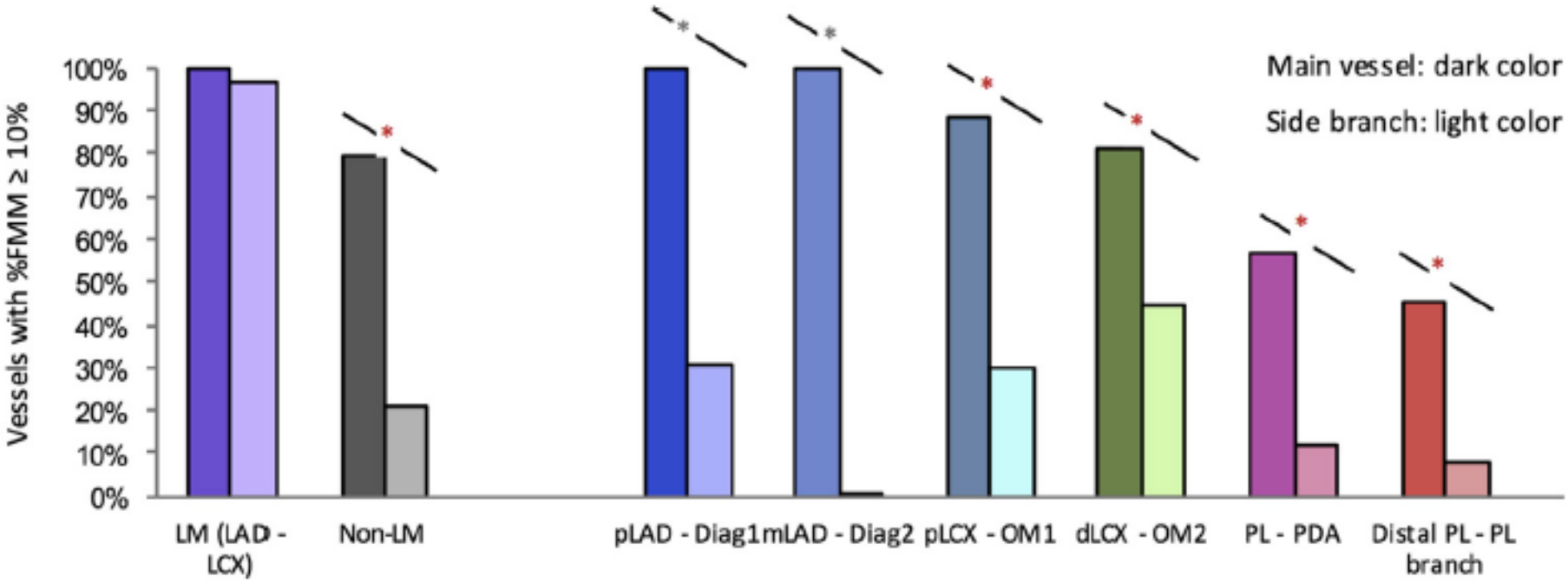
SB supplying %FMM≥10%

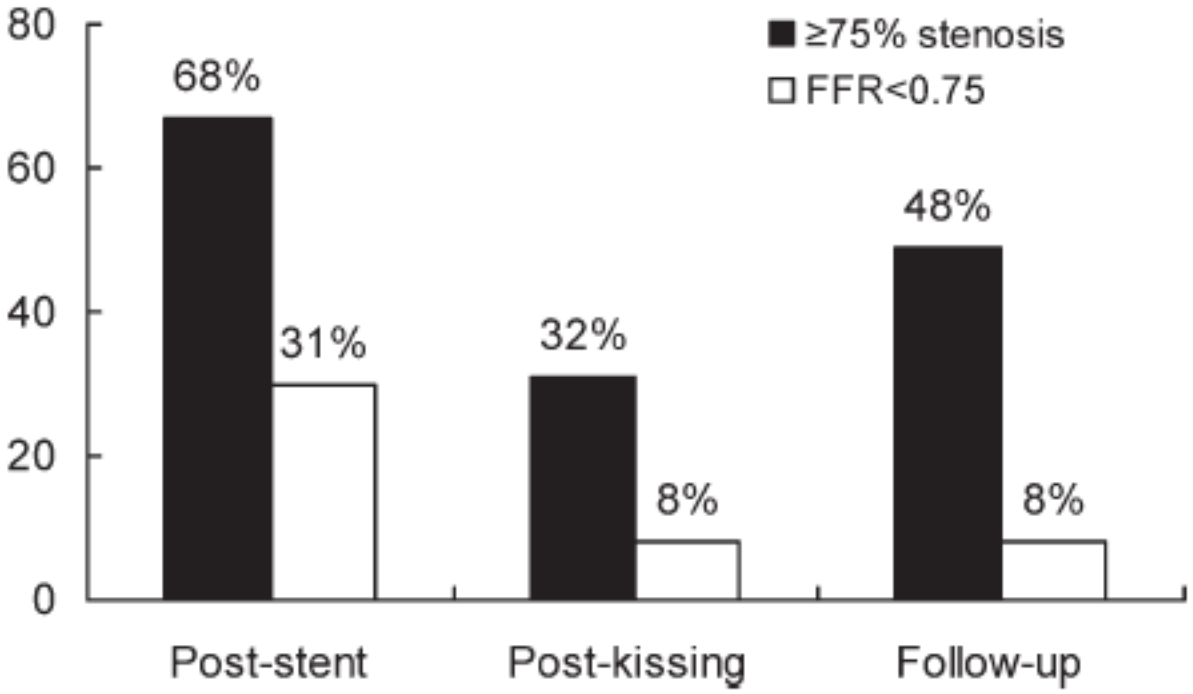


LM bifurcation and SB length ≥ 73 mm are a strong predictors of % Fractional Myocardial Mass ≥ 10%

Kim HY et al., JACC Cardiovasc Intv 2017

How to assess FFR in bifurcation

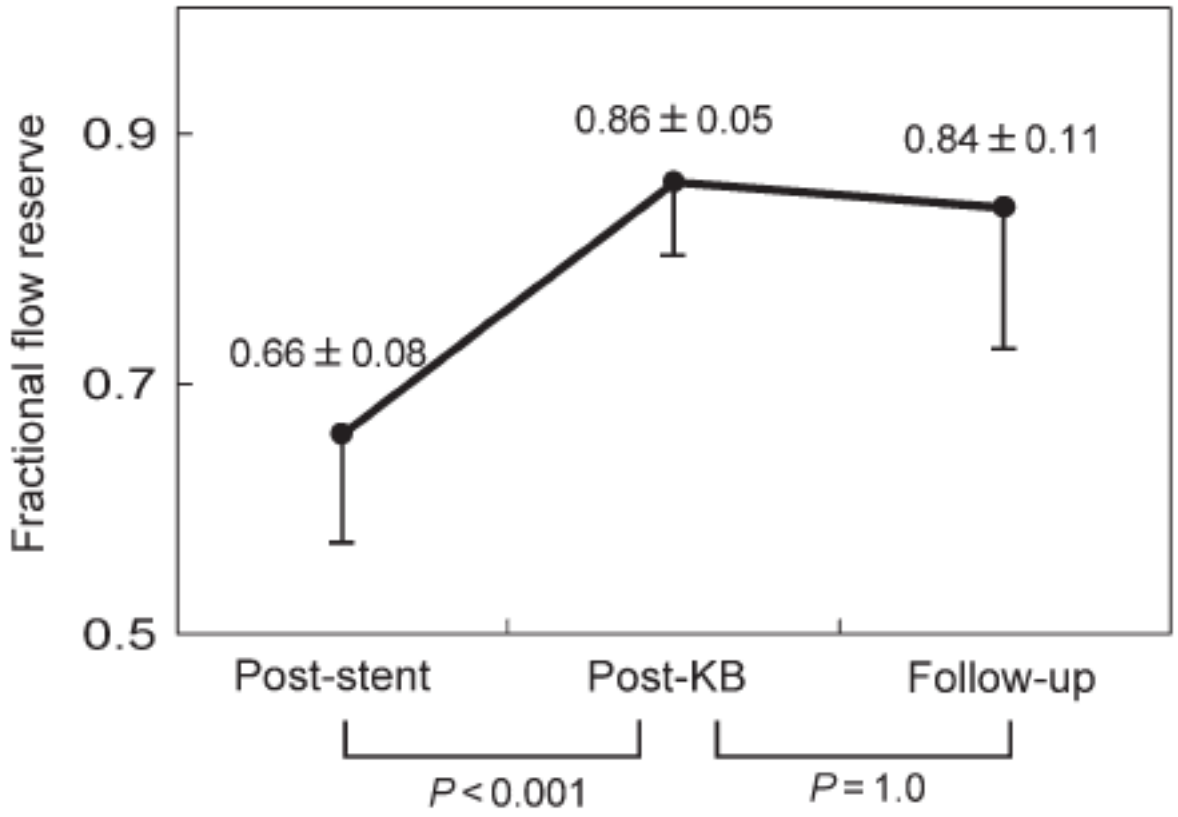
After stenting the MB, how to react to a plaque shift with abnormal FFR?



Koo et al., EHJ 2008

How to assess FFR in bifurcation

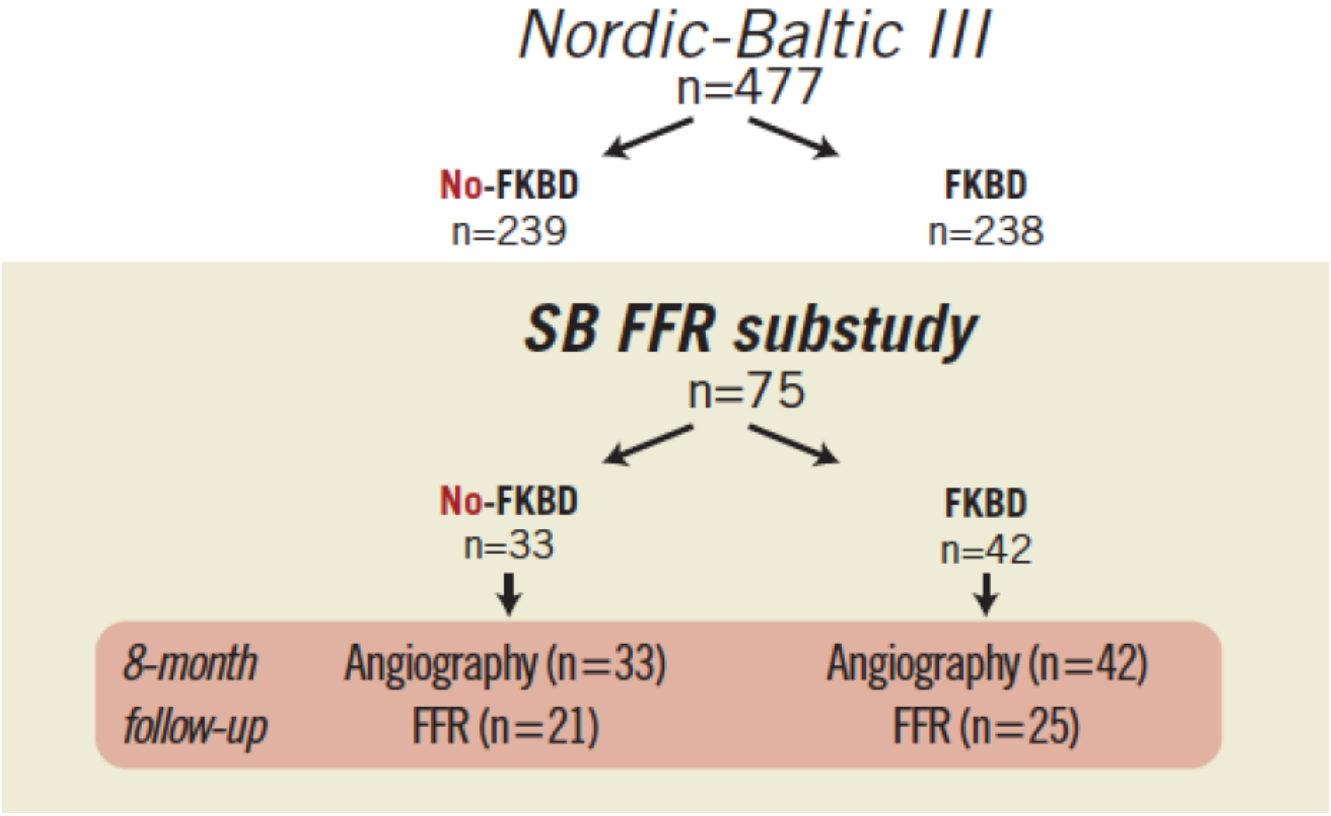
After stenting the MB, how to react to a plaque shift with abnormal FFR?



Koo et al., EHJ 2008

How to assess FFR in bifurcation

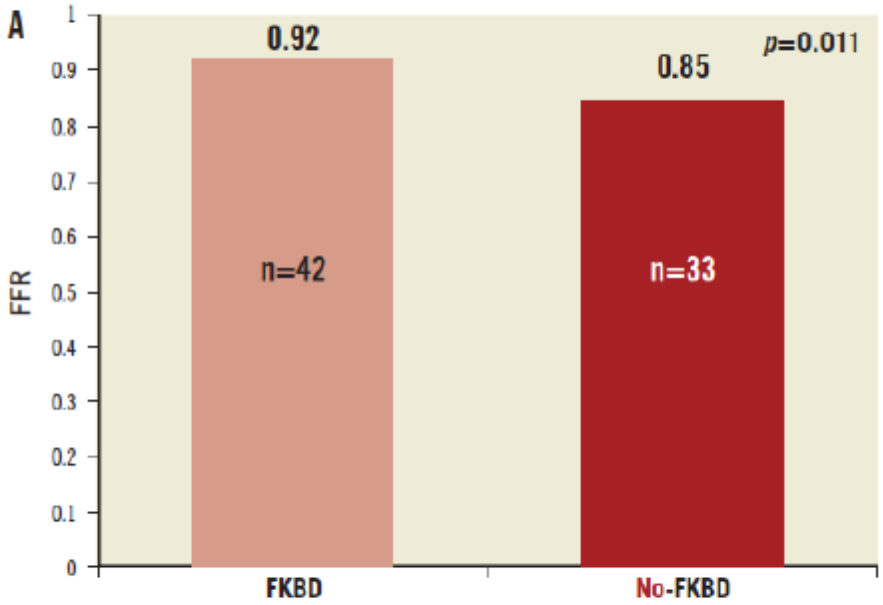
After stenting the MB, do we always need final kissing balloon?



Eurointervention 2012;7:1155-1161

How to assess FFR in bifurcation

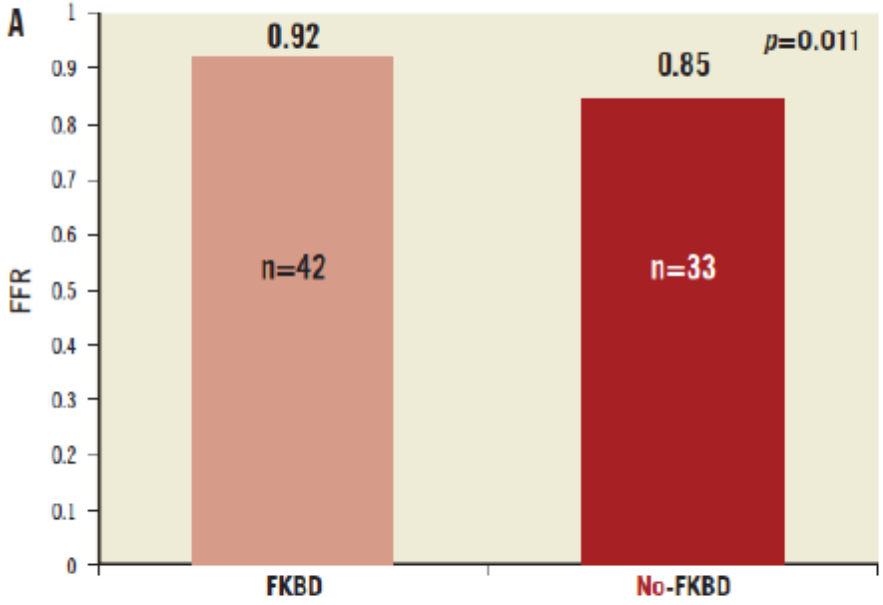
Baseline



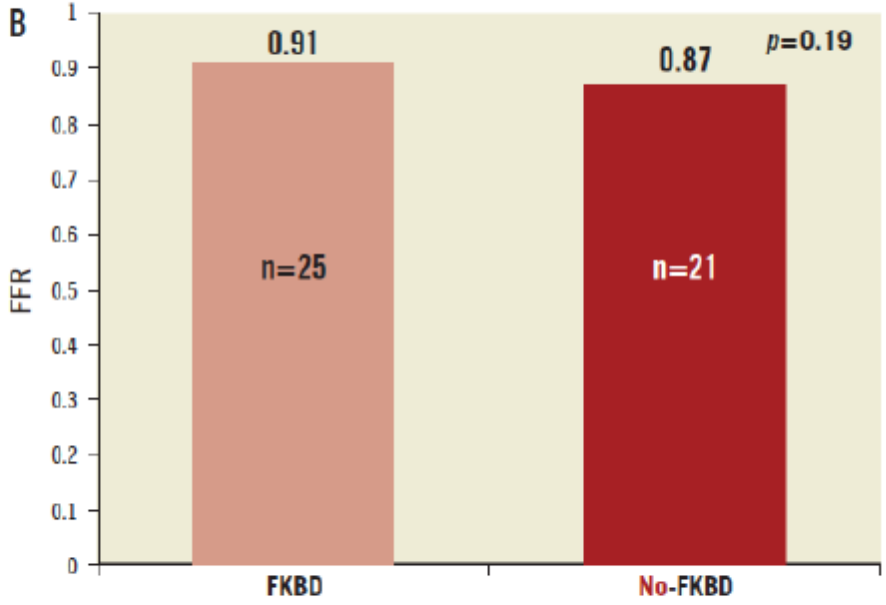
19% with FFR ≤ 0.75 all in No-final KB

How to assess FFR in bifurcation

Baseline



8-months

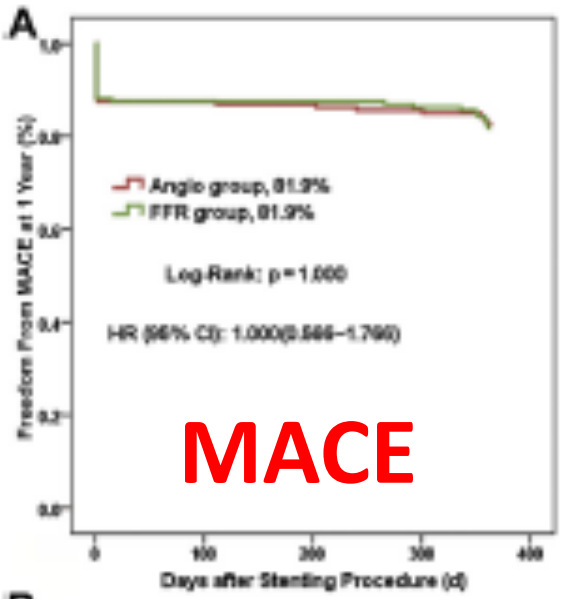


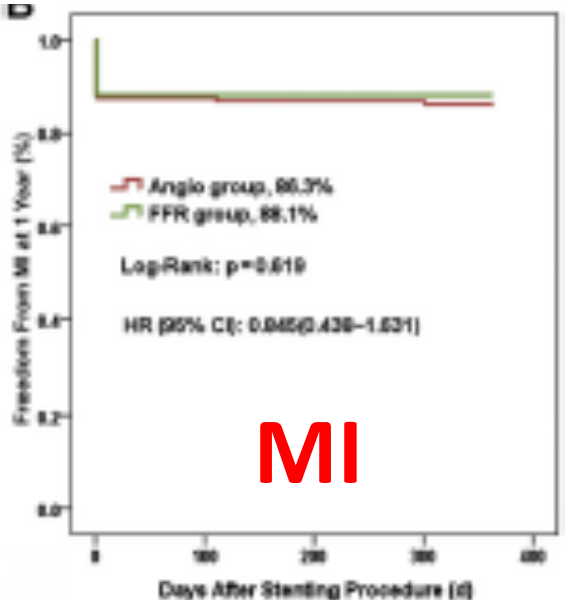
19% with FFR ≤ 0.75 all in No-final KB

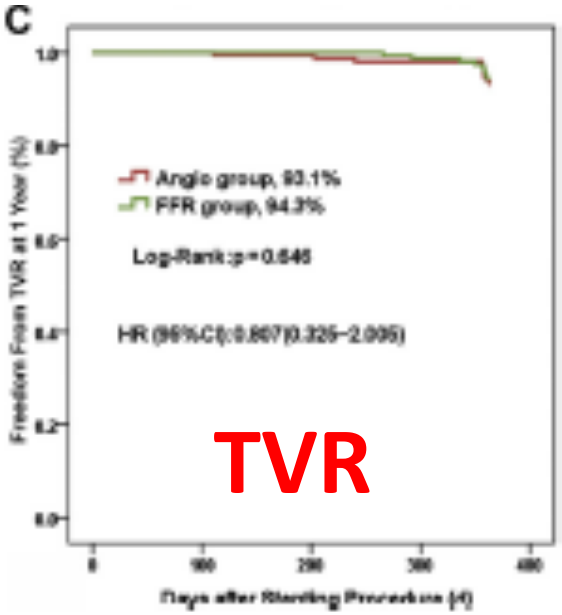
FFR-guided vs. Angio-guided SB PCI

DK-CRUSH 6 trial

- RCT 1:1 in 320 pts with Medina 1:1:1 or 0:1:1
- FFR-guided ➔ KB or provisional stenting with FFR ≤ 0.80 (52%)
- Angio-guided ➔ KB or provisional stenting with TIMI < 3, DS%>70%







Failure to cross with PW 9.4% ➔ 1.9% after predil with 2.0 mm Balloon

Chen S-L et al, JACC Cardiovasc Intv 2015

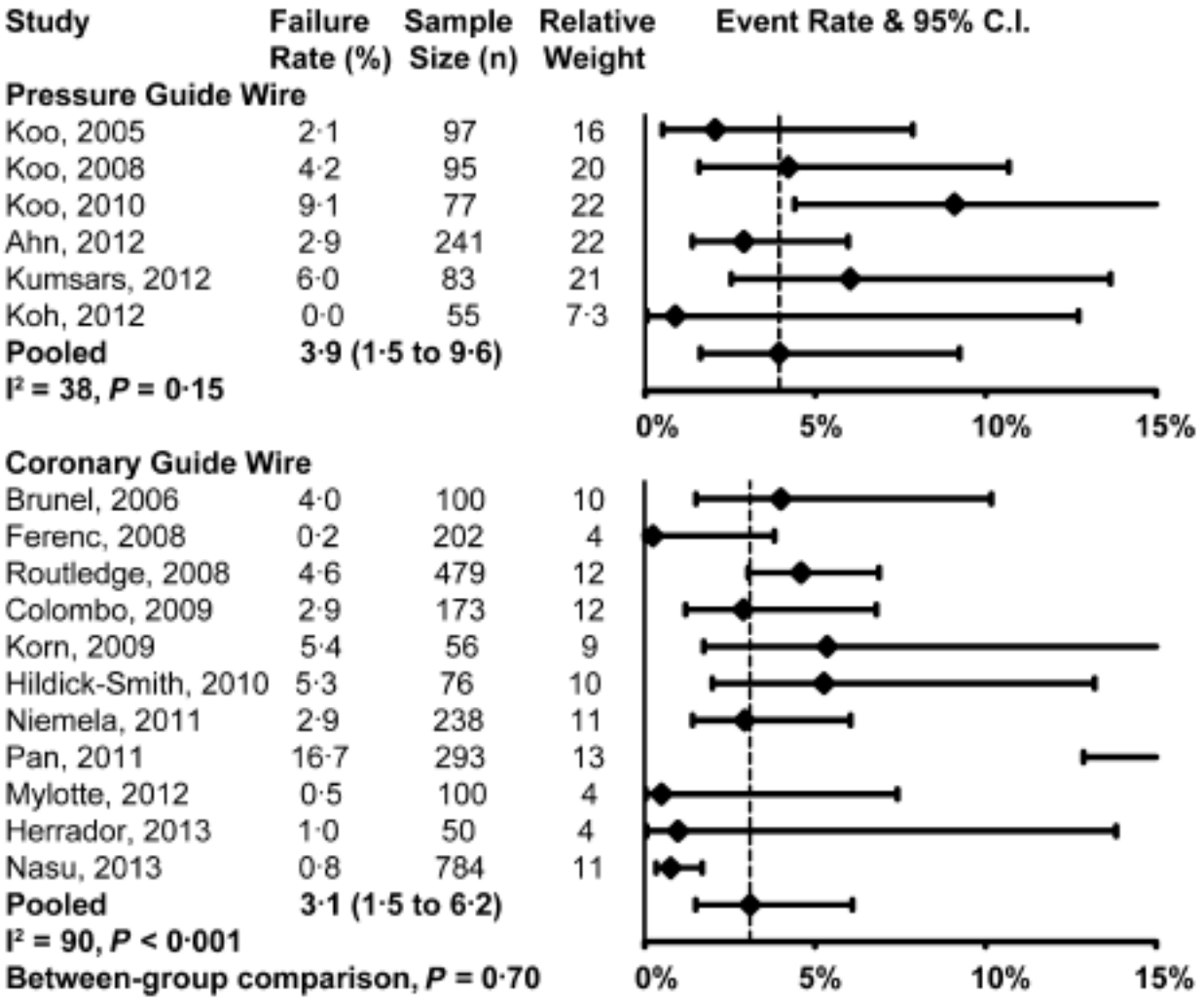
How to assess FFR in bifurcation

Do we need to measure FFR in all SB after provisional stenting?

- Dissection/failure to cross of the SB reported in 1-5% of the cases

Failure rate to crossing SB

Pressure vs. coronary guidewire



Ather S et al, Eur J Clin Invest 2016

How to assess FFR in bifurcation

Do we need to measure FFR in all SB after provisional stenting?

- Dissection/failure to cross of the SB reported in 1-5% of the cases
- Big SB supplying large territories
- Diameter stenosis of SB > 75%

Ather S et al, Eur J Clin Invest 2016

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Jailed PW technique to ease SB functional assessment

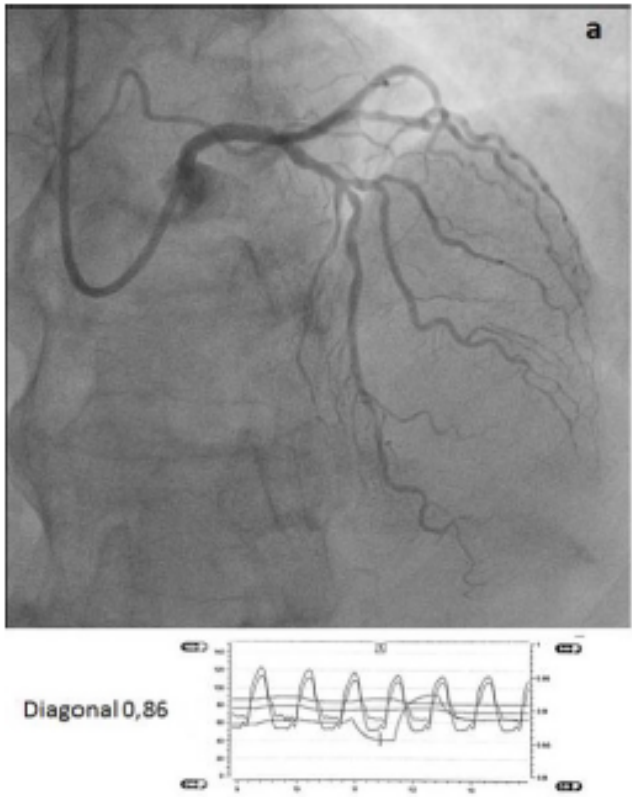
Table 1. Clinical and procedural characteristics.

	Age	Gender	Medina class	MV	SB	Stent in MV	MV stent inflation pressure	Lesion	% SB stenosis after MV stent	FFR in SB after MV stenting	FFR in SB after balloon angioplasty	Post-procedure FFR in proximal MV
1	50	M	0,1,0	DES	-	3.5×23	12	LAD-D1	<50%	0.89	–	0.94
2	47	M	1,1,0	DES	-	3.0×18	14	LAD-D1	<50%	0.86	–	0.94
3	59	F	1,1,1	DES	-	2.75×33	12	LAD-D1	<50%	0.95	–	0.93
4	75	F	1,0,1	DES	-	2.75×23	12	CX-OM	>70%	0.88	–	0.94
5	67	M	0,1,0	DES	BA	3.5×33	12	LAD-D1	>70%	0.65	0.88	0.95
6	78	M	0,1,0	DES	-	2.5×18	12	CX-OM	>70%	0.88	–	0.88
7	86	F	1,1,0	DES	Stent	2.75×33	10	LAD-D1	>70%	0.58	0.65	0.93
8	71	M	1,1,1	DES	BA	2.5×18	12	LAD-D1	>70%	0.73	0.82	0.95
9	67	M	0,1,0	DES	BA	3.0×18	12	LAD-D1	>70%	0.77	0.85	0.93
10	66	M	1,1,0	DES	-	3.5×18	14	LM-CX	<50%	0.99	–	0.94
11	70	M	0,1,0	DES	-	2.5×18	12	LAD-D1	<50%	0.87	–	1.0

BA: balloon angioplasty; DES: drug-eluting stent; MV: main vessel; SB: side branch

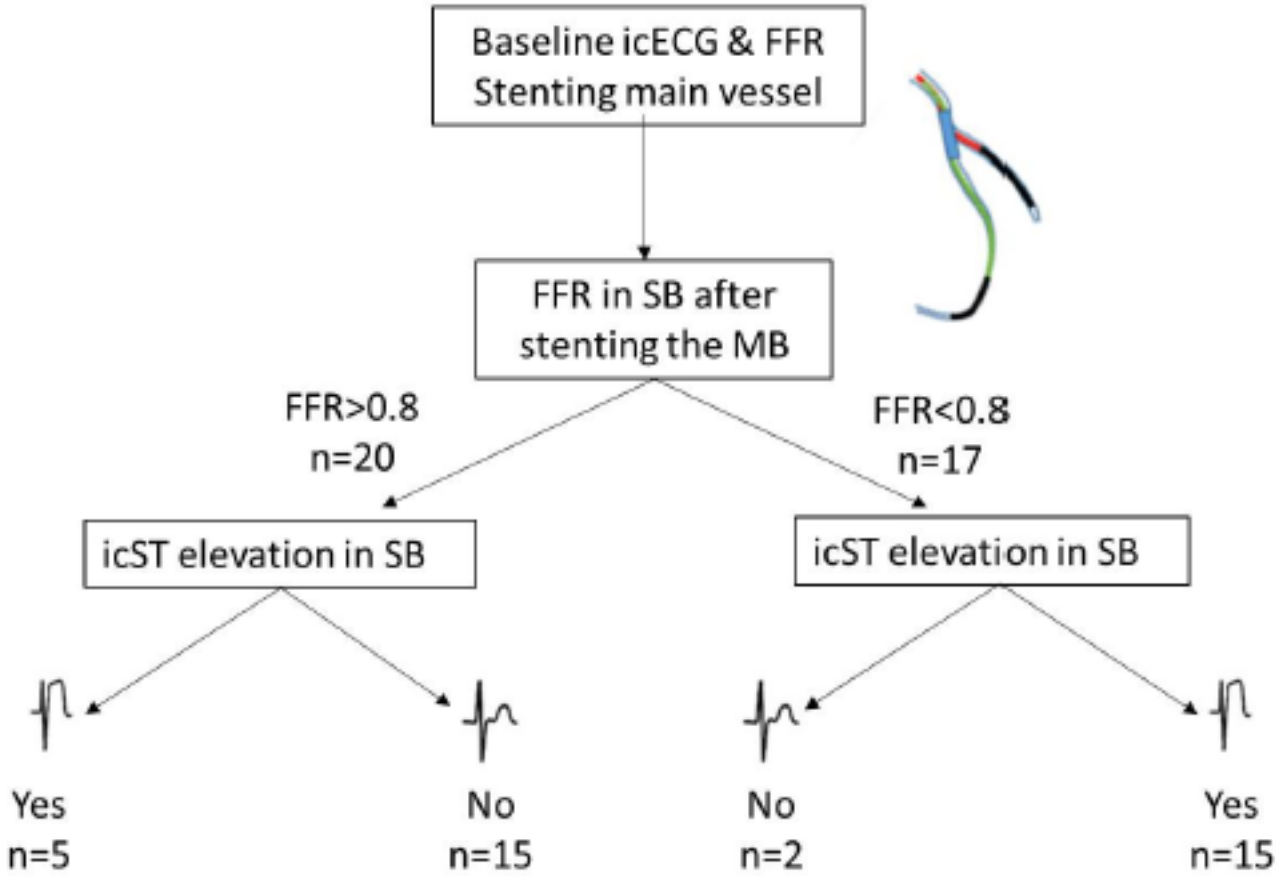
Bilge M et al, Eurointervention 2014

icECG-guided PCI in bifurcation



Vassilev D et al, Eurointervention 2017

icECG-guided PCI in bifurcation



PPV: 75%, NPV: 88%

Vassilev D et al, Eurointervention 2017

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Conclusions

- In the diagnotic setting, FFR is a reliable tool to assess the functional significance of both the MB and SB
- In the PCI setting:
  - FFR is of limited use to predict the functional changes occurring after MB stenting
  - FFR can be used to assess the functional impact of plaque shift after MB stenting in big jailed SB supplying large territories (DS > 75%)
- Alternative techique are being investigated to functional guidance of PCI in bifurcation