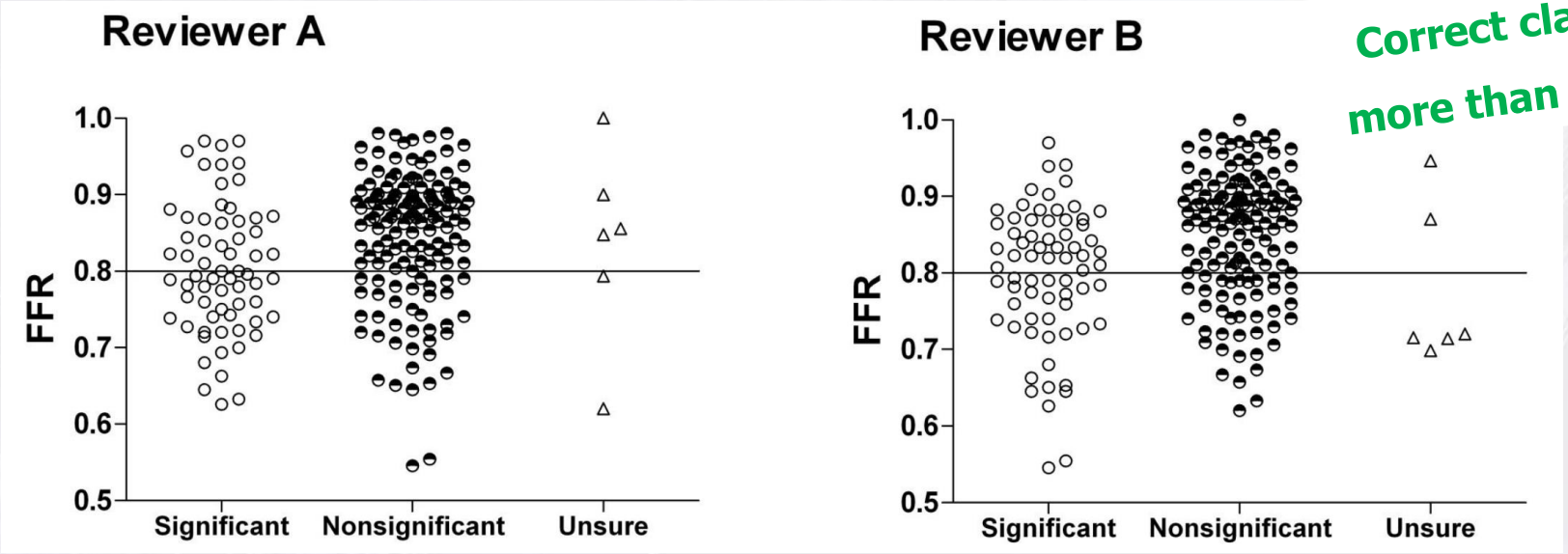
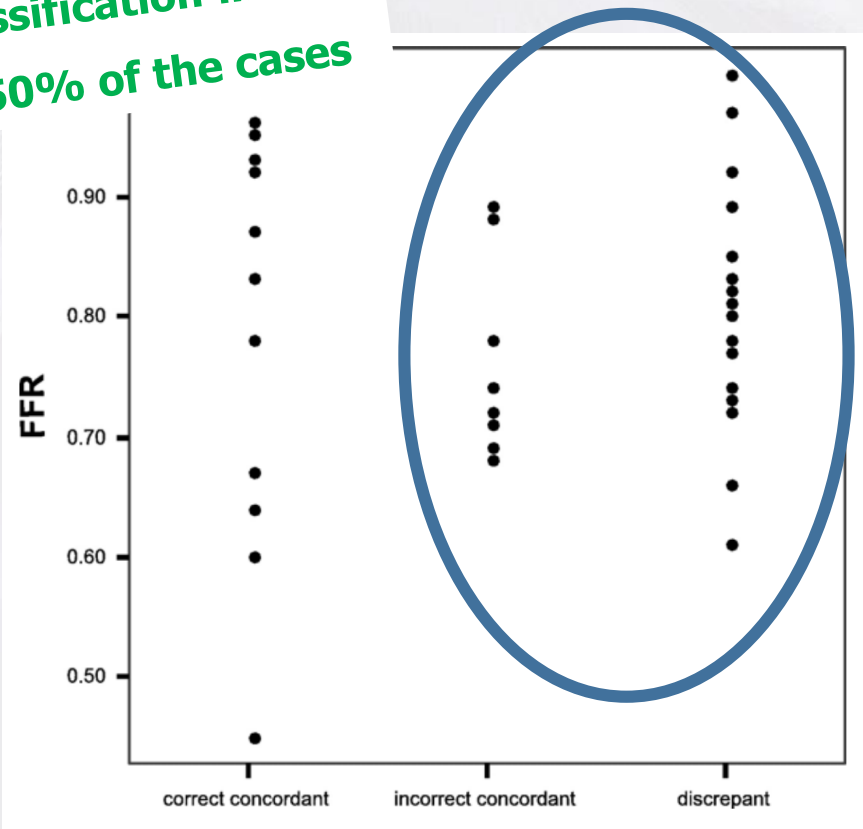
Functional Assessment in Left Main PCI

(with tips and tricks)

Rationale for Intracoronary Physiology in Left Main Disease



Correct classification in no more than 50% of the cases



Misclassification of LM disease severity by angiography (visual estimation) alone is high (about 50%)

Misclassification in LM is higher as compared to other vessels

Hamilos et al., Circulation 2009 Lindstaedt et al., IJC 2017

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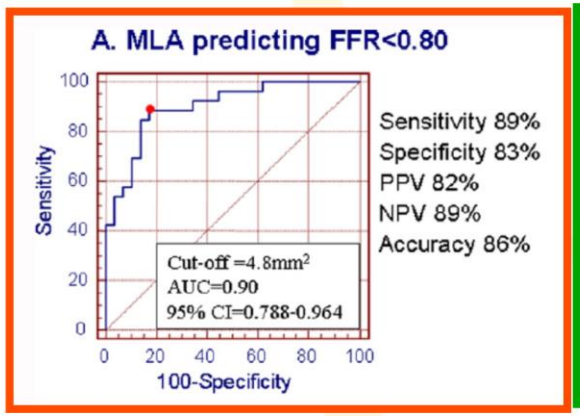
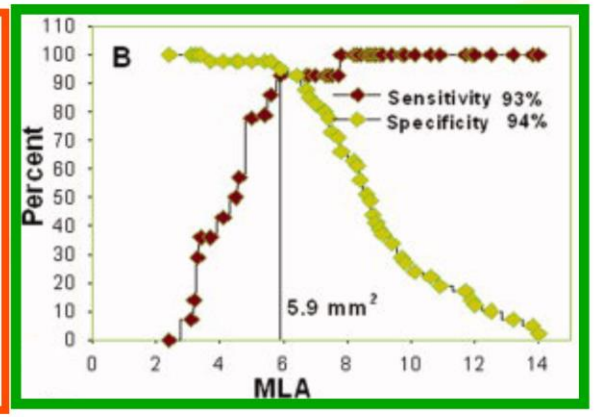
Sensitivity → 100%

4.8 mm² — 6 mm²



Kang et al.



Jasti et al.

	Kang et al.	Jasti et al.	LITRO study	Fassa et al.
MLA, mm2	4.9	7.6	7.2	9.4
PB, %	69	59	59	53
EEM area, mm2	17.8	18.7	18.8	20.5
Method	**FFR** **IV** adenosine	**FFR** **IC** adenosine 42 - 56 μg	Clinical validation	From "Normal" population- Clinical validation
Cut-off MLA	**4.8**	**5.9**	**6**	**7.5**

IVUS cut-offs to discriminate LM lesions requiring revascularization are variable and unclear.

6 mm2 cut-off seems to be reasonable, but larger validation is needed.

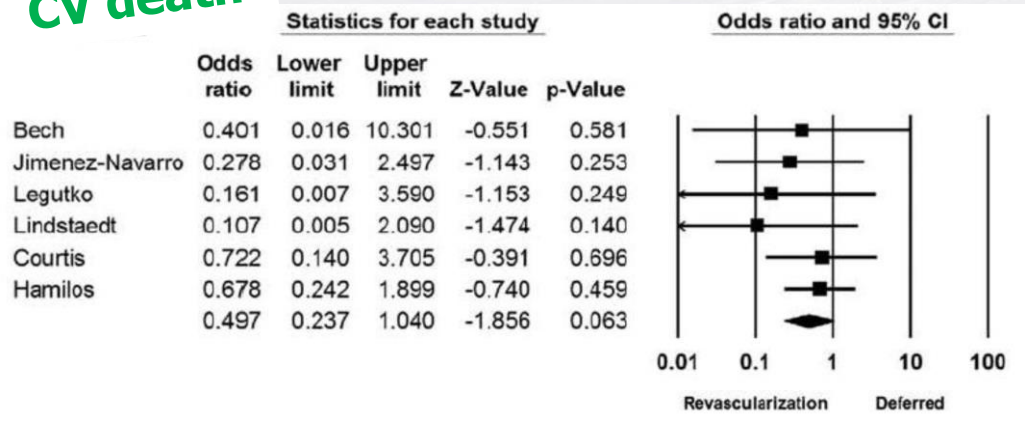
Data supporting Physiology in Left Main Disease

Trial	LM exclusion criteria	Note
Pijls et al. NEJM 1996		2 patients
DEFER		0 patients
FAME		
FAME 2		
FAME 3		
SYNTAX II		
DEFINE-FLAIR		
iFR-SWEDEHEART		30 patients

Major RCTs supporting the role of intracoronary physiology excluded or are excluding patients with LM disease

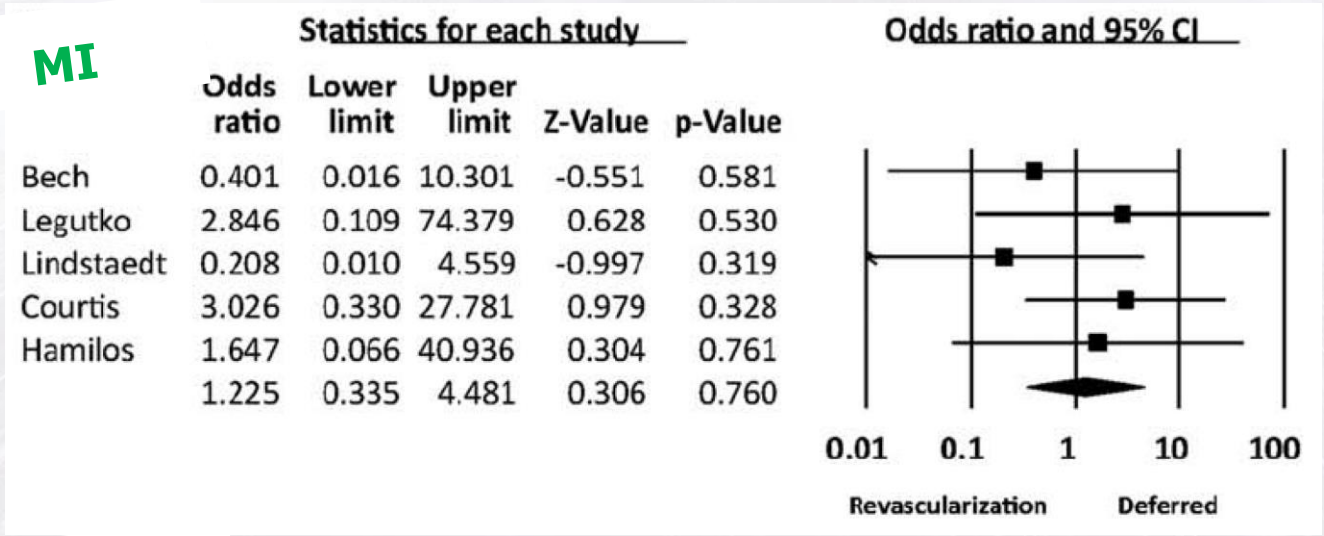
Data supporting Physiology in Left Main Disease

CV death



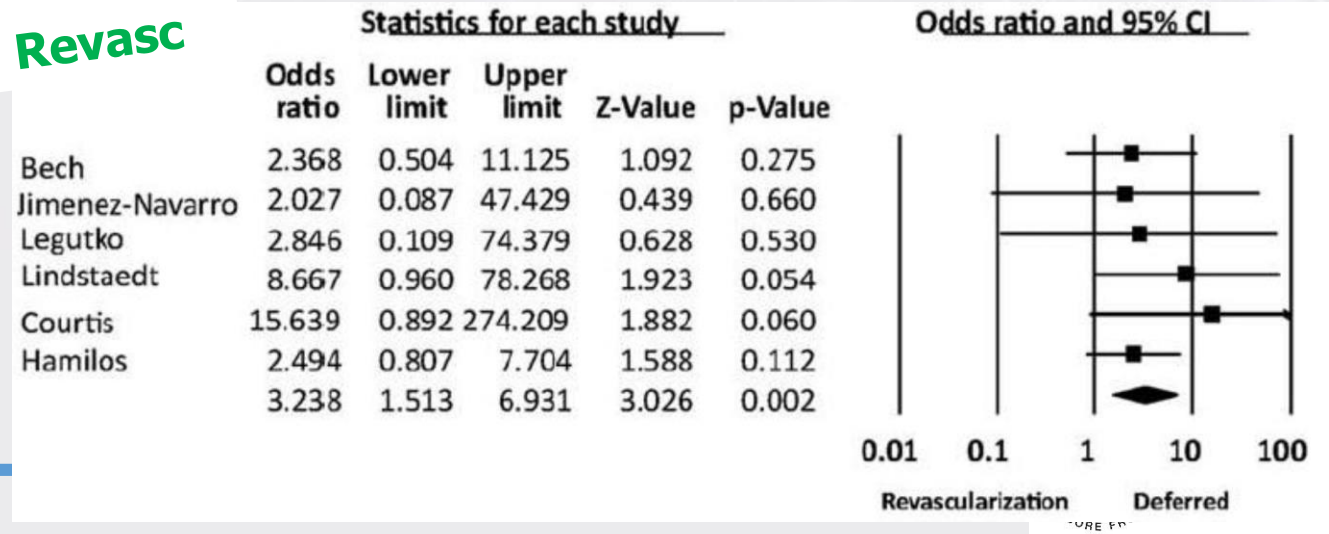
	Odds ratio	Lower limit	Upper limit	Z-Value	p-Value
Bech	0.401	0.016	10.301	-0.551	0.581
Jimenez-Navarro	0.278	0.031	2.497	-1.143	0.253
Legutko	0.161	0.007	3.590	-1.153	0.249
Lindstaedt	0.107	0.005	2.090	-1.474	0.140
Courtis	0.722	0.140	3.705	-0.391	0.696
Hamilos	0.678	0.242	1.899	-0.740	0.459
	0.497	0.237	1.040	-1.856	0.063

MI



	Odds ratio	Lower limit	Upper limit	Z-Value	p-Value
Bech	0.401	0.016	10.301	-0.551	0.581
Legutko	2.846	0.109	74.379	0.628	0.530
Lindstaedt	0.208	0.010	4.559	-0.997	0.319
Courtis	3.026	0.330	27.781	0.979	0.328
Hamilos	1.647	0.066	40.936	0.304	0.761
	1.225	0.335	4.481	0.306	0.760

Revasc



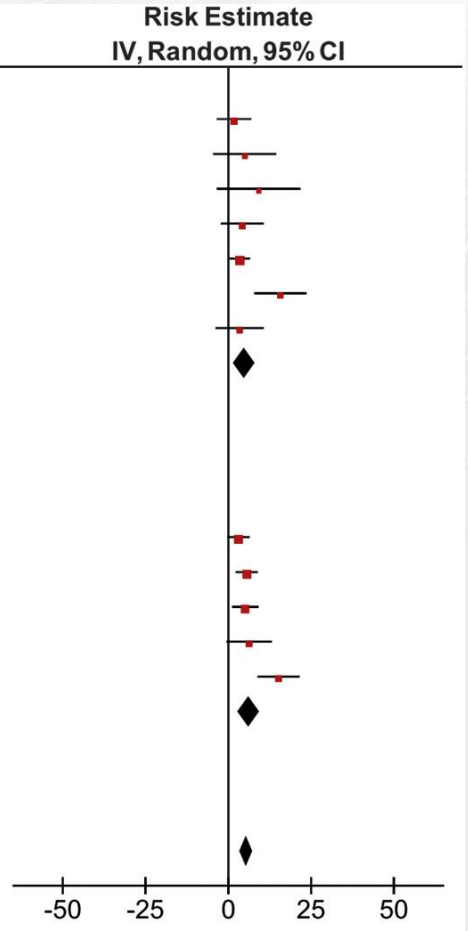
	Odds ratio	Lower limit	Upper limit	Z-Value	p-Value
Bech	2.368	0.504	11.125	1.092	0.275
Jimenez-Navarro	2.027	0.087	47.429	0.439	0.660
Legutko	2.846	0.109	74.379	0.628	0.530
Lindstaedt	8.667	0.960	78.268	1.923	0.054
Courtis	15.639	0.892	274.209	1.882	0.060
Hamilos	2.494	0.807	7.704	1.588	0.112
	3.238	1.513	6.931	3.026	0.002

As compared to LM receiving PCI, deferral of PCI in LM lesion with negative FFR seems to be safe in terms of CV death and MI, although an higher need of repeated procedure has been reported.

Mallidi et al., CCI 2015

Data supporting Physiology in Left Main Disease

Study or Subgroup	Risk Estimate	SE	Weight	Risk Estimate IV, Random, 95% CI
1.1.1 FFR				
Lindstaedt, 2006	1.72	2.66	9.1%	1.72 [-3.49, 6.93]
Legutko, 2005	5	4.87	4.1%	5.00 [-4.55, 14.55]
Jimenez-Navarro, 2004	9.16	6.45	2.5%	9.16 [-3.48, 21.80]
Jasti, 2004	4.27	3.32	7.0%	4.27 [-2.24, 10.78]
Hamilos, 2009	3.48	1.56	14.0%	3.48 [0.42, 6.54]
Courtis, 2009	15.68	4.02	5.4%	15.68 [7.80, 23.56]
Bech, 2001	3.45	3.72	6.1%	3.45 [-3.84, 10.74]
Subtotal (95% CI)			**48.2%**	**5.07 [1.93, 8.21]**
Heterogeneity: Tau² = 6.48; Chi² = 9.86, df = 6 (P = 0.13); I² = 39%				
Test for overall effect: Z = 3.17 (P = 0.002)				
1.1.2 IVUS				
Okabe, 2008	3.04	1.72	13.2%	3.04 [-0.33, 6.41]
LITRO, 2011	5.58	1.72	13.2%	5.58 [2.21, 8.95]
Fassa, 2005	5.11	2.06	11.6%	5.11 [1.07, 9.15]
De La Torre, 2007	6.25	3.49	6.6%	6.25 [-0.59, 13.09]
Abizaid, 1999	15.13	3.24	7.3%	15.13 [8.78, 21.48]
Subtotal (95% CI)			**51.8%**	**6.36 [3.06, 9.66]**
Heterogeneity: Tau² = 8.55; Chi² = 10.96, df = 4 (P = 0.03); I² = 63%				
Test for overall effect: Z = 3.78 (P = 0.0002)				
Total (95% CI)			**100.0%**	**5.68 [3.51, 7.84]**
Heterogeneity: Tau² = 6.28; Chi² = 21.48, df = 11 (P = 0.03); I² = 49%				
Test for overall effect: Z = 5.15 (P < 0.00001)				
Test for subgroup differences: Chi² = 0.31, df = 1 (P = 0.58), I² = 0%				



The pooled event rate in patients where PCI is deferred based on FFR or IVUS did not differ

Cerrato et al., IJC 2018

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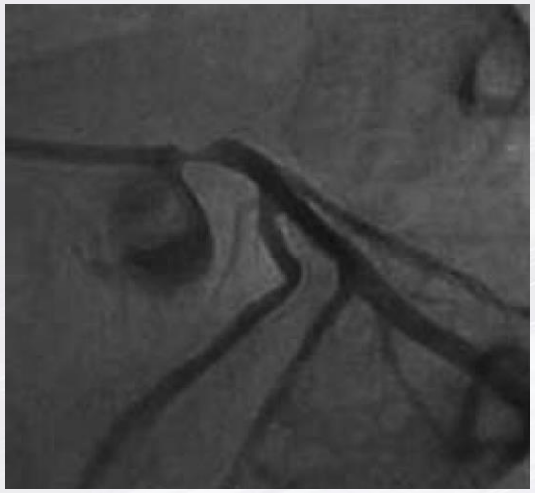
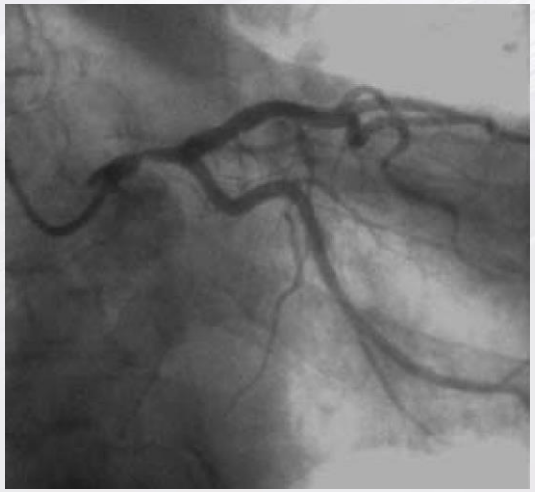
Tips and Tricks for Physiology Assessment in Left Main



Isolated ostial LM stenosis

- **Feasible, but challenging**
- **Equalization is crucial and it should be carefully performed**
- **Do not forget nitro**
- **Adenosine must be infused by intravenous route**



Isolated mid-shaft LM stenosis

- **Feasible**
- **Do not forget nitro before equalization and adenosine infusion**
- **Prefer intravenous adenosine infusion**
- **Highly suggested (not mandatory), assessment of both LAD and LCx**

Tips and Tricks for Physiology Assessment in Left Main

Isolated pre-divisional LM stenosis

- **Feasible**
- **Do not forget nitro before equalization and adenosine infusion**
- **Prefer intravenous adenosine infusion**
- **Physiology assessment should be performed in both LAD and LCx**
- **Physiology information can be helpful to plan PCI strategy**

- **… and if you choose provisional technique … you can use FFR guidewire to assess ostial LCx after LM-LAD stenting or you risk incarcerating the FFR guide in the LCx**

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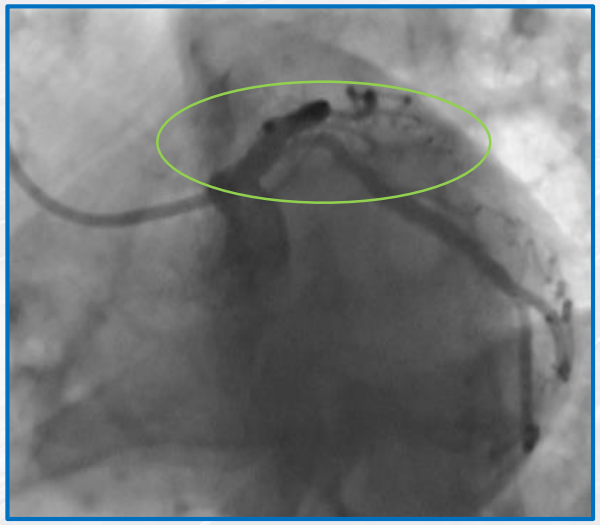
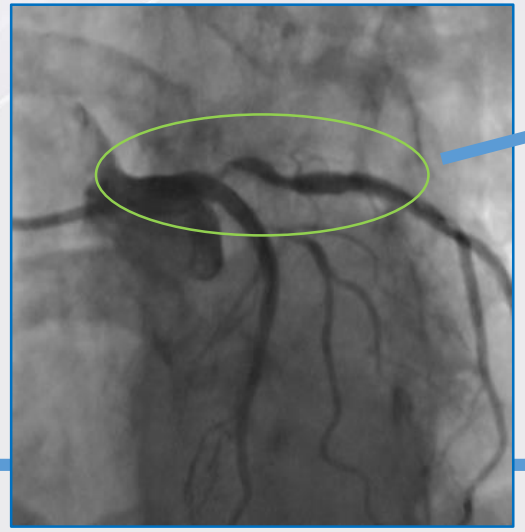
FIRE TRIAL

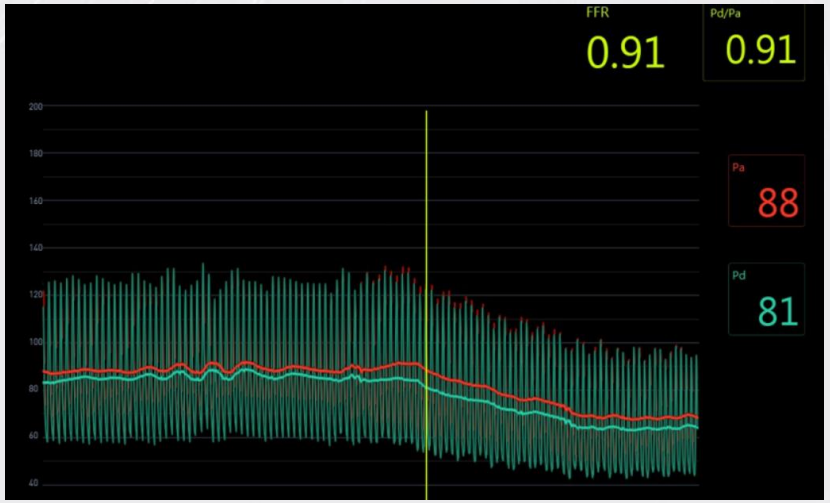
BEFORE

AFTER LM-LAD STENTING





- **Re-wiring of LCx with Comet guidewire**
- **FFR moves from 0.95 to 0.91**
- **I'm satisfied and I do not perform bifurcation stenting of LM**



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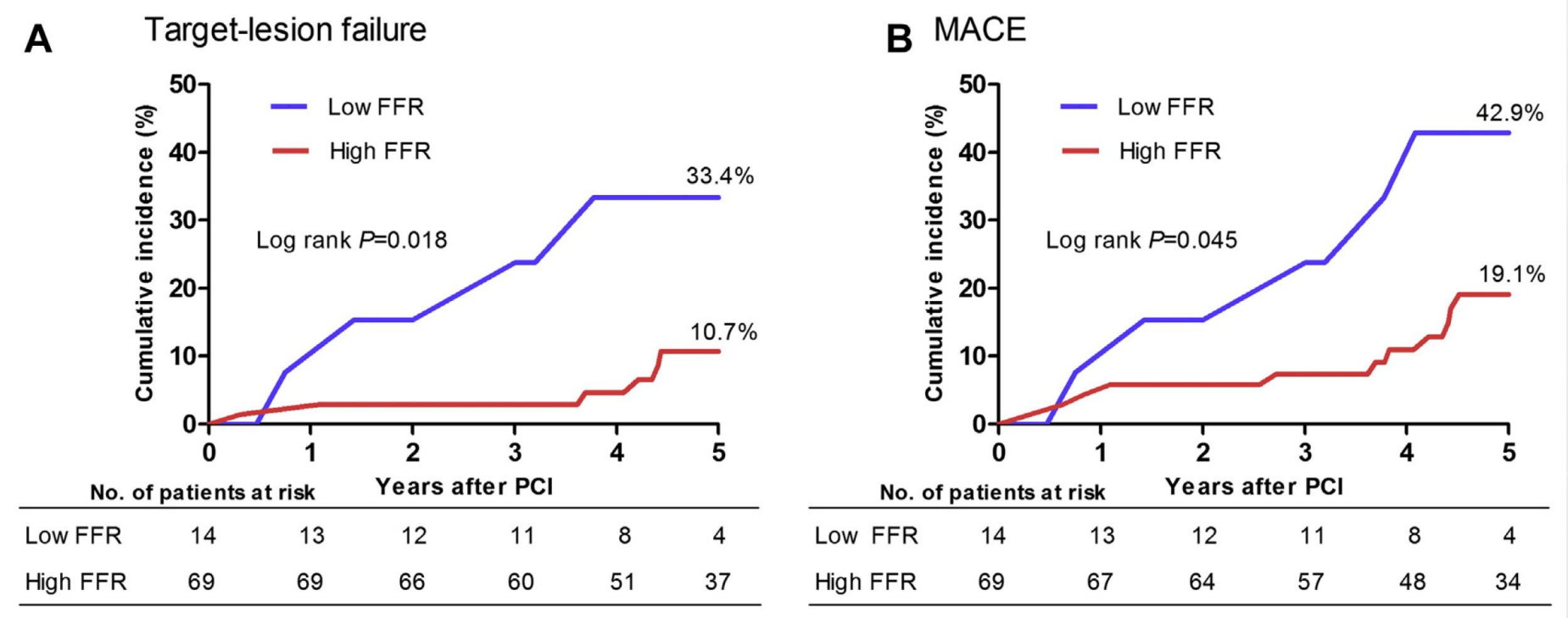
Tips and Tricks for Physiology Assessment in Left Main



83 patients with jailed FFR guidewire after stenting of the LM

Low FFR ≤0.80

FFR measurement in jailed LCx can be helpful in selecting adequate treatment strategy and may reduce unnecessary complex procedure

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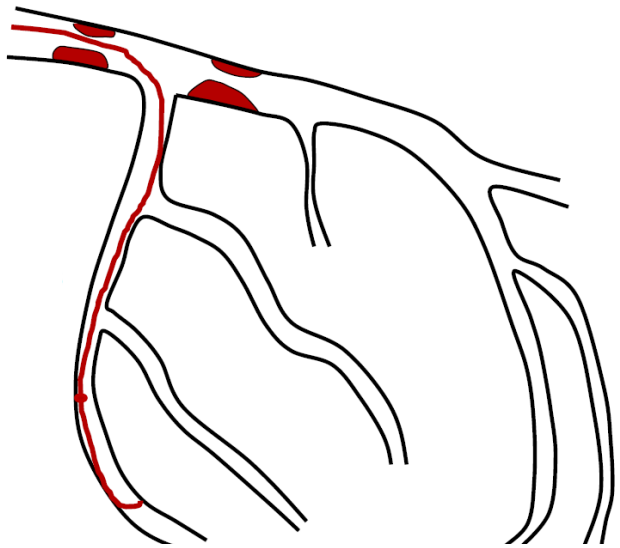
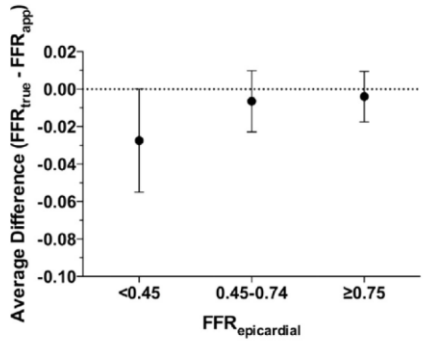
Tips and Tricks for Physiology Assessment in Left Main



91 paired measurements obtained in 24 patients



When FFRapp >0.85, FFRtrue >0.80 100% of the time.

LM stenosis + one downstream branch with disease

- **Feasible**
- **Remember potential interference between vessels**
- **Assess FFR in both downstream branches**
- **If FFR value in the diseased downstream branch is <0.45 … … … remind to use a higher cut-off (0.85) for the estimation of the lesion in the LM with the guidewire**
- **Otherwise, standard cut-off (0.80) can be considered reliable**

Johnson et al., JACC CVI 2015

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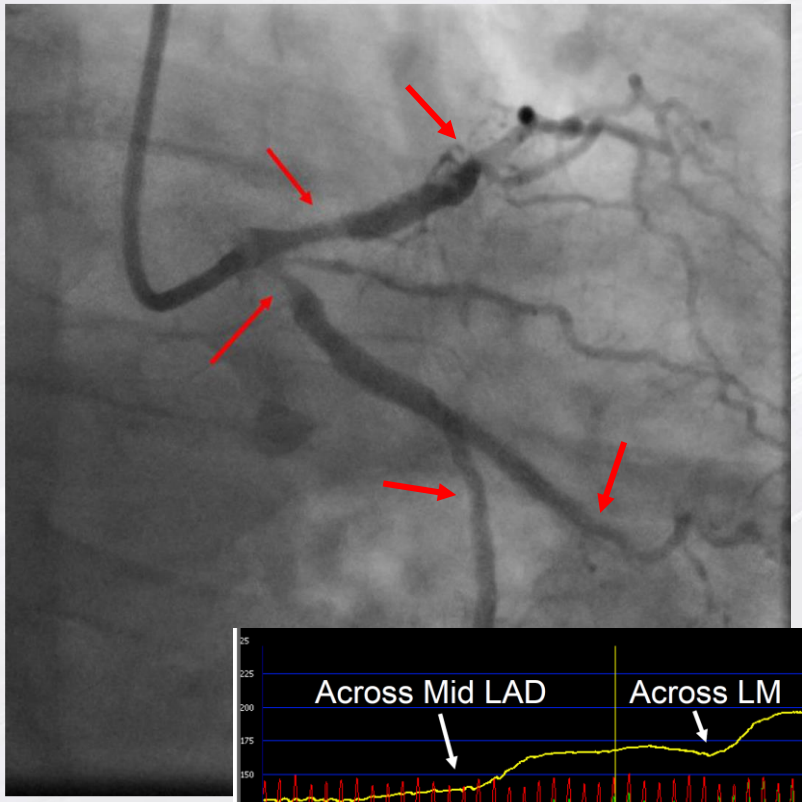

LM stenosis + two downstream branches with disease

- **Feasible, but really challenging**
- **Significant likelihood of lesion interplay**
- **Mandatory FFR pullback**
- **Mandatory intravenous adenosine**
- **Start to treat the lesion with the largest step up during pull-back and after stent implantation repeat FFR pullback**

Conclusions

- **LM assessment with Intracoronary Physiology is feasible**
- **No RCTs have been performed in this specific scenario**
- **Observational data support the safety in LM stenosis where PCI is deferred based on FFR assessment**
- **FFR measurement should be carefully performed, with special attention in patients with ostial LM lesion or disease in both downstream epicardial branches**

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