EUROPEAN HEART HOUSE

Anti-Thrombotic Therapy – Update 2017

Thursday 23 February – Saturday 25 February, 2017

Thrombosis
ESC Working Group

EUROPEAN
SOCIETY OF
CARDIOLOGY®

FFR? FFR-CT? Ischaemia testing?

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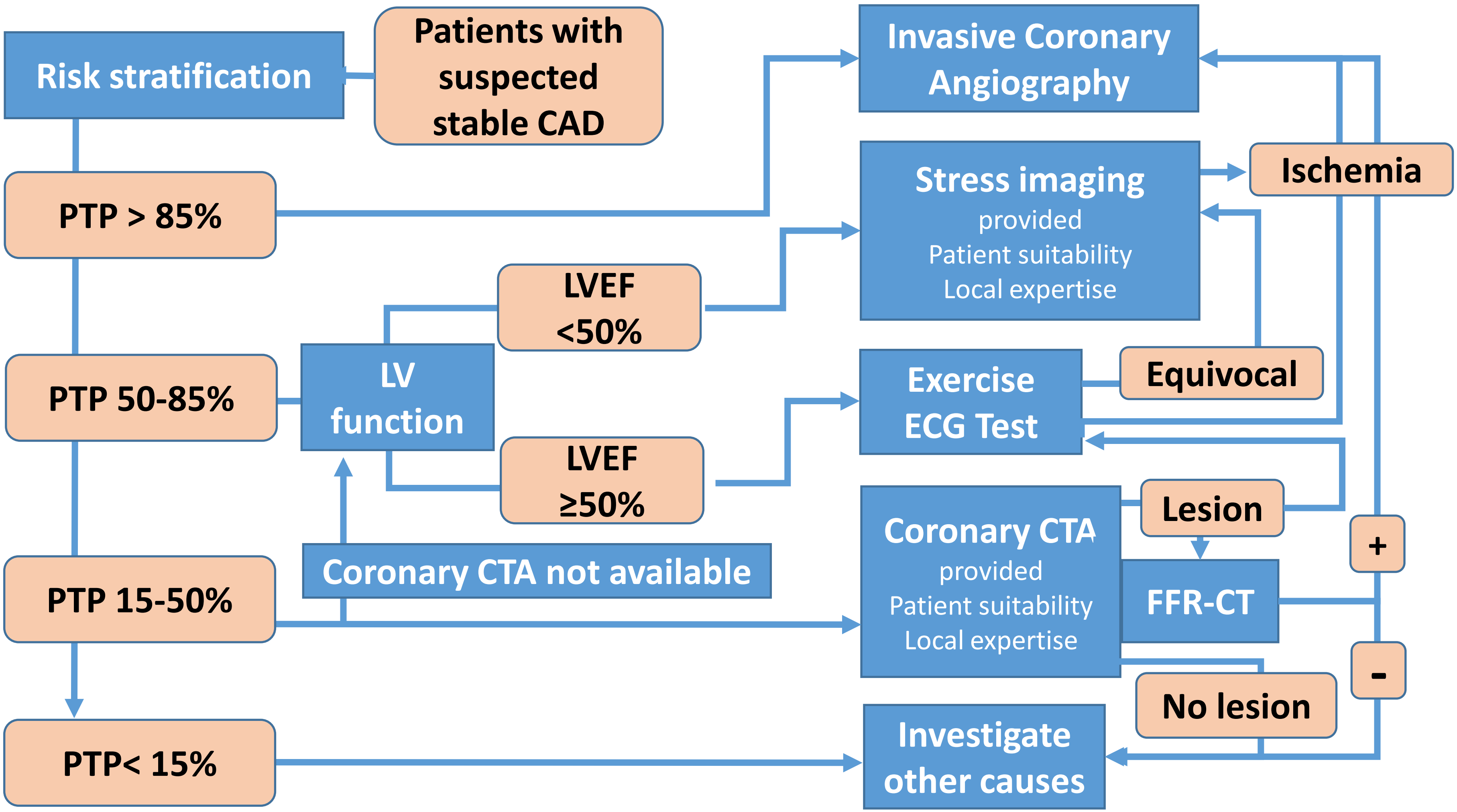
Diagnostic management of patients with suspected stable CAD

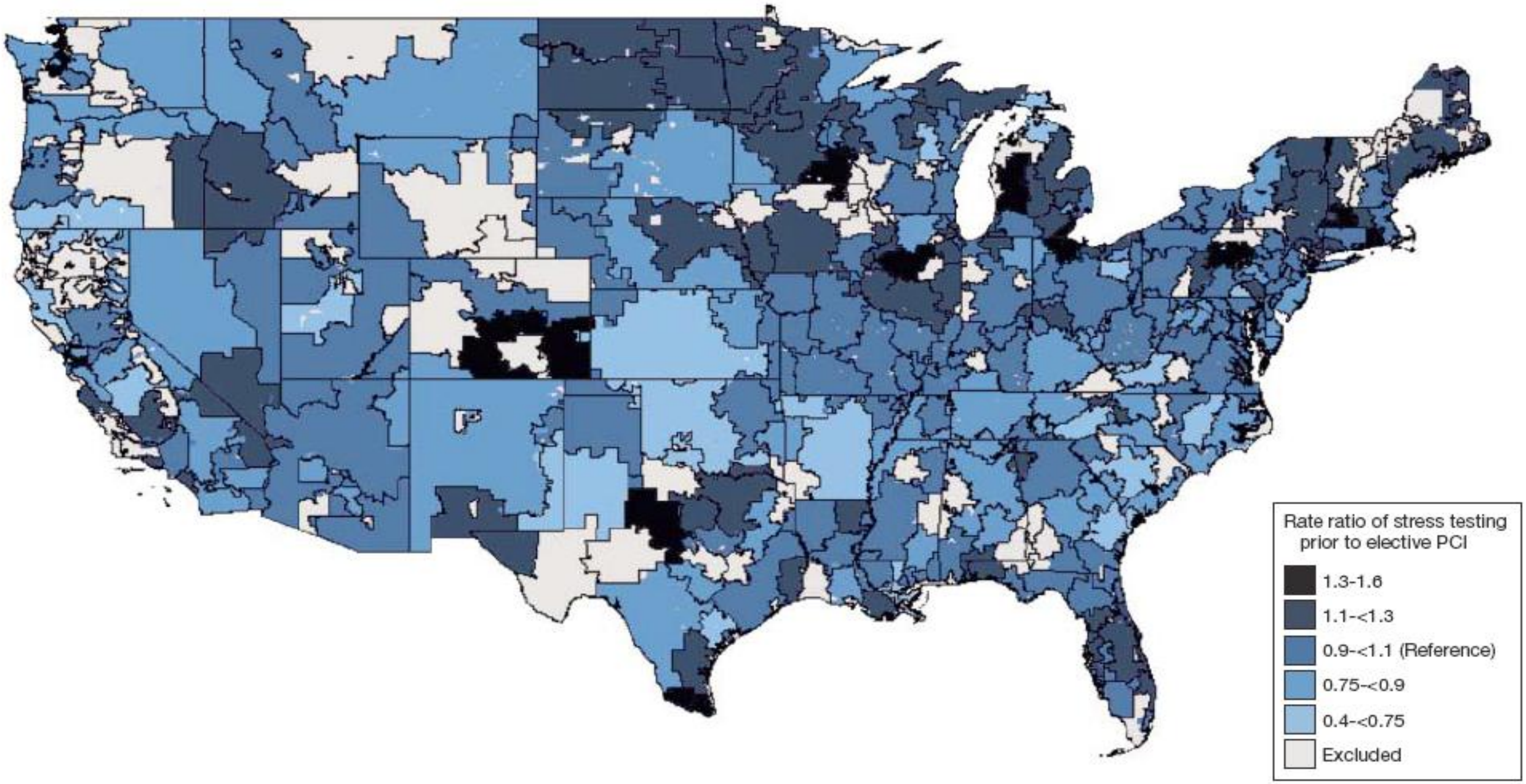


Zimarino et al. J Cardiovasc Med 2017 (in press)

modified from ESC guidelines on the management of stable CAD. Eur Heart J 2013

Rate of stress testing before PCI

44% of Medicare benificiaries underwent stress testing in the 90 days before elective PCI

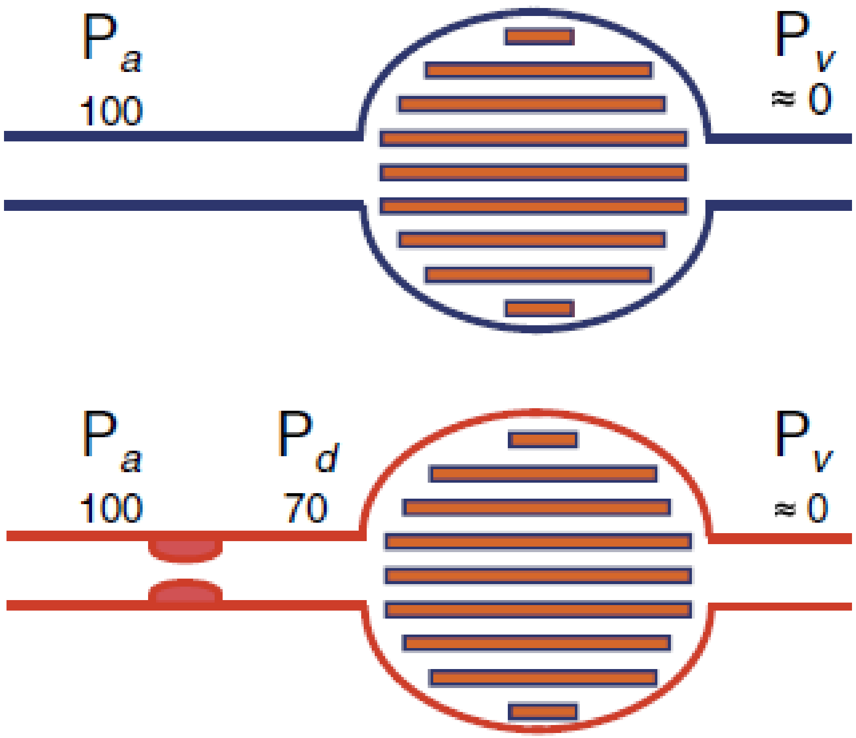


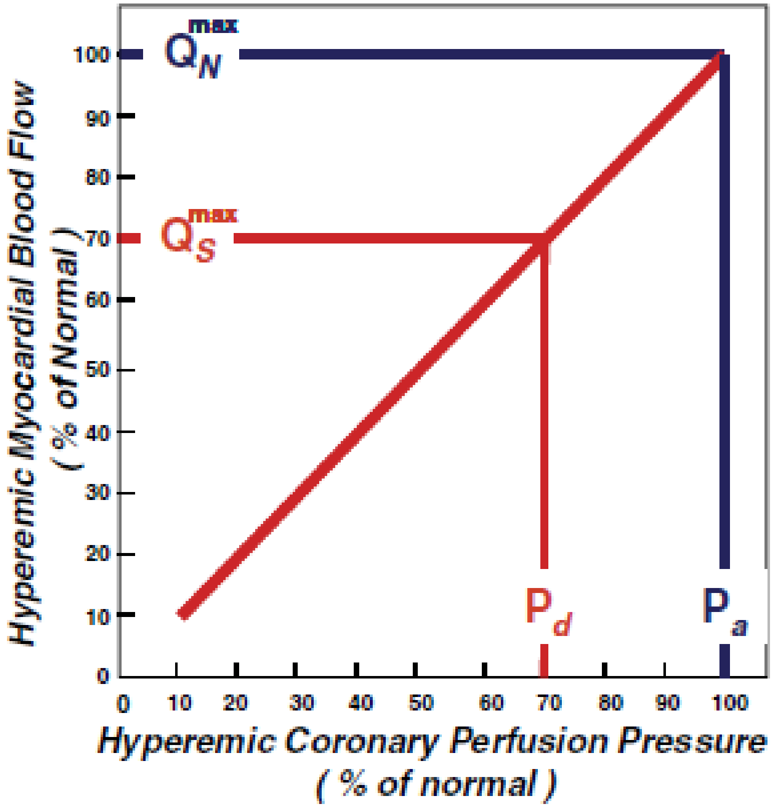
Lin GA, JAMA. 2008; 300: 1765-1773

Recommendations for the clinical value of intracoronary FFR

Recommendations	Class[a]	Level[b]	Ref.[c]
FFR to identify haemodynamically relevant coronary lesion(s) in stable patients when evidence of ischaemia is not available.	I	A	50,51,713
FFR-guided PCI in patients with multivessel disease.	IIa	B	54

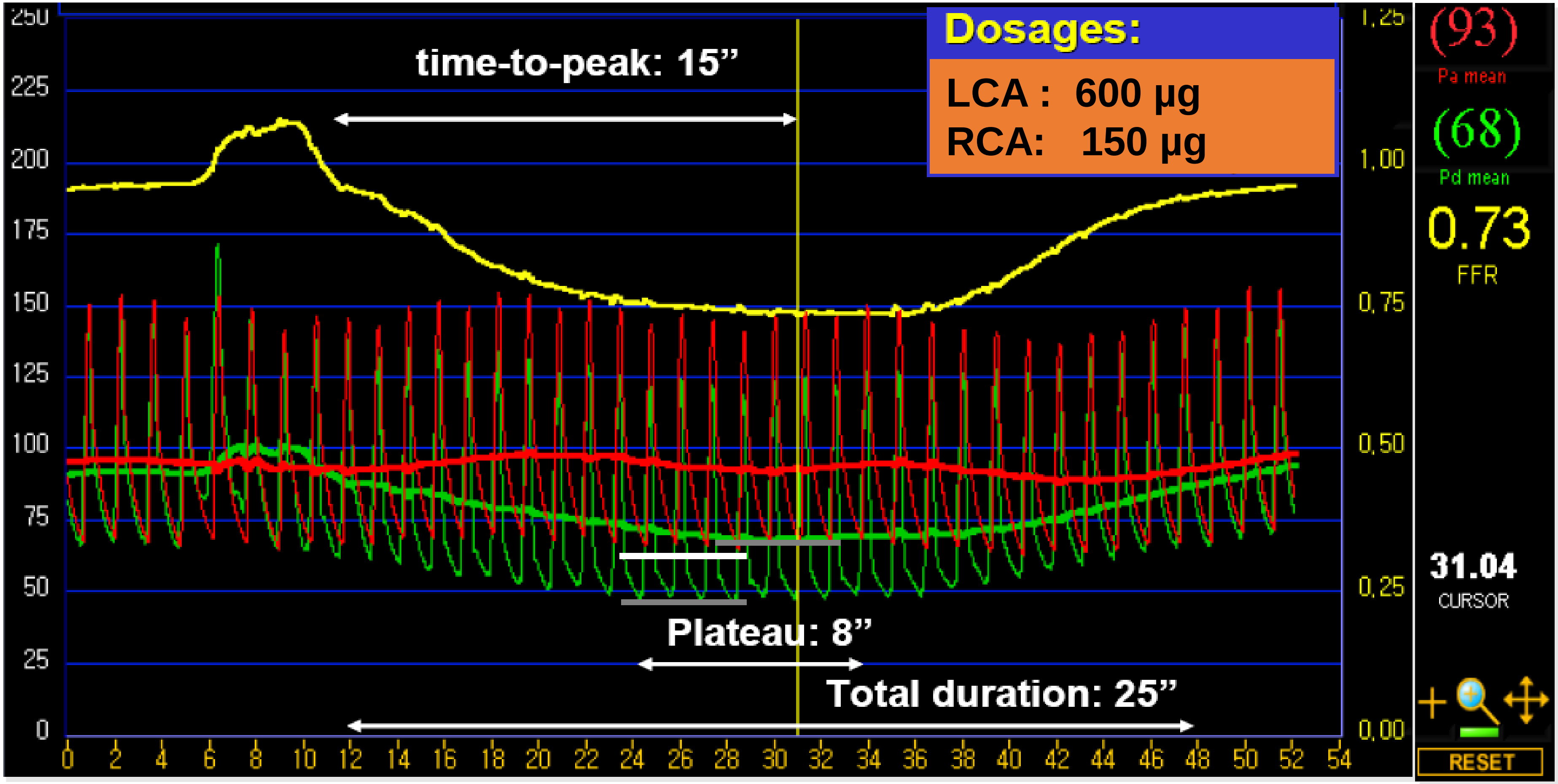
Fractional Flow Reserve (FFR) for the Functional Assessment of Coronary Stenosis



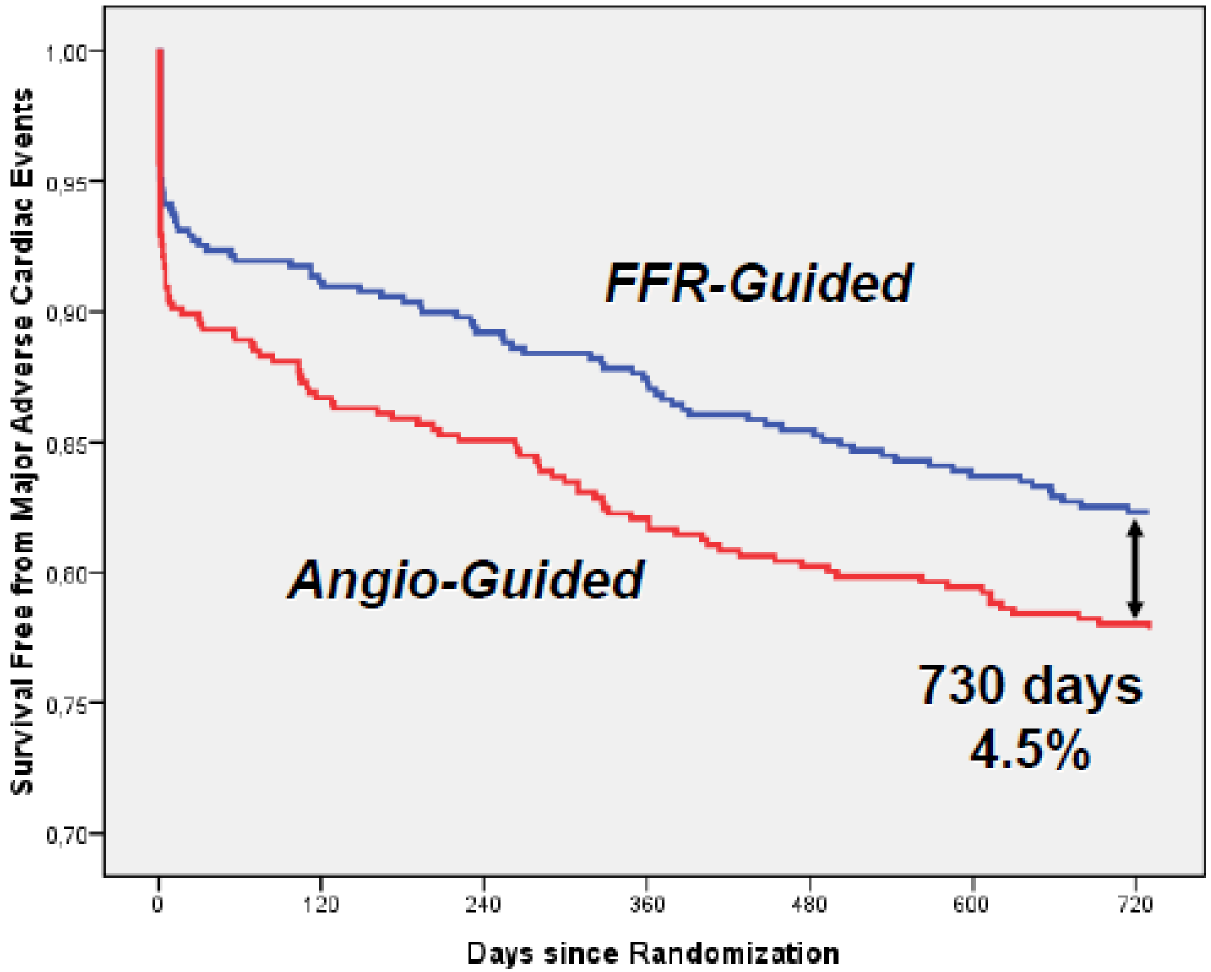


Pijls NH et al. JACC 2012; 59: 1045–57

FFR measurement
intracoronary adenosine bolus

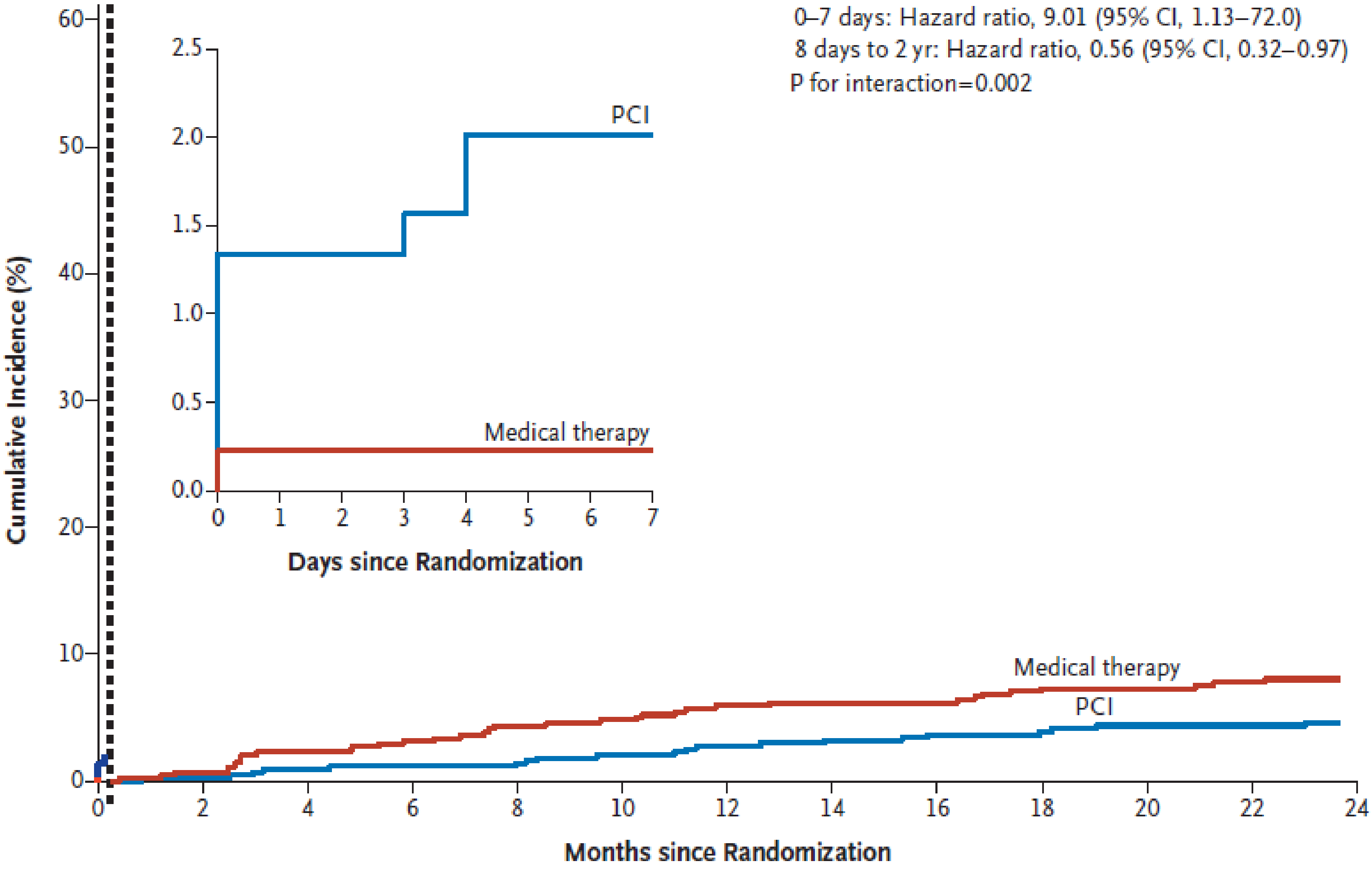


FFR- vs Angio-guided PCI: persistence of 2-year outcome



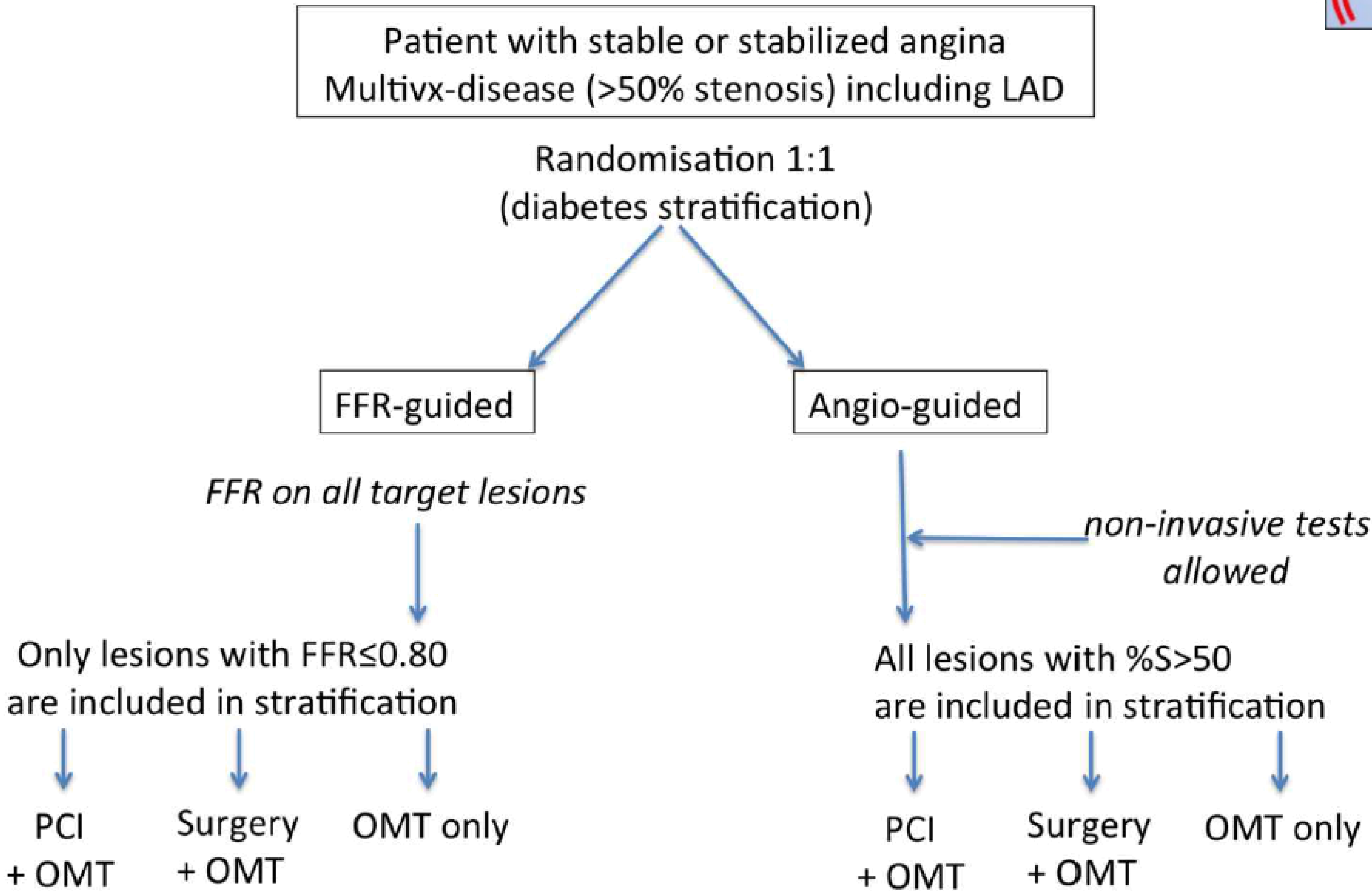
Pijls NH and the FAME investigators, JACC 2010; 56:177-84

PCI vs OMT in stable CAD patients with FFR ≤ 0.80

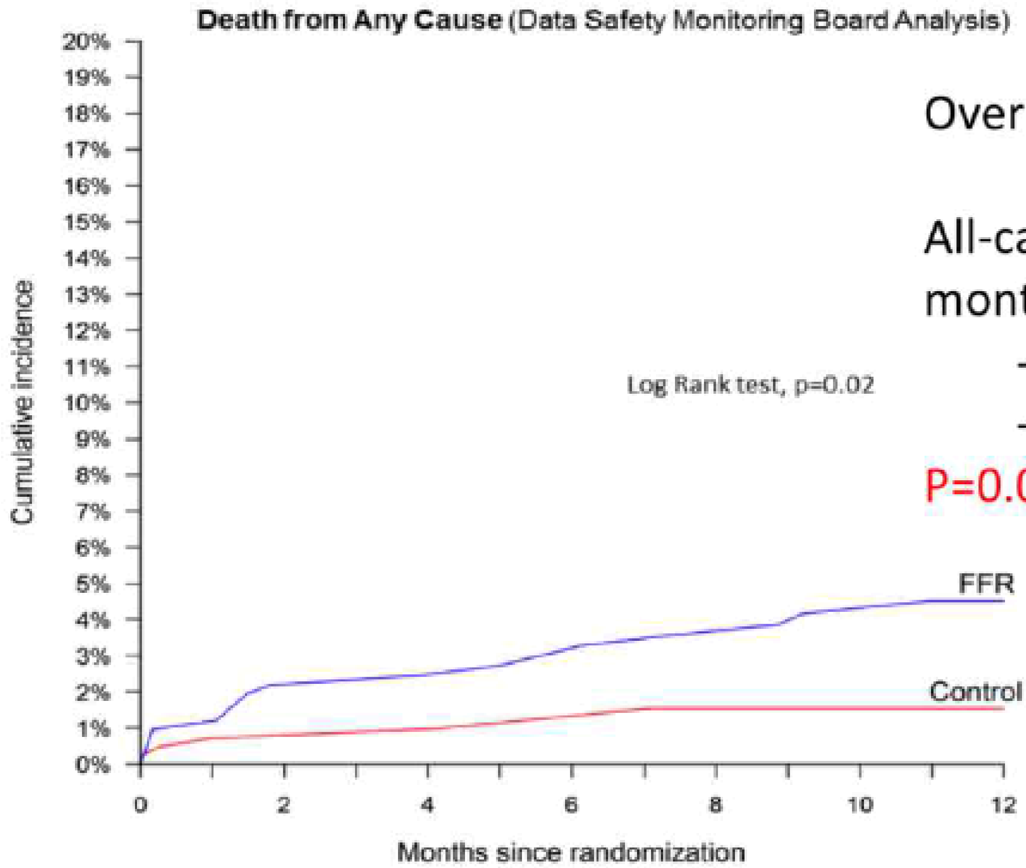


De Bruyne B and the FAME-2 investigators, NEJM 2014; 371:1208-17

FUnctional Testing Underlying REvascularization
The FUTURE trial



Results
- as analyzed by the DSMB committee -



No. at risk													
Control	419	411	411	411	411	377	369	369	352	352	352	352	352
FFR	417	411	394	394	371	362	360	352	336	314	309	281	281

Over n = 836 first patients

All-cause deaths at 12 months(n=24):
- control : 7 (2%)
- FFR : 17 (4%)

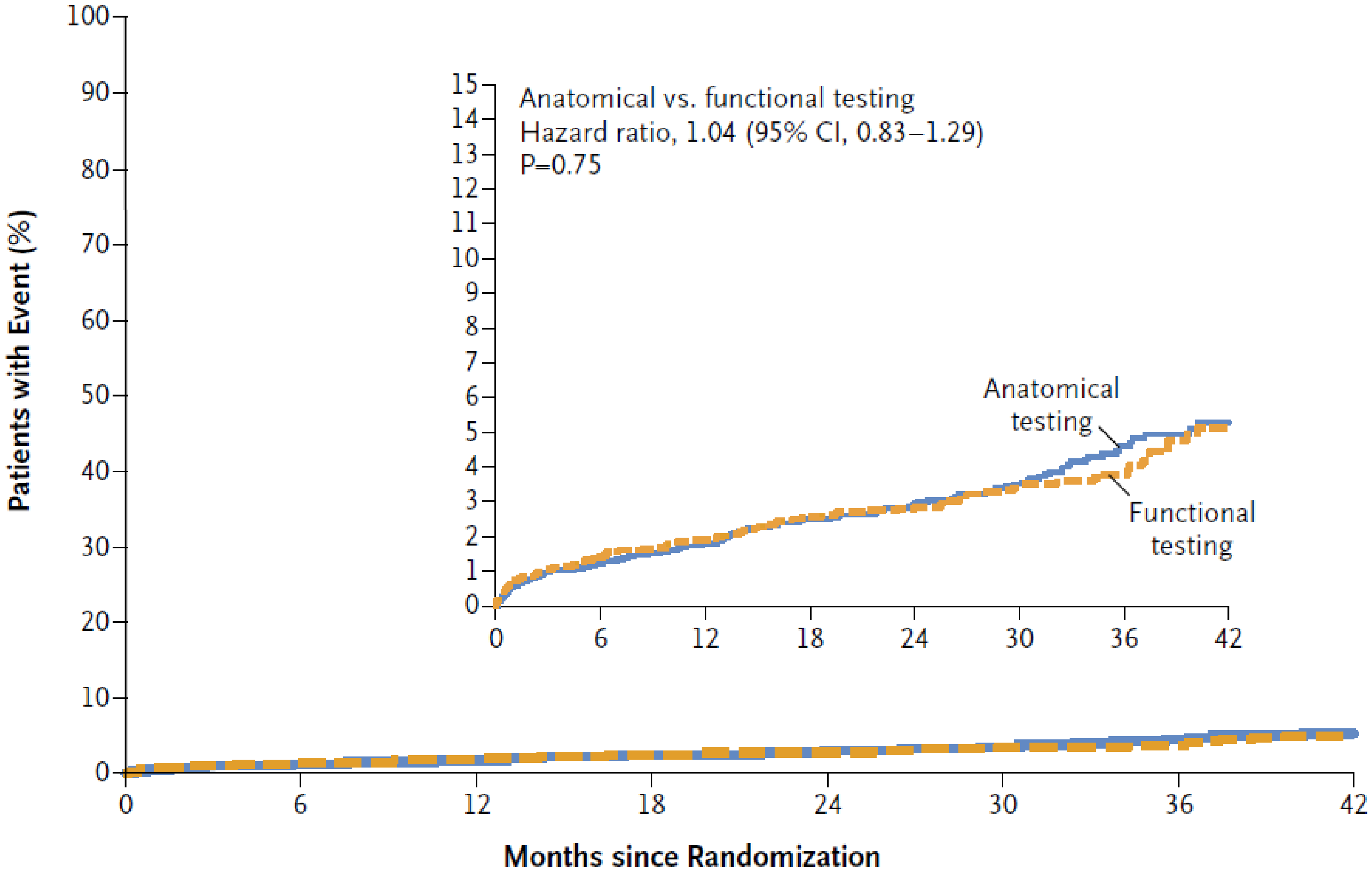
P=0.02

Results
- as halted by Sponsor and Steering committee -

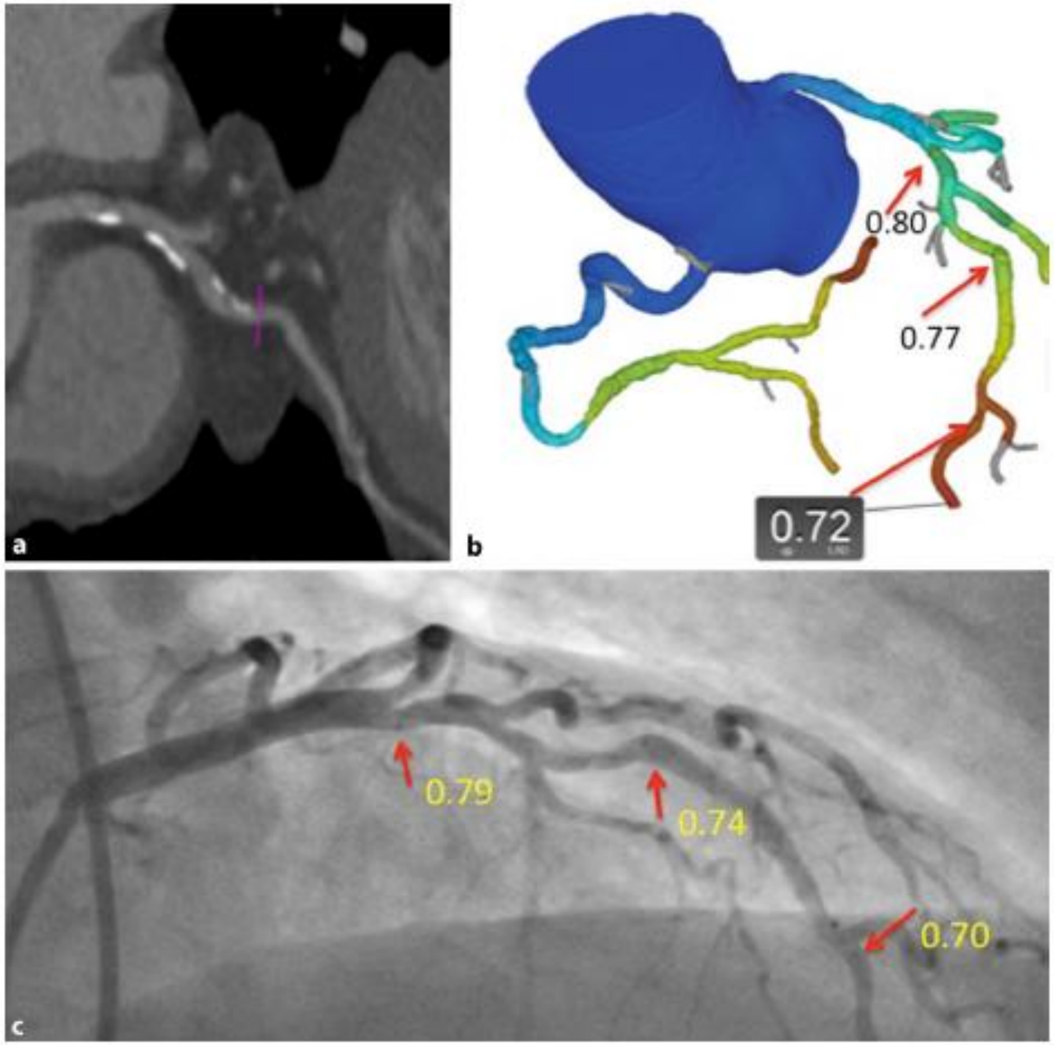
Variable	Control group (n=398)*	FFR Group (n=399)*	HR (95%CI)	P vlue
Death from any cause (%)	8 (1.8)	17 (3.9)	1.98 (0.85–4.60)	0.07
Cardiovascular death (%)	6 (1.3)	12 (2.7)	1.88 (0.70-5.01)	0.16
MACE(%)	58 (13.2)	65 (15.1)	1.09 (0.76-1.56)	0.63
Myocardial infarction (%)	24 (5.3)	29 (6.5)	1.23 (0.71-2.11)	0.46
Stroke (%)	4 (0.9)	2 (0.4)	0.48 (0.09-2.62)	0.40
Repeat revascularization (%)	33 (7.6)	32 (7.6)	0.97 (0.60-1.58)	0.91
EQ-5D – visual analogue scale	71±18	70±17		0.51

*only for patients having reached the one-year endpoint

Anatomic vs Functional testing for CAD

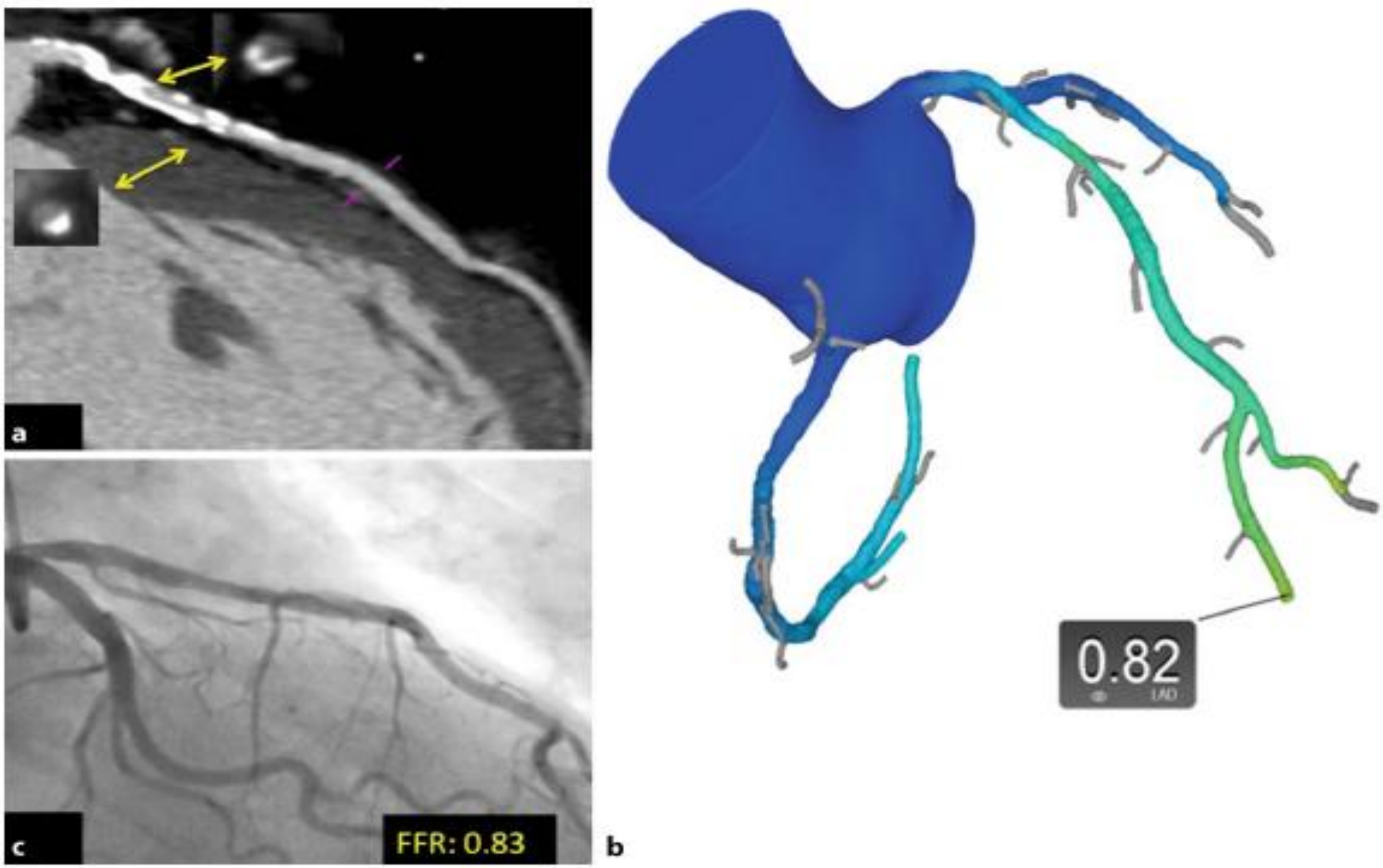


Fractional Flow Reserve derived from Computed Tomography (FFR-CT)



Leber WA, Herz 2016 (in press)

FFR-CT in diffusely calcified coronary arteries



Leber WA, Herz 2016 (in press)

An updated definition of Revascularization adequacy

Revascularisation strategy		Definition
Complete anatomic revascularisation		Treatment of all coronary segments > 1.5 mm with a ≥50% DS irrespective of their ability to produce ischemia.
Myocardial-specific	**functionally adequate revascularization**	Treatment of all coronary segments > 1.5 mm with a ≥50% DS supplying viable ischemic myocardium.
Lesion-specific		Treatment of all coronary segments > 1.5 mm with a FFR<0.80.
Incomplete revascularisation		Inability or unsuitability to treat all coronary segments with significant disease (either ≥50% DS or FFR<0.80) supplying viable myocardium.

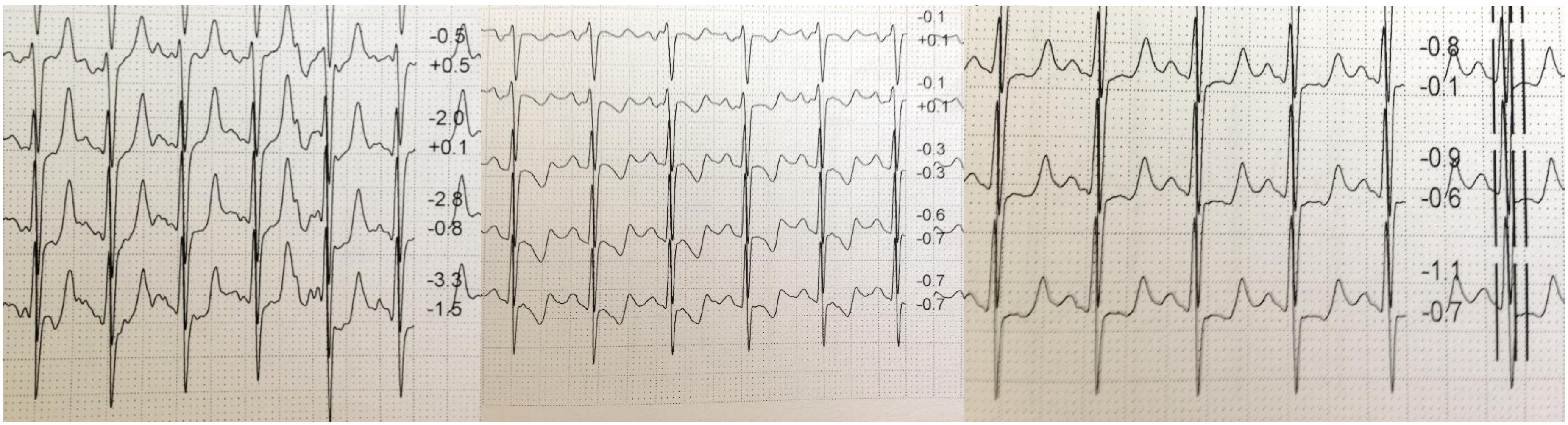
Zimarino M et al. Int J Cardiol. 2013;168: 1748-57

Performance of non-invasive diagnostic methods used to make diagnosis of CAD

	Diagnosis of CAD	
	Sensitivity (%)	Specificity (%)
Exercise ECG [a, 91, 94, 95]	45–50	85–90
Exercise stress echocardiography[96]	80–85	80–88
Exercise stress SPECT[96-99]	73–92	63–87
Dobutamine stress echocardiography[96]	79–83	82–86
Dobutamine stress MRI[b,100]	79–88	81–91
Vasodilator stress echocardiography[96]	72–79	92–95
Vasodilator stress SPECT[96, 99]	90–91	75–84
Vasodilator stress MRI [b,98, 100-102]	67–94	61–85
Coronary CTA[c,103-105]	95–99	64–83
Vasodilator stress PET[97, 99, 106]	81–97	74–91

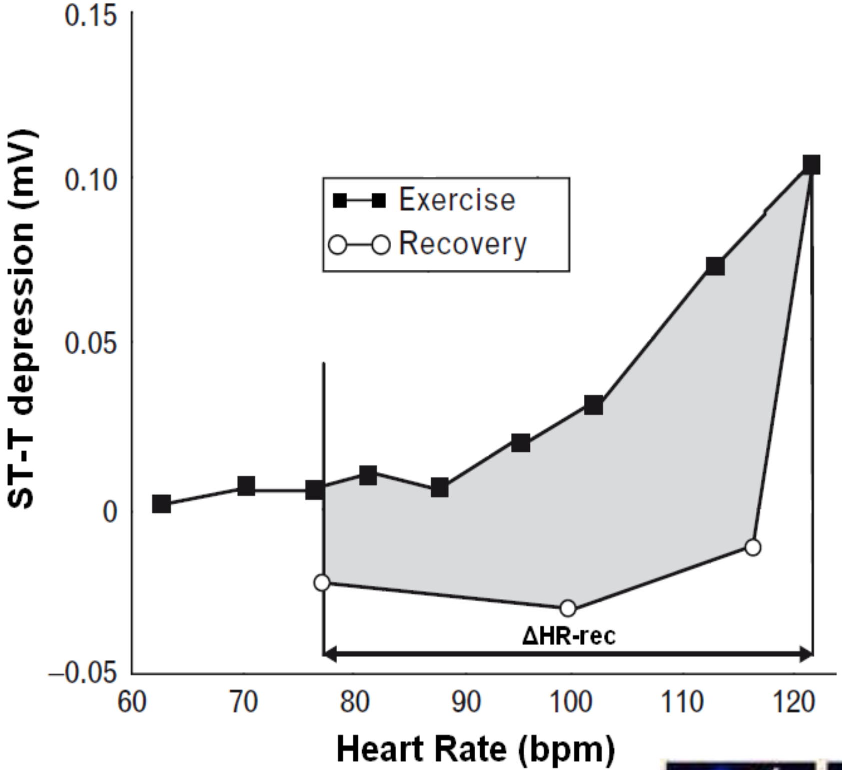
ESC guidelines on the management of stable CAD. Eur Heart J 2013

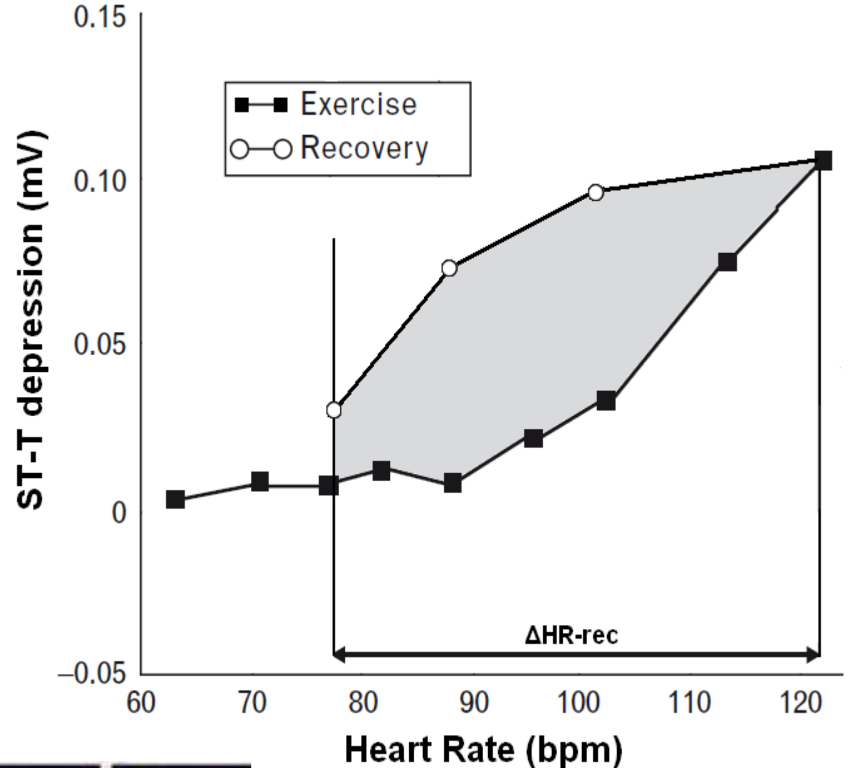
ECG stress testing



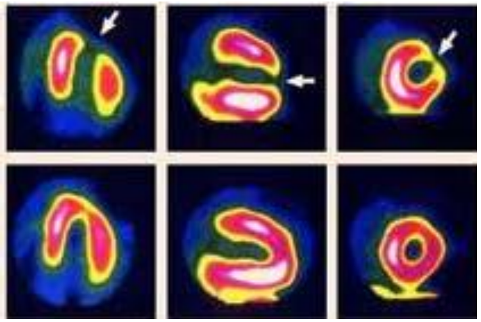
Basal **Stress** **Recovery**

ST/HR Hysteresis





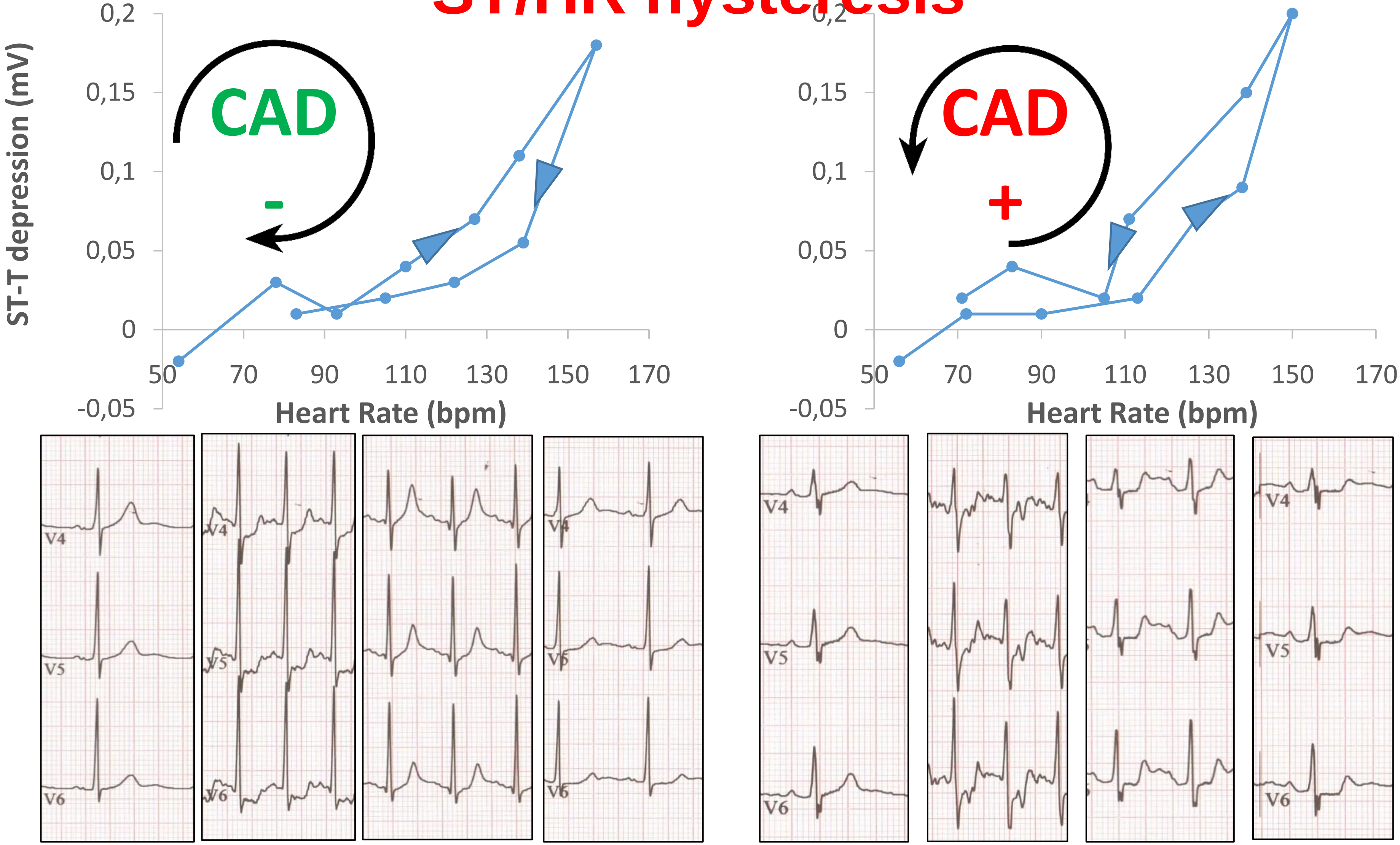
Normal



Indicative of Myocardial Ischemia

adapted from Okin PM et al. Circulation 1989;80:533–41

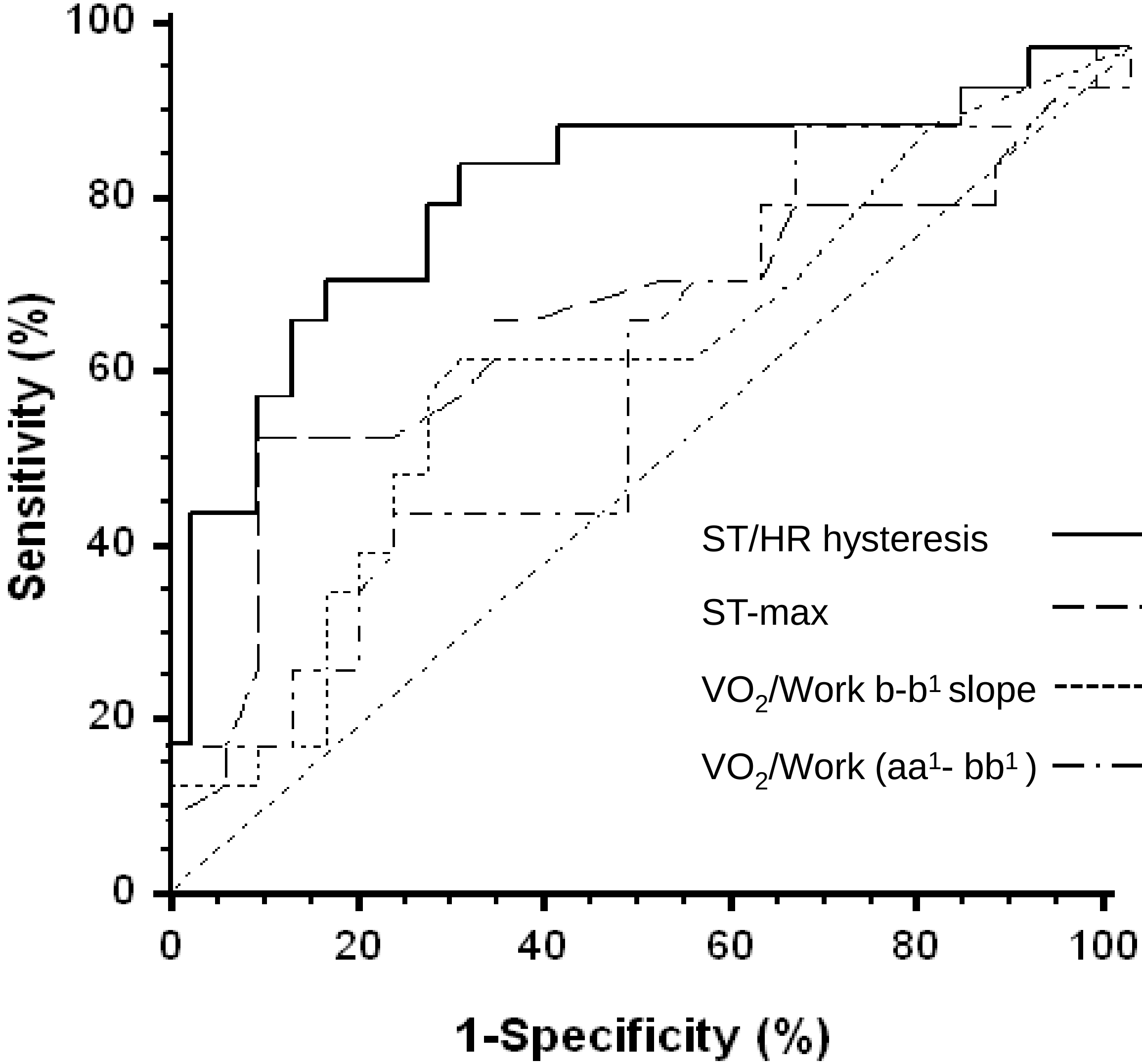
ST/HR hysteresis



Baseline 58 bpm | **Peak 157 bpm** | **1' Rec 122 bpm** | **5' Rec 83 bpm** | **Baseline 55 bpm** | **Peak 150 bpm** | **1' Rec 112 bpm** | **5' Rec 83 bpm**

Zimarino M. et al. J Cardiovasc Med 2017 (in press)

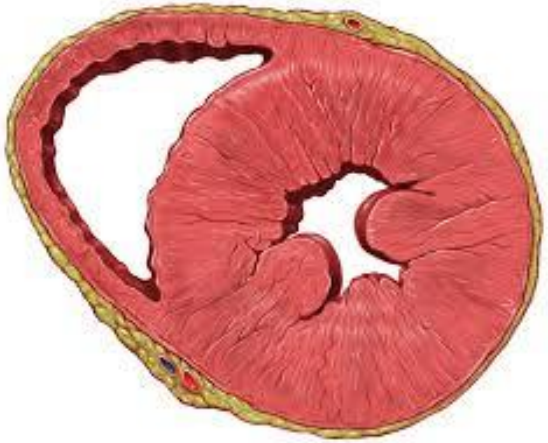
ST/HR Hysteresis and CPET



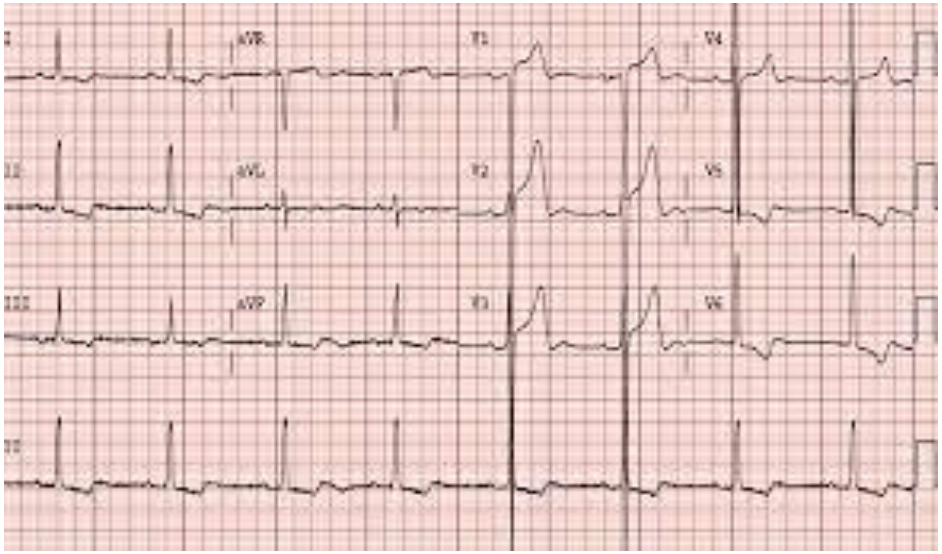
	AUC	95 % CI	P
ST/HR hysteresis	0.82	0.699 to 0.913	0.001
ST-max	0.68	0.542 to 0.798	NS
VO_2/Work b-b[1] slope	0.63	0.481 to 0.747	NS
VO_2/Work (aa[1]- bb[1])	0.61	0.474 to 0.740	NS

Zimarino M. et al. Int J Cardiol 2013; 168: 1274–9

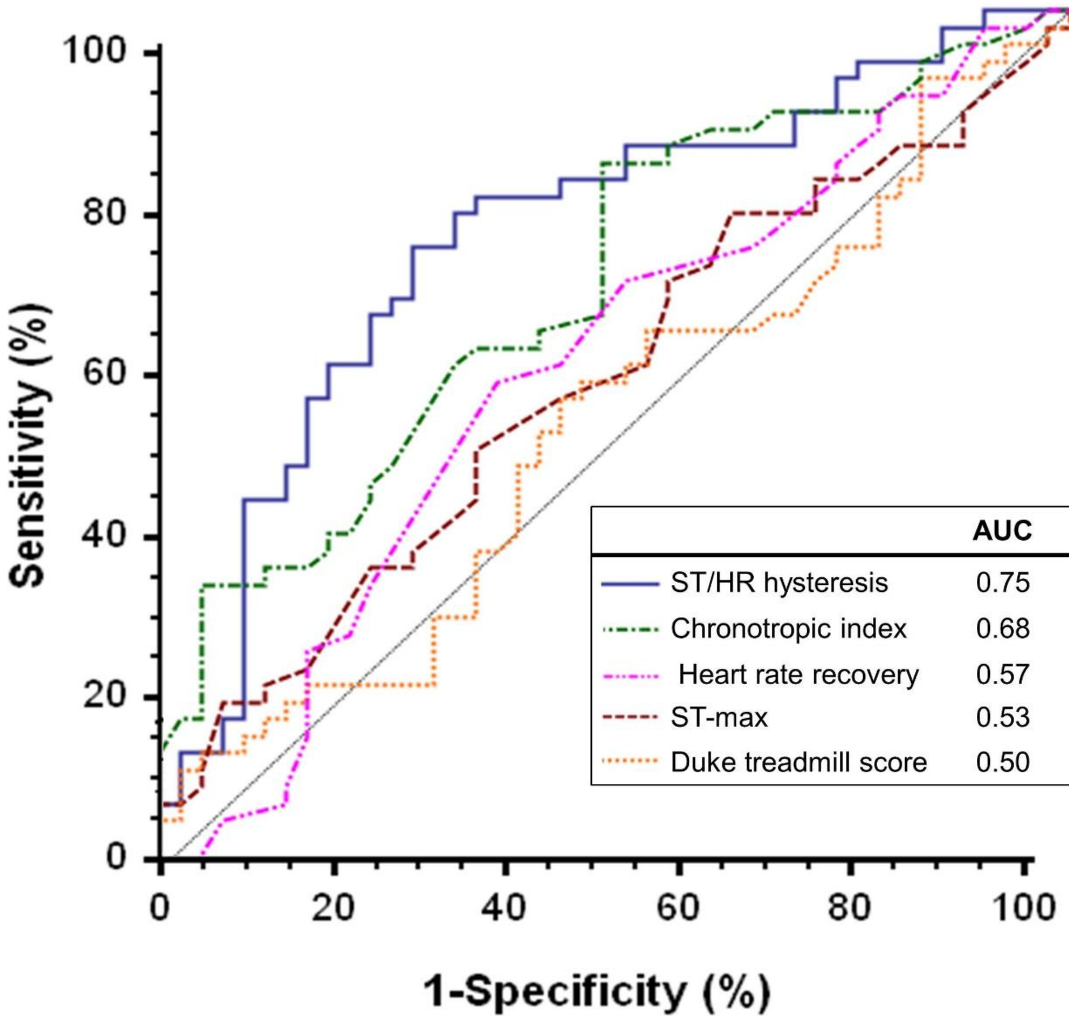
Left ventricular hypertrophy



$$\sigma = \frac{Pr^2}{2h}$$



ST/HR Hysteresis in patients with LVH



	AUC	95 % CI	P*
ST/HR hysteresis	0.75	0.63 to 0.82	<0.0001
Chronotropic index	0.68	0.58 to 0.77	0.0004
Heart rate recovery	0.57	0.47 to 0.67	NS
ST-max	0.53	0.44 to 0.63	NS
Duke treadmill score	0.50	0.40 to 0.60	NS

*all significance values are compared with the "neutral test" 0.5 AUC value.

Zimarino M. et al. Eur J Prev Cardiol 2016; 23: 1632-9

Conclusions

- In pts with stable CAD (and with NSTE-ACS aside from culprit lesions) a thorough assessment of functional relevance of both myocardium and coronary severity is mandatory in most cases.
- FFR has a robust scientific evidence supporting its clinical relevance, although recently…
- FFR-CT seems promising, but clinical translation of its relevance is needed.
- Good old exercise testing should not be abandoned in the current era of resource containment, as the adjunctive analysis of ST/HR hysteresis increases its diagnostic accuracy.