Perform PCI: Search for Ischaemia/viability in severe HF is of Limited Value

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2019 ESC Guidelines for the diagnosis and management of chronic coronary syndromes

Myocardial revascularization should be considered in eligible patients with HF based on their symptoms, coronary anatomy, and risk profile. Successful revascularization in patients with HF due to ischaemic cardiomyopathy may improve LV dysfunction and prognosis by reducing ischaemia to viable, hibernating myocardium. If avail-

LV dysfunction and CAD, what do Guidelines say?

Recommendations on revascularizations in patients with chronic heart failure and systolic left ventricular dysfunction (ejection fraction ≤35%)

Recommendations	Class[a]	Level[b]
In patients with severe LV systolic dysfunction and coronary artery disease suitable for intervention, myocardial revascularization is recommended.[81,250]	I	B
In patients with one- or two-vessel disease, PCI should be considered as an alternative to CABG when complete revascularization can be achieved.	IIa	C
In patients with three-vessel disease, PCI should be considered based on the evaluation by the Heart Team of the patient's coronary anatomy, the expected completeness of revascularization, diabetes status, and comorbidities.	IIa	C

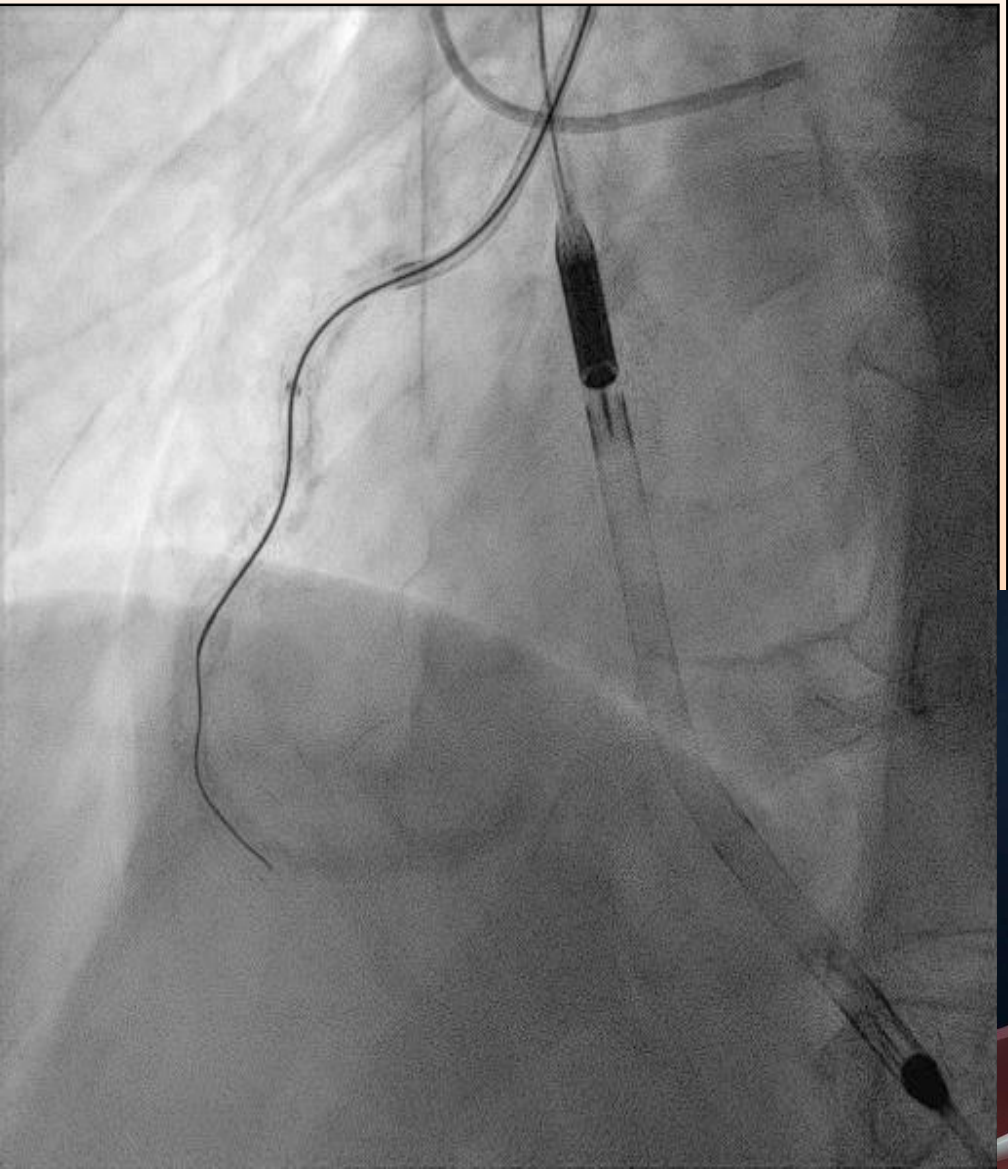
2018 ESC/EACTS Guidelines on myocardial revascularization

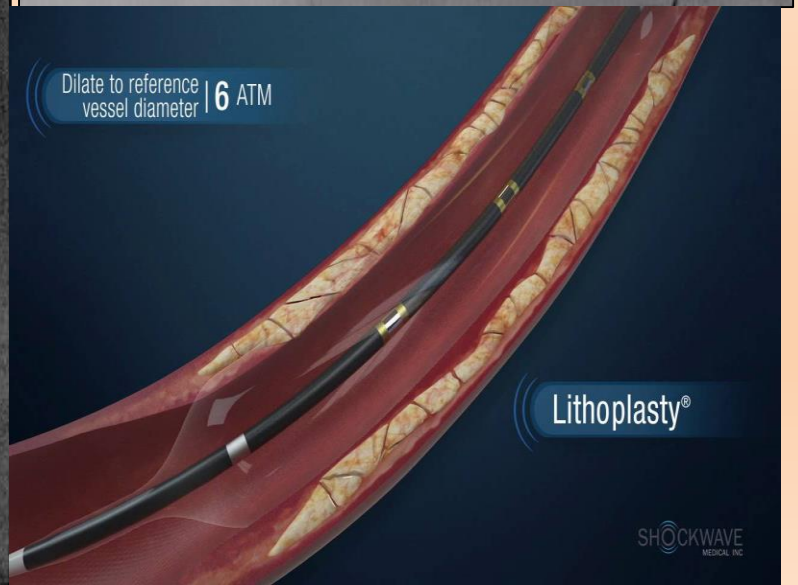
58 Years: previous PCI RCA 2015 (described unexpandable stent mid-segment despite 30 Atm of pressure with NC balloon); stopped all medicines; new non-Q MI April 2019

RCA: proximal in-stent total occlusion

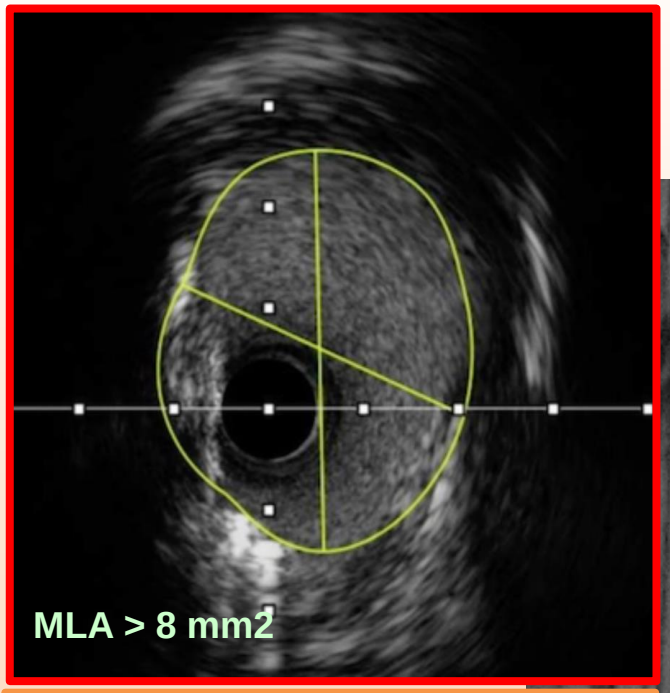
Left coronary angiography

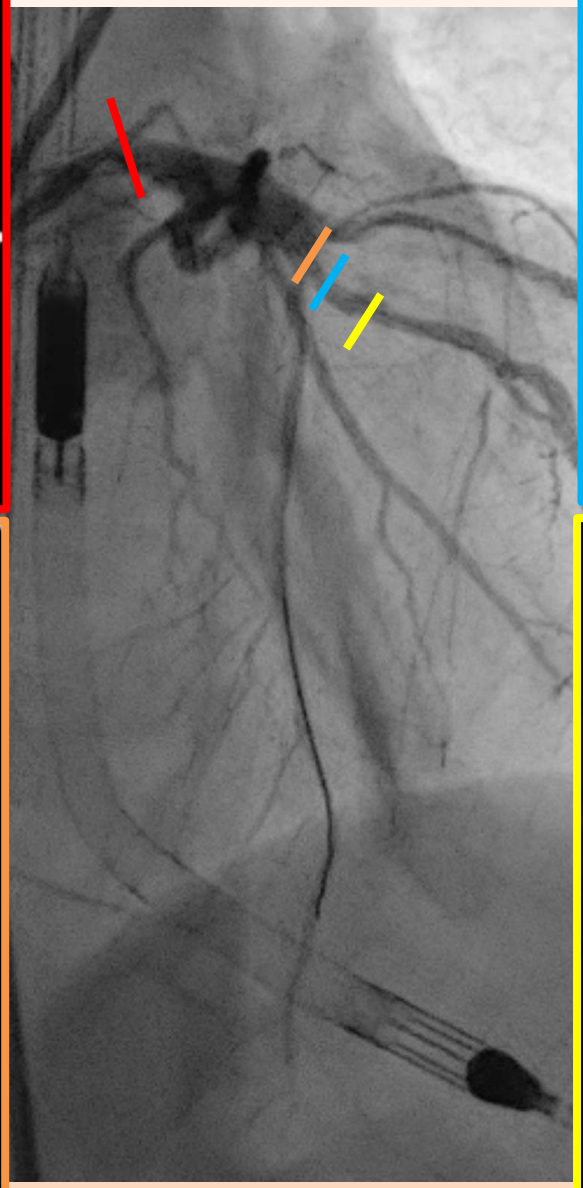
CTO crossing with Gaia II/III guidewires
Corsair microcatheter
Guideliner 6F

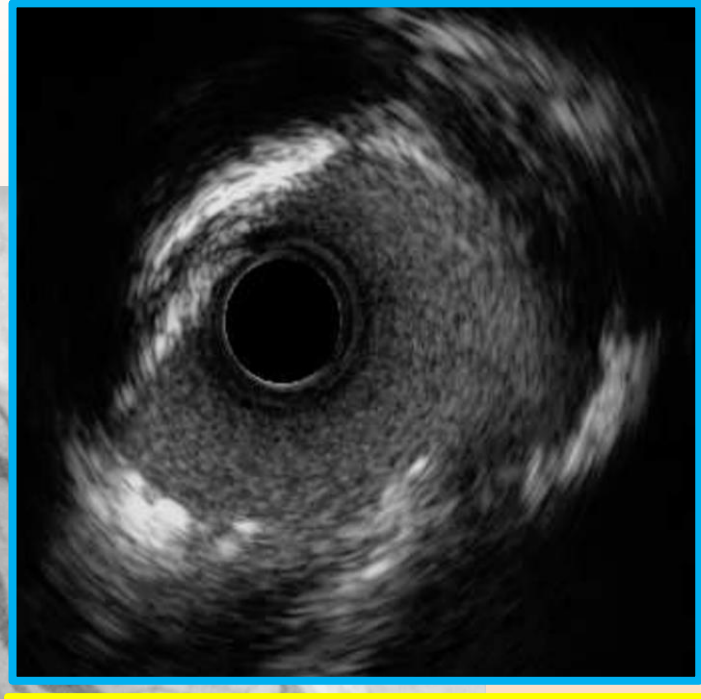


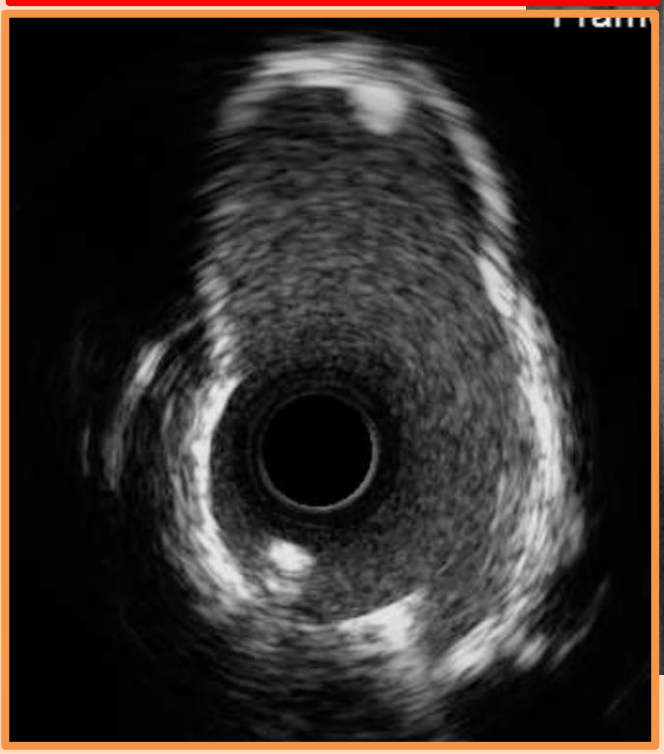


IVUS

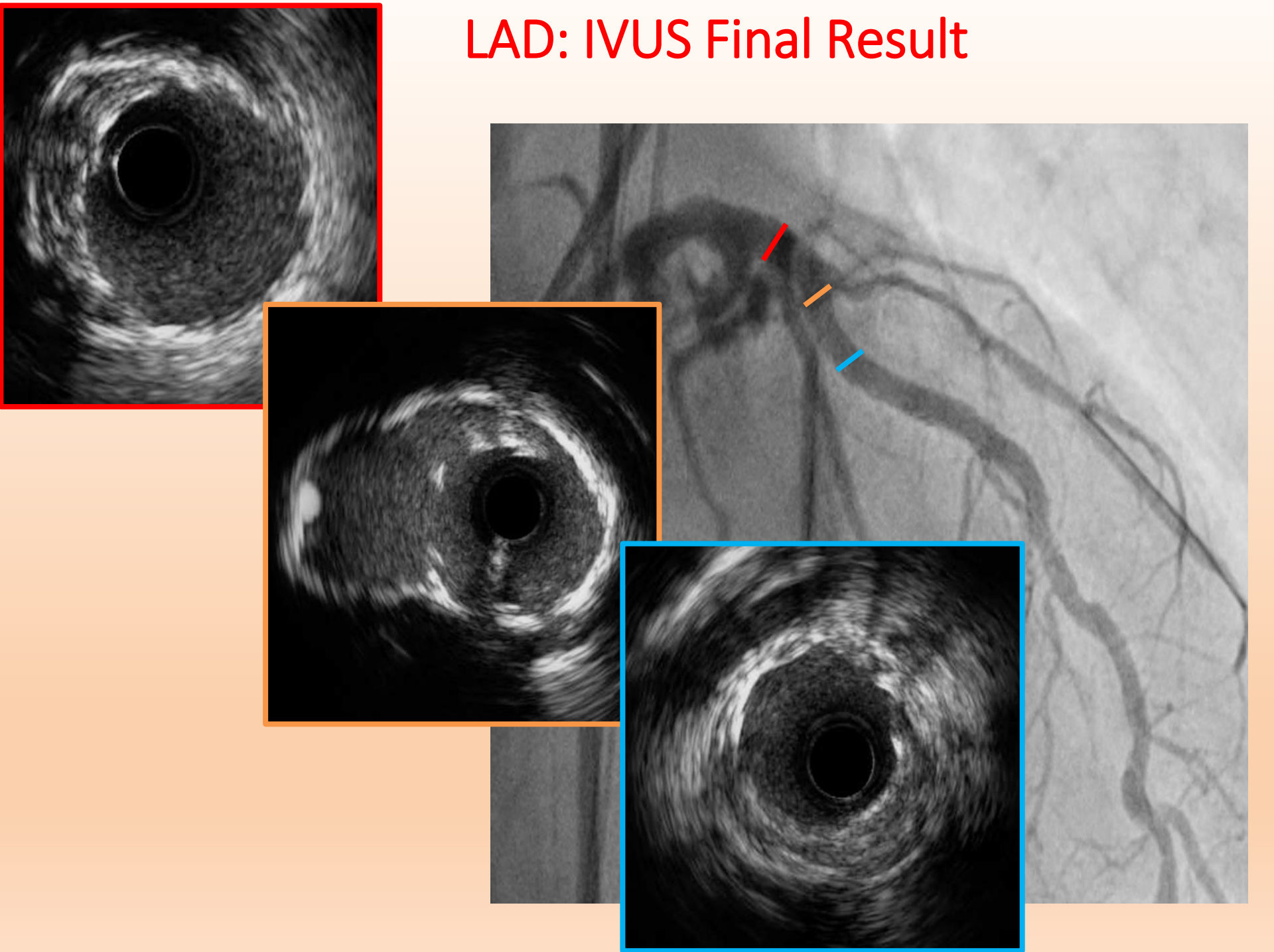




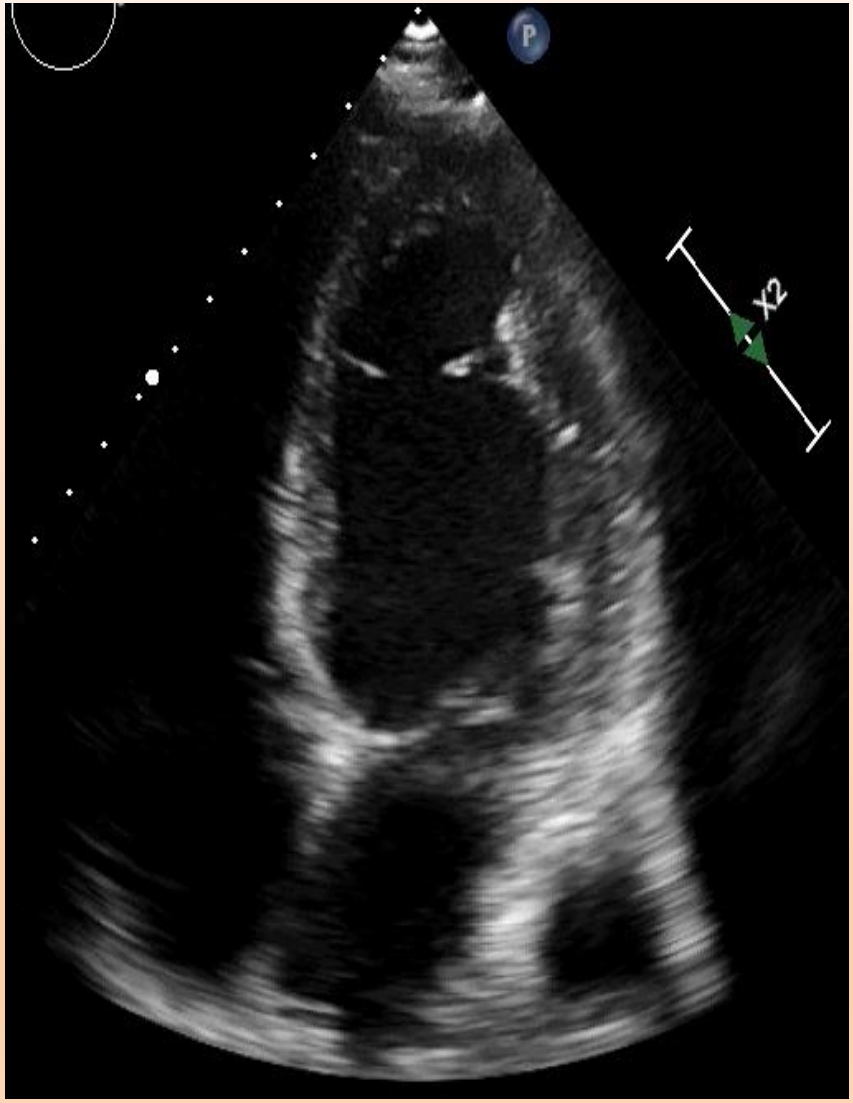


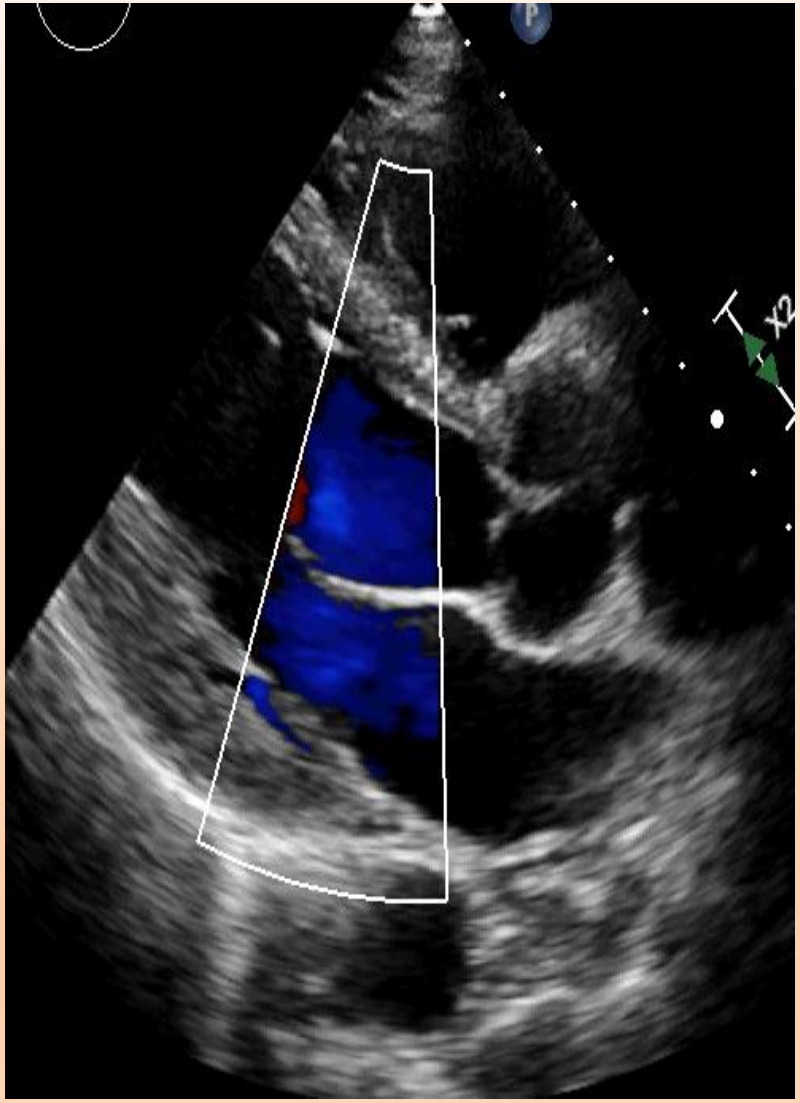


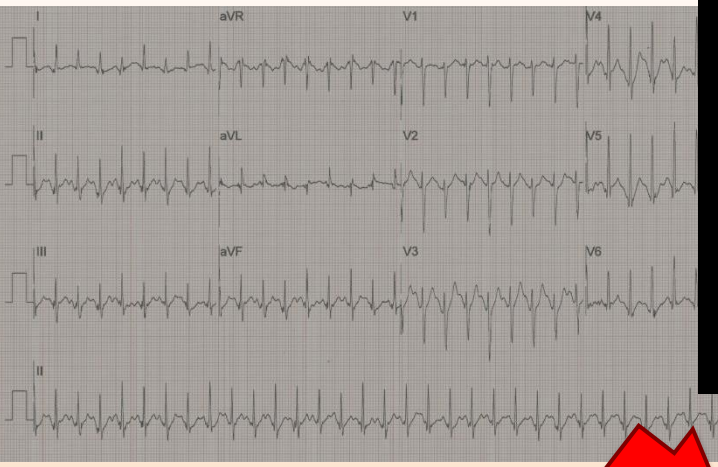
LAD: IVUS Final Result



TTE Post procedure



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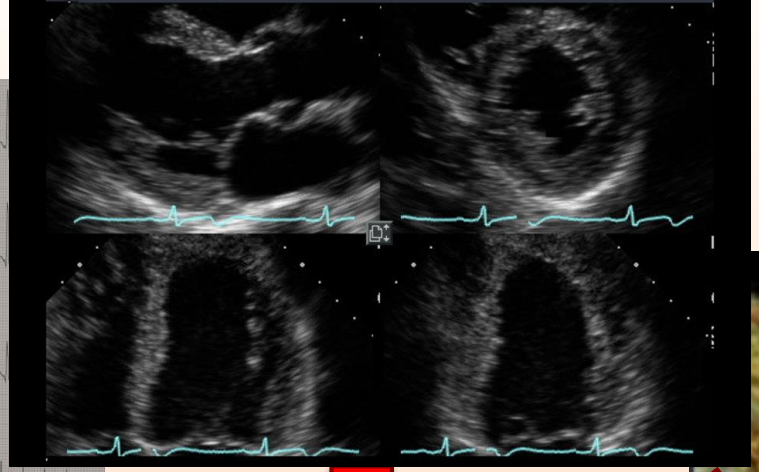


LCX
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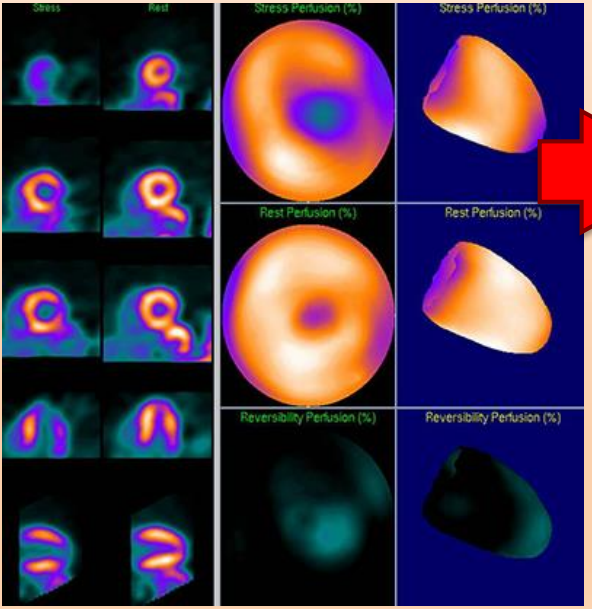
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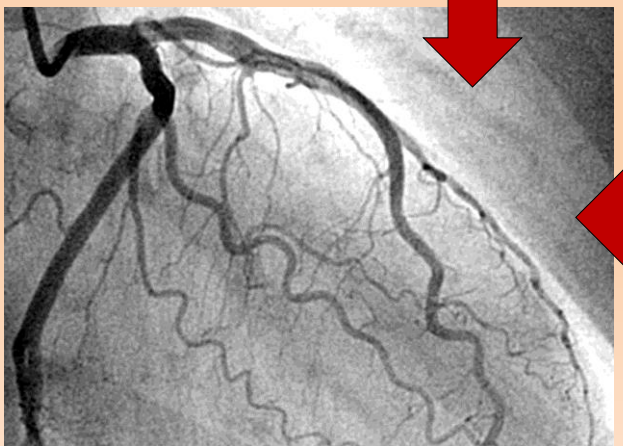

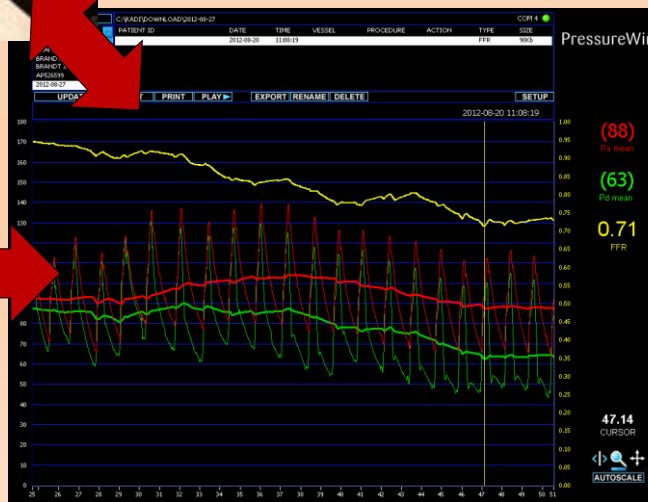
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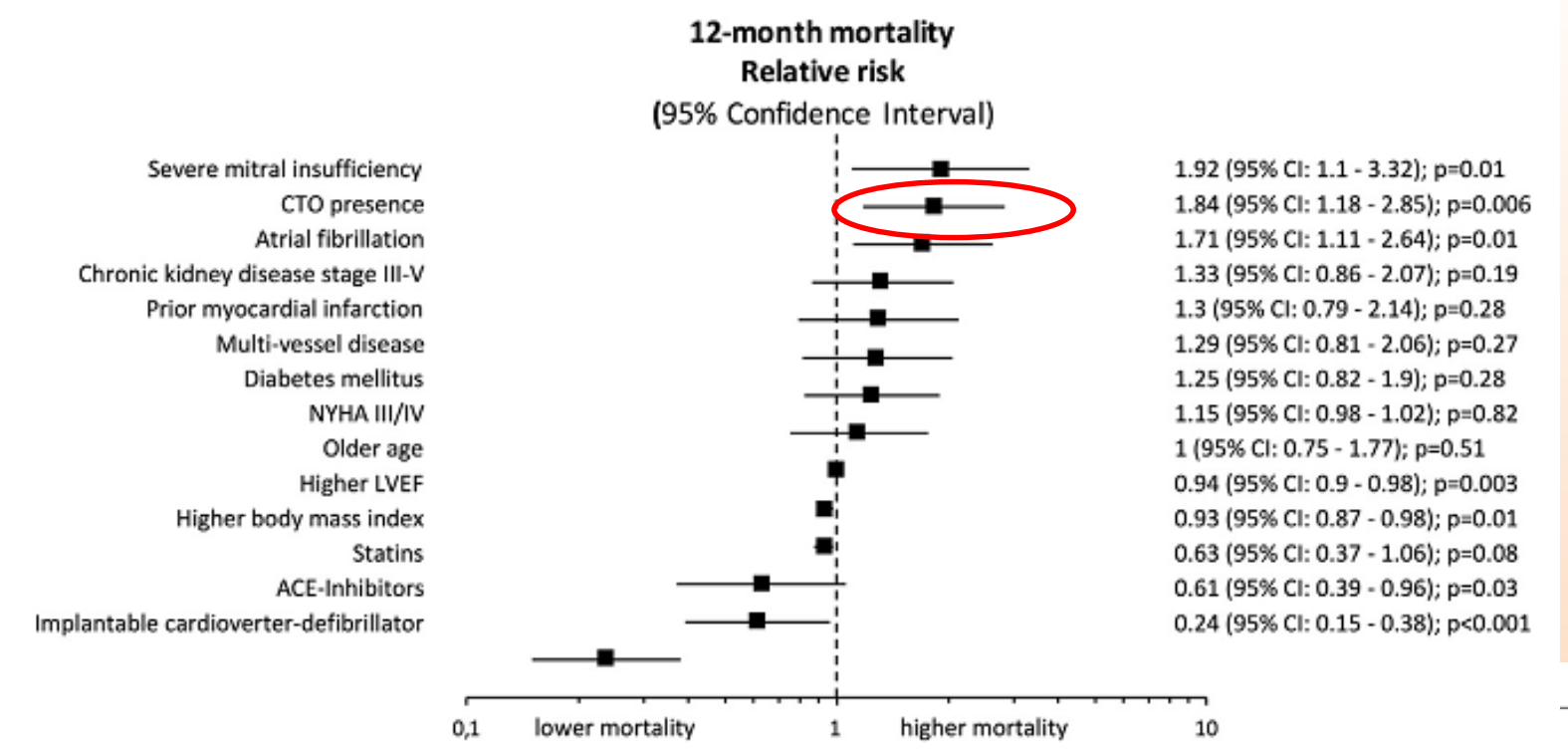
Impact of Chronic Total Occlusion of the Coronary Artery on Long-Term Prognosis in Patients With Ischemic Systolic Heart Failure

Insights From the COMMIT-HF Registry

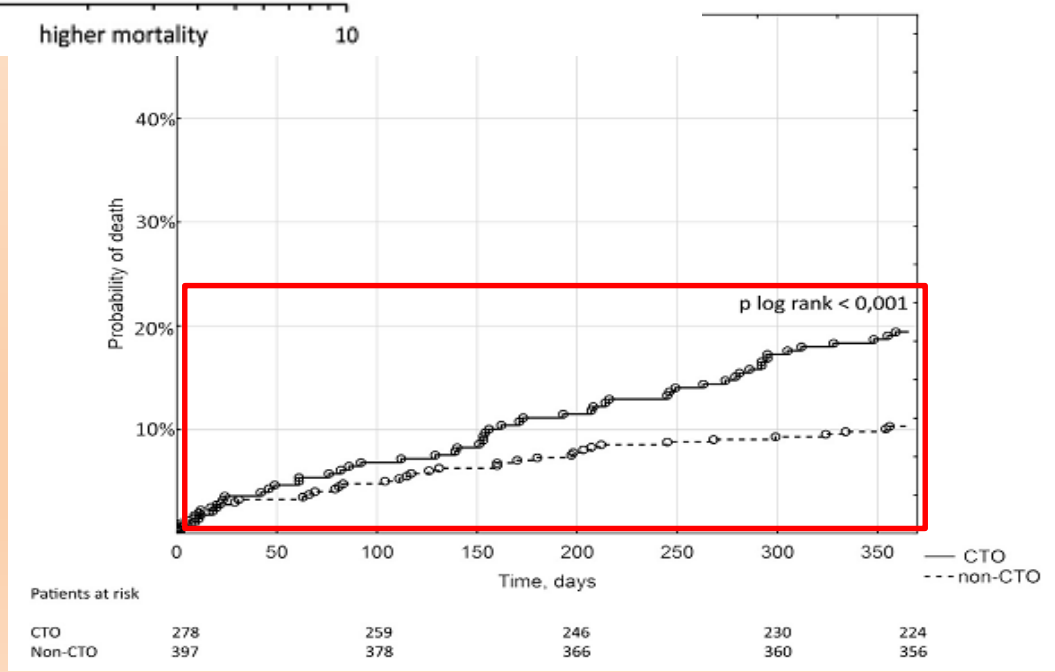
- Single centre, observational registry
- January 2009-Dicember 2014
- Follow-up: 12 months
- **1798** consecutive nonselected patients hospitalized in cardiology wards and intensive cardiac care units with a diagnosis of **HF with reduced EF**
- **675 pts** underwent elective coronary angiography and enrolled in this subanalysis
- 278 patients **(41.2%) with CTO**
- The patients with CTO had a higher prevalence of previous MI (77% vs 66%) and CABG (38% vs 26%)

Tajstra, Pyka et al J Am Coll Cardiol Intv 2016:9:1790-7



PCI only in 4.4% patients

Viability testing rarely performed



Tajstra, Pyka et al J Am Coll Cardiol Intv 2016:9:1790-7

2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure

The Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC)

Developed with the special contribution of the Heart Failure Association (HFA) of the ESC

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Indication for coronary angiography in HF

Coronary angiography <u>is recommended</u> in patients with HF and:

- **angina pectoris recalcitrant** to medical therapy — I C
- **symptomatic ventricular arrhythmia** or **aborted cardiac arrest.** — I C

Coronary angiography <u>should be considered</u> in patients with HF and:

- **intermediate to high pre-test probability** of CAD and the presence of ischaemia **in non-invasive stress tests** in order to establish the ischaemic aetiology and CAD severity. — IIa C

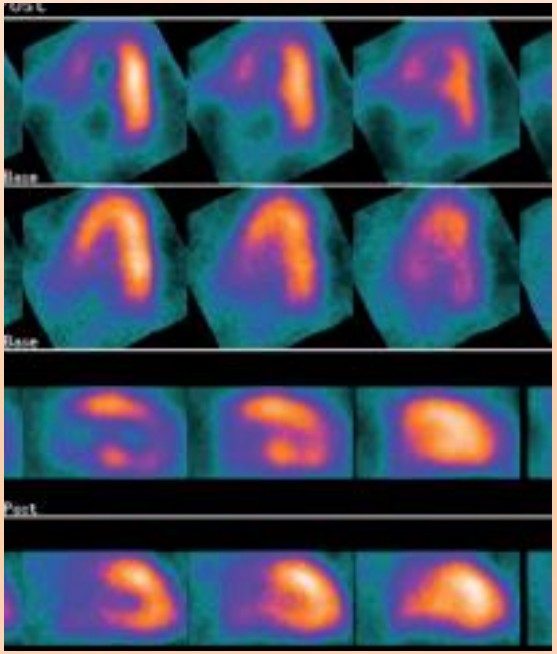
Ponikowski et al ESC guidelines Acute and Chronic Heart Failure

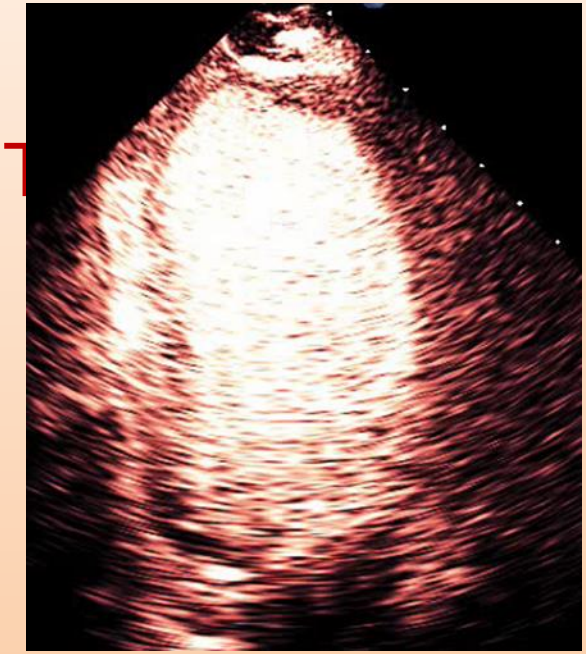
Which Test Should We Use?

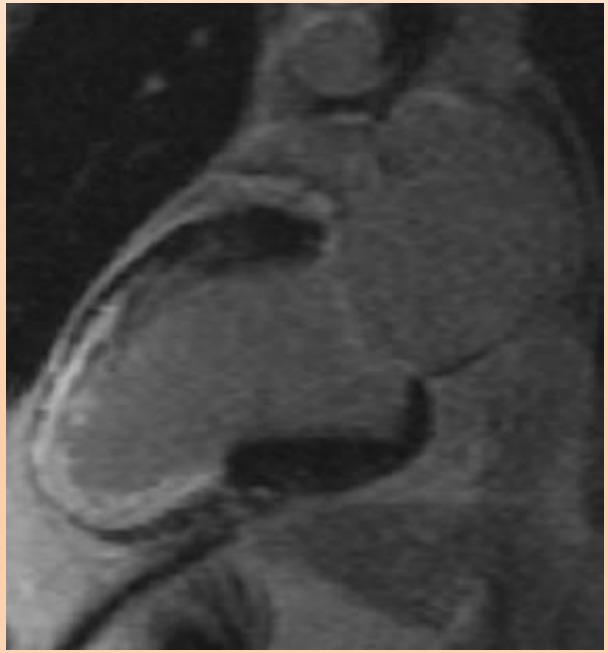
Each test has strengths and weaknesses

(radiation, expected quality-feasibility, quantification fibrosis or ischaemia, availability-convenience)

NUCLEAR ST CMR







Local expertise is paramount

Functional stress tests for detecting myocardial ischemia

- Exercise stress echo (treadmill or bicycle ergometer) → more physiological environment than pharmacological tests; additional data (exercise time, workload, heart rate, blood pressure and ECG)

- Pharmacological stress echo (dobutamine/dipyridamole) → preferred for patient unable to exercise adequately.

- SPECT perfusion scintigraphy (exercise/pharmacological stress testing) → images of regional tracer uptake reflecting relative regional myocardial blood flow

- Stress cardiac magnetic resonance (use of vasodilators or beta-adrenergic agonists)

Sensitivity and specificity?

	Diagnosis of CAD	
	Sensitivity (%)	Specificity (%)
Exercise stress echocardiography[96]	80–85	80–88
Dobutamine stress echocardiography[96]	79–83	82–86
Dobutamine stress MRI[b,100]	79–88	81–91
Vasodilator stress MRI[b,98, 100-102]	67–94	61–85
Exercise stress SPECT[96-99]	73–92	63–87
Vasodilator stress SPECT[96, 99]	90–91	75–84

2013 ESC guidelines on the management of stable coronary artery disease

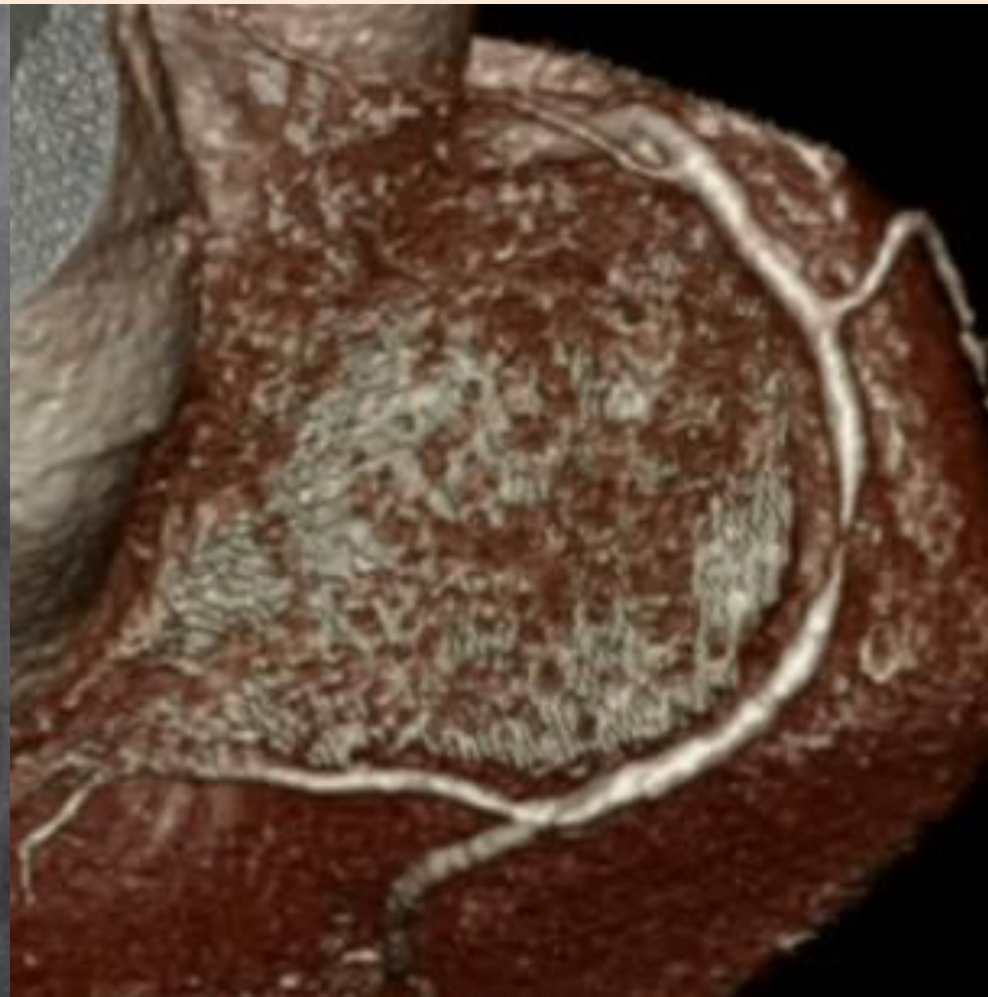
→ old trials and meta-analysis (especially for stress echo and SPECT)

→blinding? Core-lab analysis?

→ limited data for HF patients

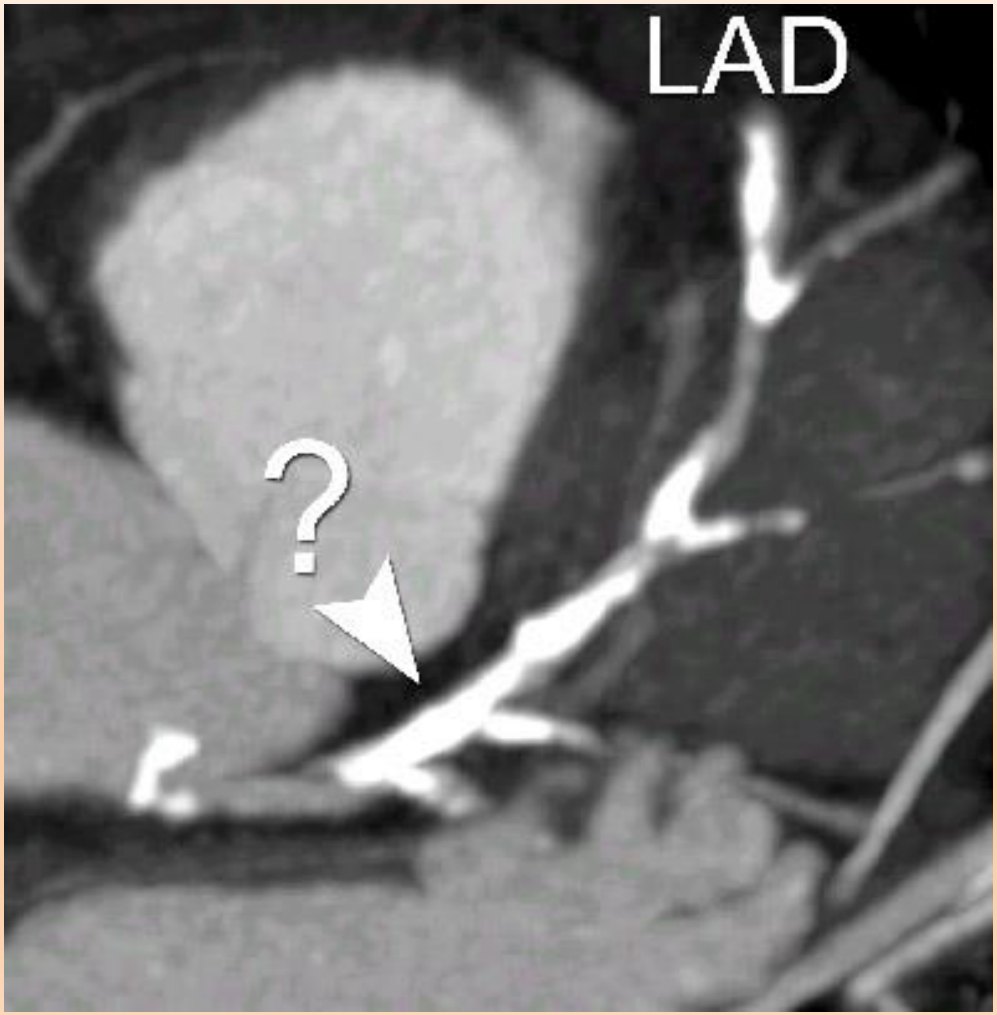
Non Invasive (CT) angiography

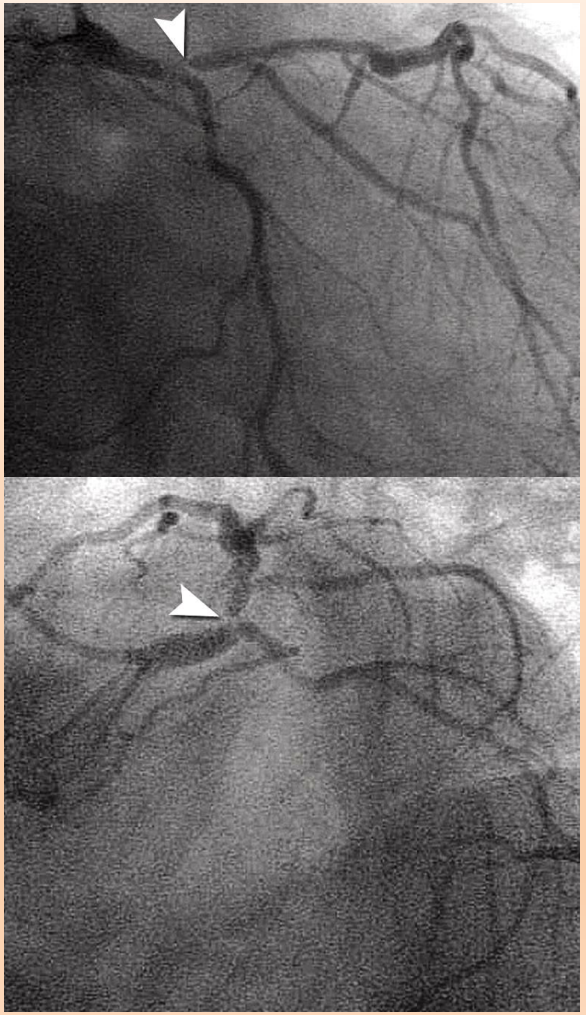
Low-intermediate CAD likelihood



Cardiac CT

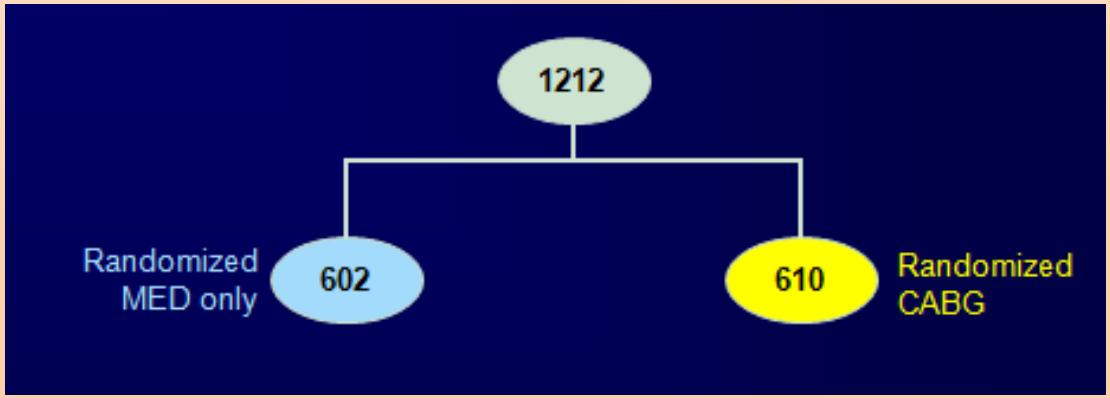
Limitations: severe calcifications





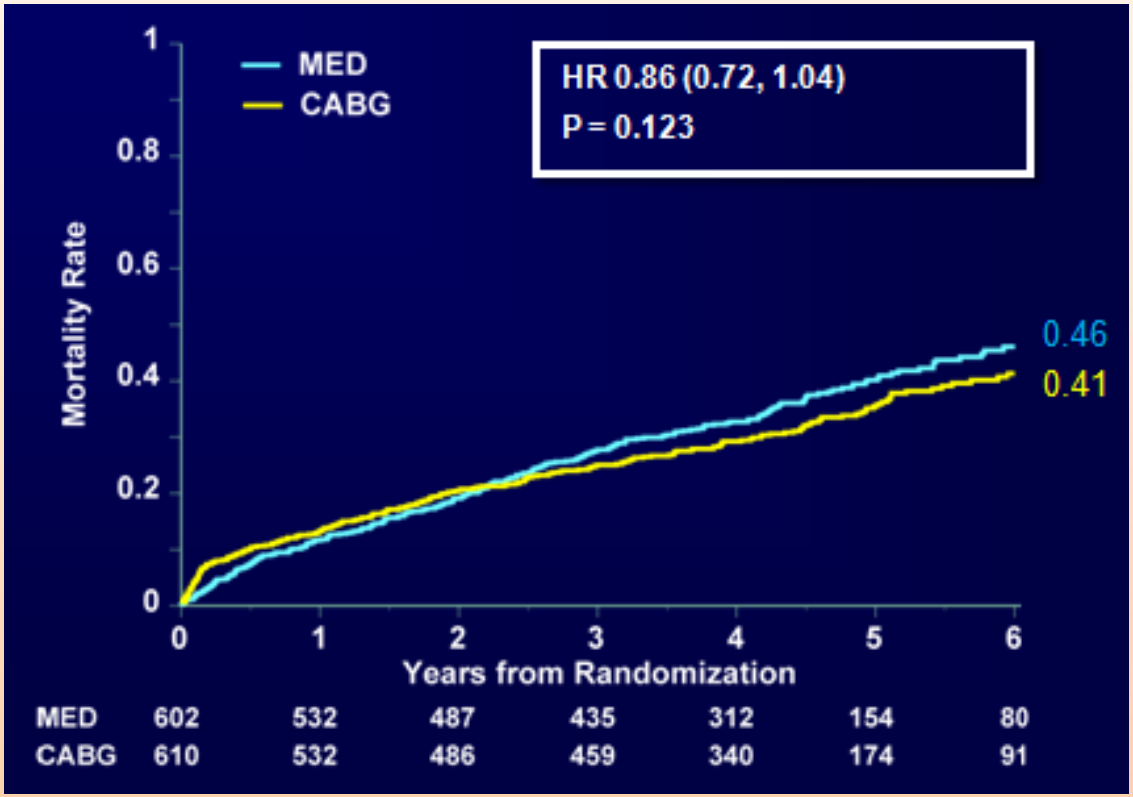
STICH trial
(Surgical Treatment for Ischemic Heart Failure Trial)

- 1212 patients with CAD and EF <35%
- 99 hospitals, 22 countries
- Randomized to OMT (602 pts) or OMT+CABG (610 pts).
- Exclusion criteria: critical stenosis on LM (>50%), angina CCS III-IV, recent MI (within 30 days), cardiogenic shock
- Mean follow-up 56 months



Velazquez EJ, et al, N Engl J Med 2011;364:1607-16

Primary endpoint: all cause mortality

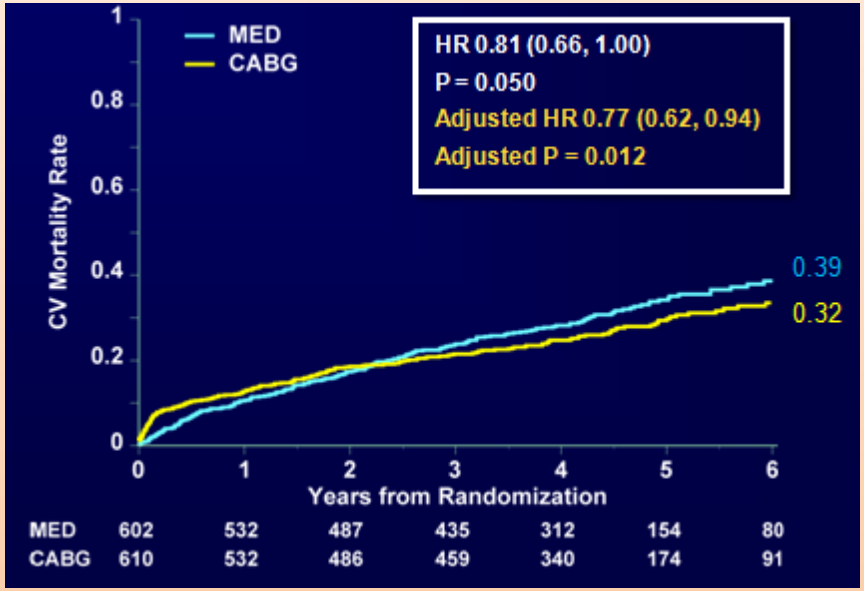


NO significant difference between medical therapy alone and medical therapy plus CABG

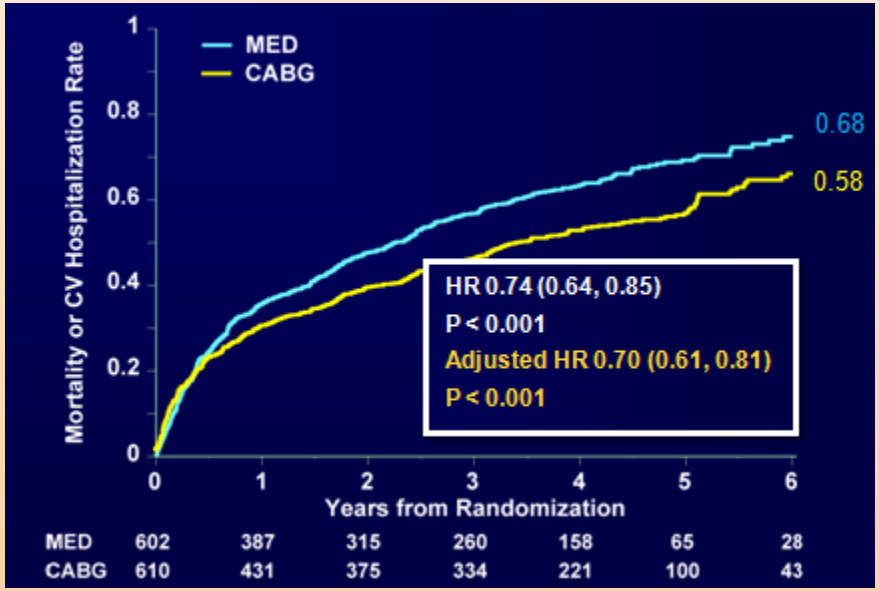
Velazquez EJ, et al, N Engl J Med 2011;364:1607-16

Secondary endpoints

CV mortality



Death and CV hospitalization



Velazquez EJ, et al, N Engl J Med 2011;364:1607-16

STICH trial

- High crossover: 17% from OMT group to CABG group and 9% from CABG to OMT group.
- Viability test was optional at enrolling
- Follow-up 5 years

Velazquez EJ, et al, N Engl J Med 2011;364:1607-16

ORIGINAL ARTICLE

Myocardial Viability and Survival in Ischemic Left Ventricular Dysfunction

STICH viability substudy

- Hypothesis: the assessment of myocardial viability could identify patients who have the greatest benefit with revascularization

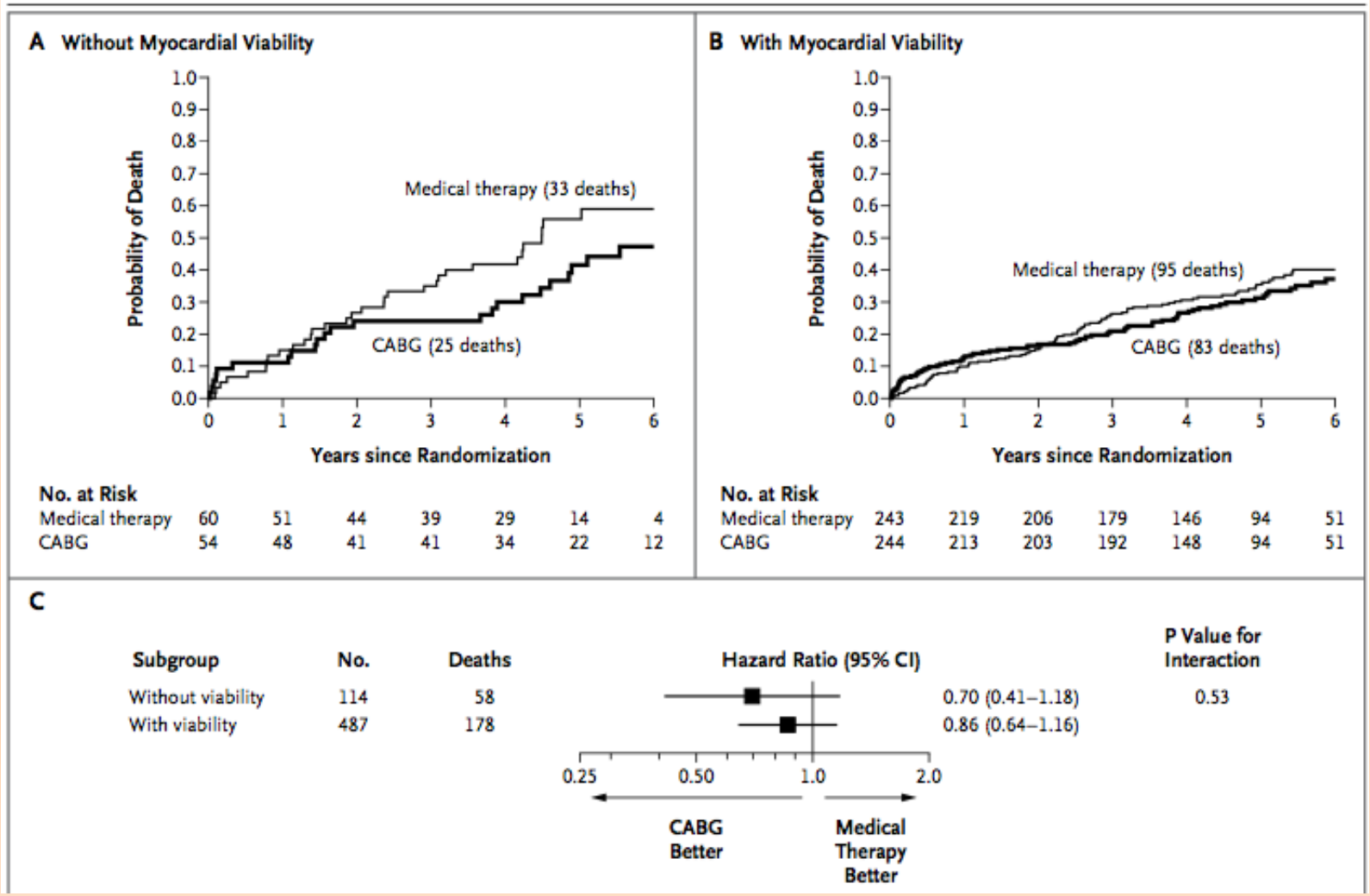
- SPECT/dobutamine stress echo

Robert O. Bonow et al.; NEJM, 2011

STICH viability substudy, study design

- 601 of 1212 pts underwent viability testing
- OMT+CABG (n. 298) vs OMT alone (n. 303)
- Primary endpoint: all cause mortality
- Secondary endpoint: CV death; composite all cause death+CV hospitalization

5 years results: the assessment of myocardial viability did not identify patients with a differential survival benefit from CABG, as compared with medical therapy alone

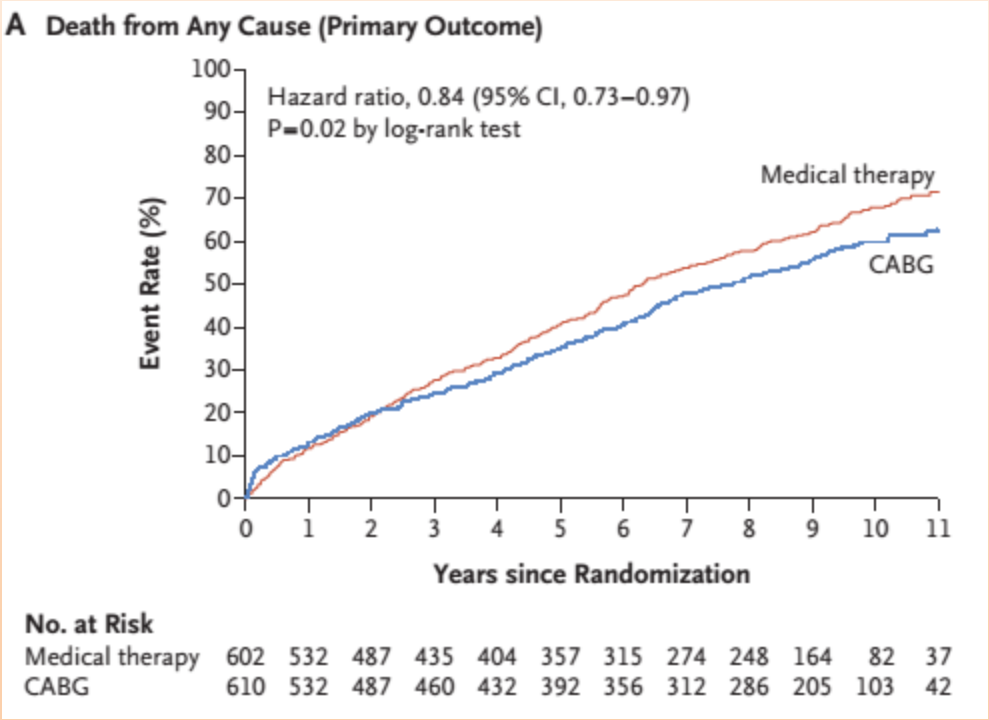


STICHES trial (Surgical Treatment for Ischemic Heart Failure Extension Study)

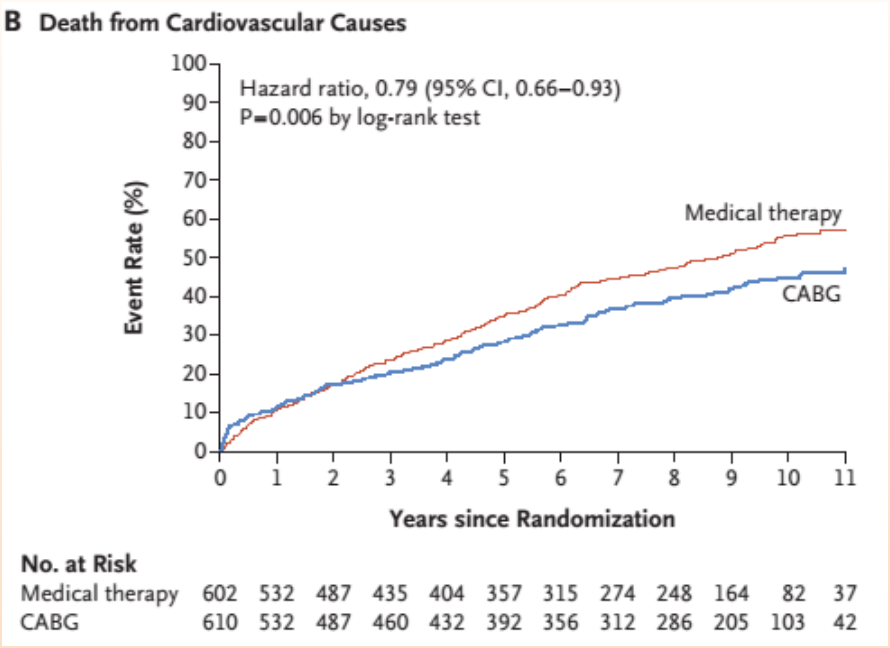
Mean Follow-up 9.8 years

Progressive divergence in the curve for mortality : 66% in the OMT group vs 58.9% in the CABG group (p 0.02)

High mortality rate in both groups

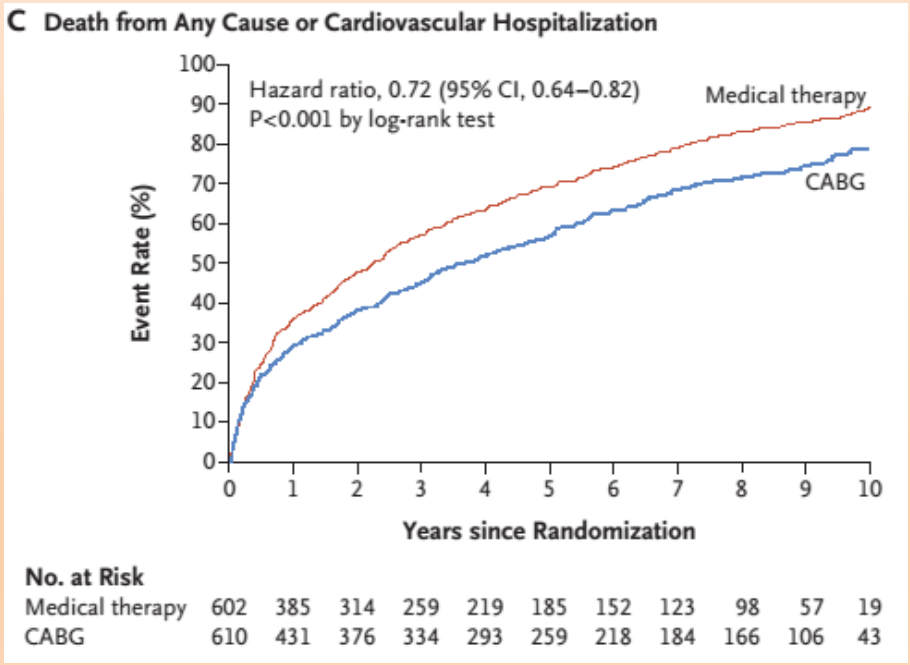


Velazquez EJ et al N Engl J Med 2016;374:1511-20



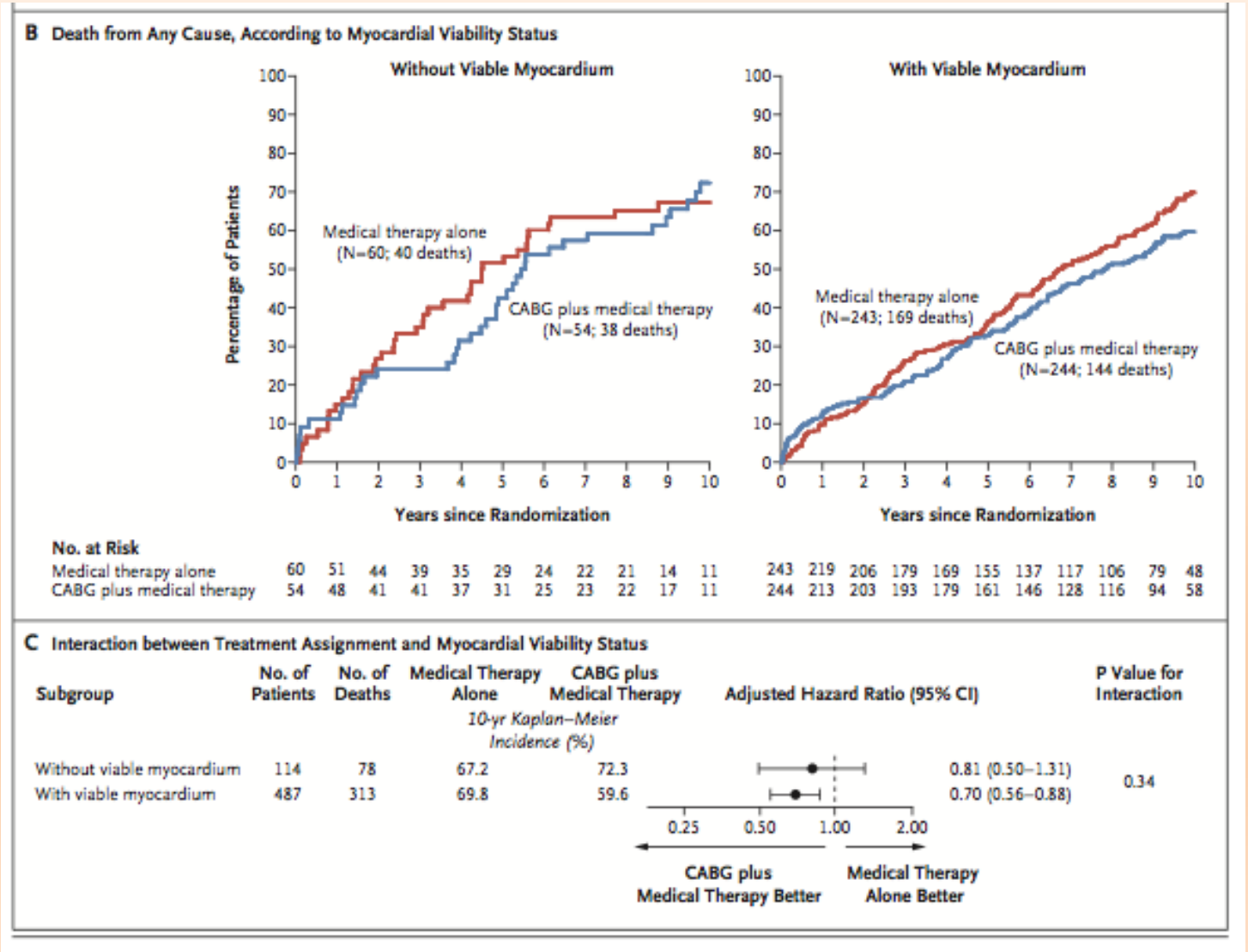
Progressive divergence in the curve for cardiovascular mortality : 49.3% in OMT group vs 40.5% in CABG group (p 0.006)

NNT 14 to prevent one death



Velazquez EJ et al N Engl J Med 2016;374:1511-20

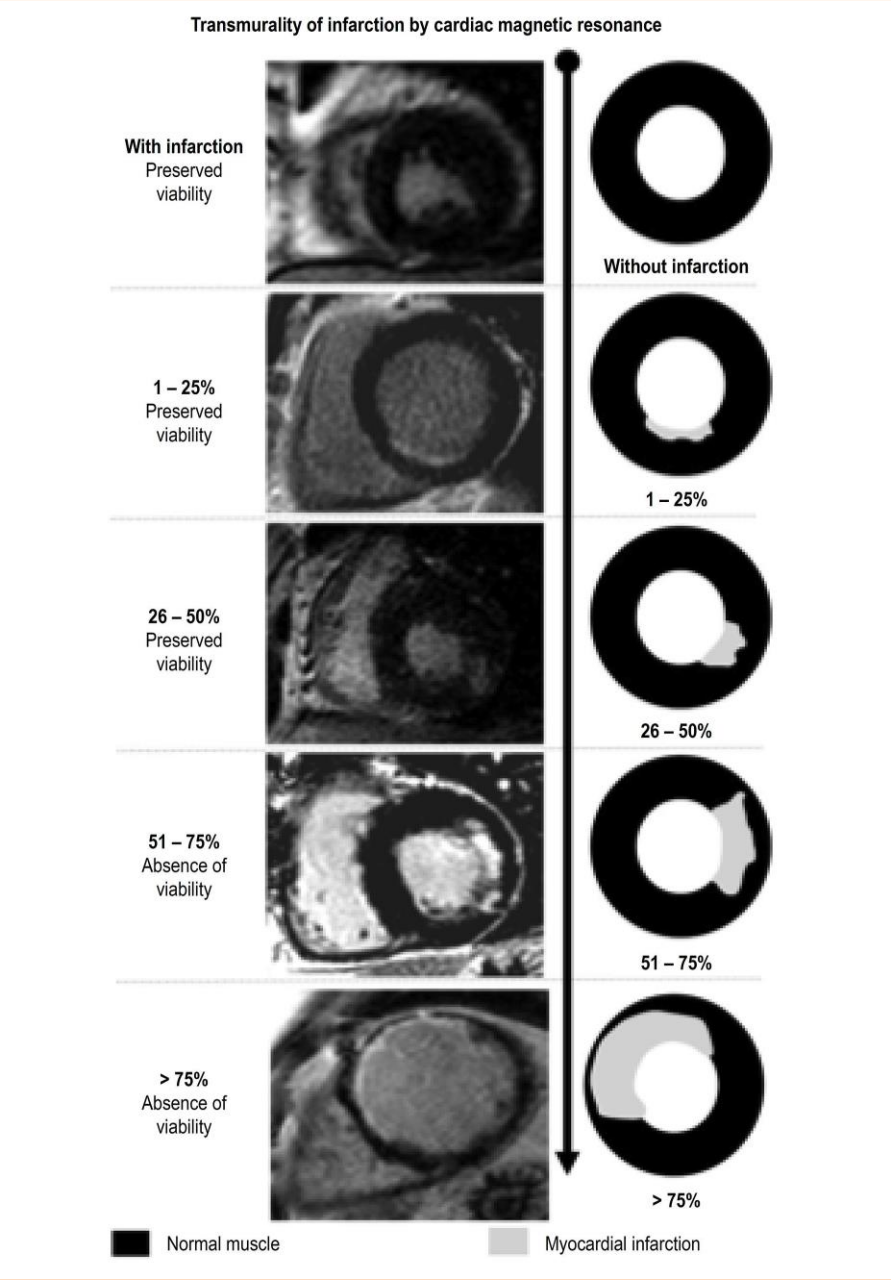
STICH Extension Study (10 years results): still myocardial viability does not predict benefit from revascularization on mortality



STICH viability, limitations

- Only about one-half of eligible patients from the main trial
- Optional viability testing performed at clinician's discretion
- Significant differences in baseline characteristics between those with versus those without viability testing
- Small sample size of the group with nonviable myocardium (114 of 601)
- Use of not gold standard technique for viability assessment (SPECT or stress echo instead of FDG-PET or CMR)
- Binary classification of viability with controversial thresholds for extent and uptake

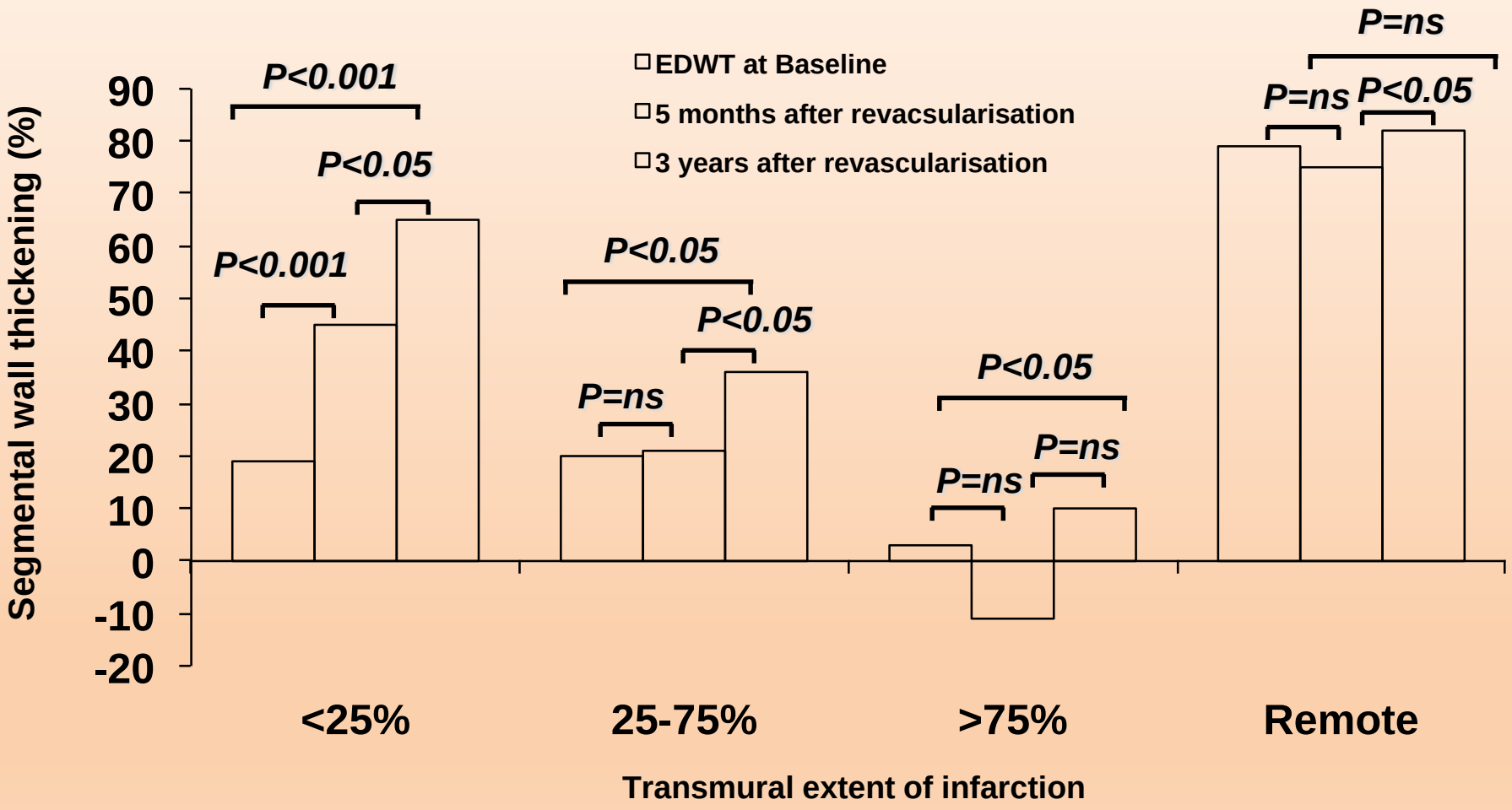
Threshold for myocardial viability assessment by CMR



Transmural myocardial infarction:

>50% wall thickness

MRI Predicts Wall Motion Improvement with CTO Revascularization

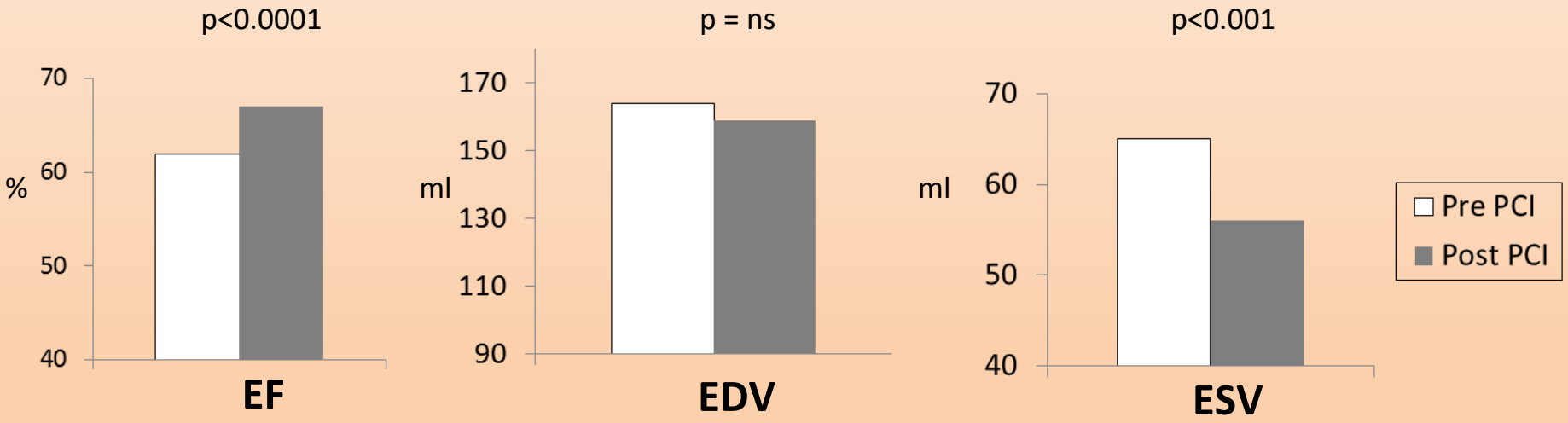


Kirschbaum Am J Cardiol 2008;101:179 –185

CMR Guidance for Recanalization of Coronary Chronic Total Occlusion

Chiara Bucciarelli-Ducci, MD, PhD,[a,b,c] Dominique Auger, MD, PhD,[a] Carlo Di Mario, MD, PhD,[b,d] Didier Locca, MD,[a] Joanna Petryka, MD,[a] Rory O'Hanlon, MD,[a] Agata Grasso, MD,[a] Christine Wright, RN,[d] Karen Symmonds, RT,[a] Ricardo Wage, RT,[a] Eleni Asimacopoulos, MB, ChB,[a] Francesca Del Furia, MD,[d] Jonathan C. Lyne, MD,[a,d] Peter D. Gatehouse, PhD,[a,b] Kim M. Fox, MD,[b,d] Dudley J. Pennell, MD[a,b]

Global LV function post CTO Recanalisation



JACC Imaging 2010

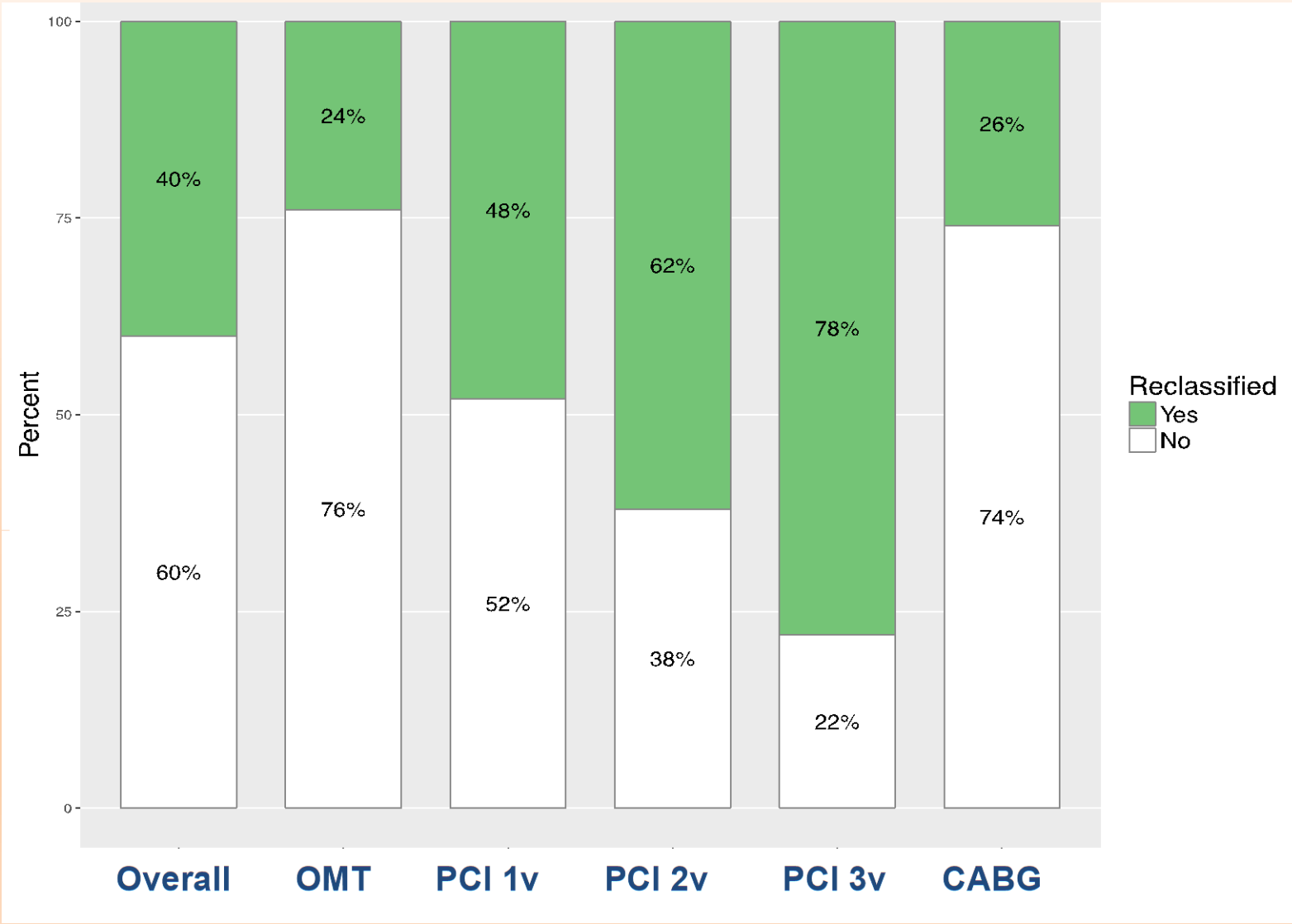
What is new in the 2019 Guidelines?

New recommendations (1)

Class I	Class IIa	Class III
Non-invasive functional imaging or coronary CTA as the initial test for diagnosing CAD.	Invasive coronary angiography with availability of invasive functional evaluation for confirmation of CAD diagnosis in patients with uncertain diagnosis on non-invasive testing.	Coronary CTA when any conditions make good image quality unlikely.
Initial non-invasive diagnostic test based on the clinical likelihood of CAD, patient characteristics, local expertise and availability.	Coronary CTA as an alternative to invasive angiography if another non-invasive test is equivocal or non-diagnostic.	
Functional imaging for myocardial ischaemia if coronary CTA has shown CAD of uncertain functional significance or is not diagnostic.		
Invasive angiography to diagnose CAD in patients with - a high clinical likelihood and severe symptoms refractory to medical therapy - typical angina at low level of exercise and clinical evaluation that indicates high event risk. Invasive functional assessment must be available and used to evaluate stenoses before revascularization, unless very high grade (>90% diameter stenosis).		

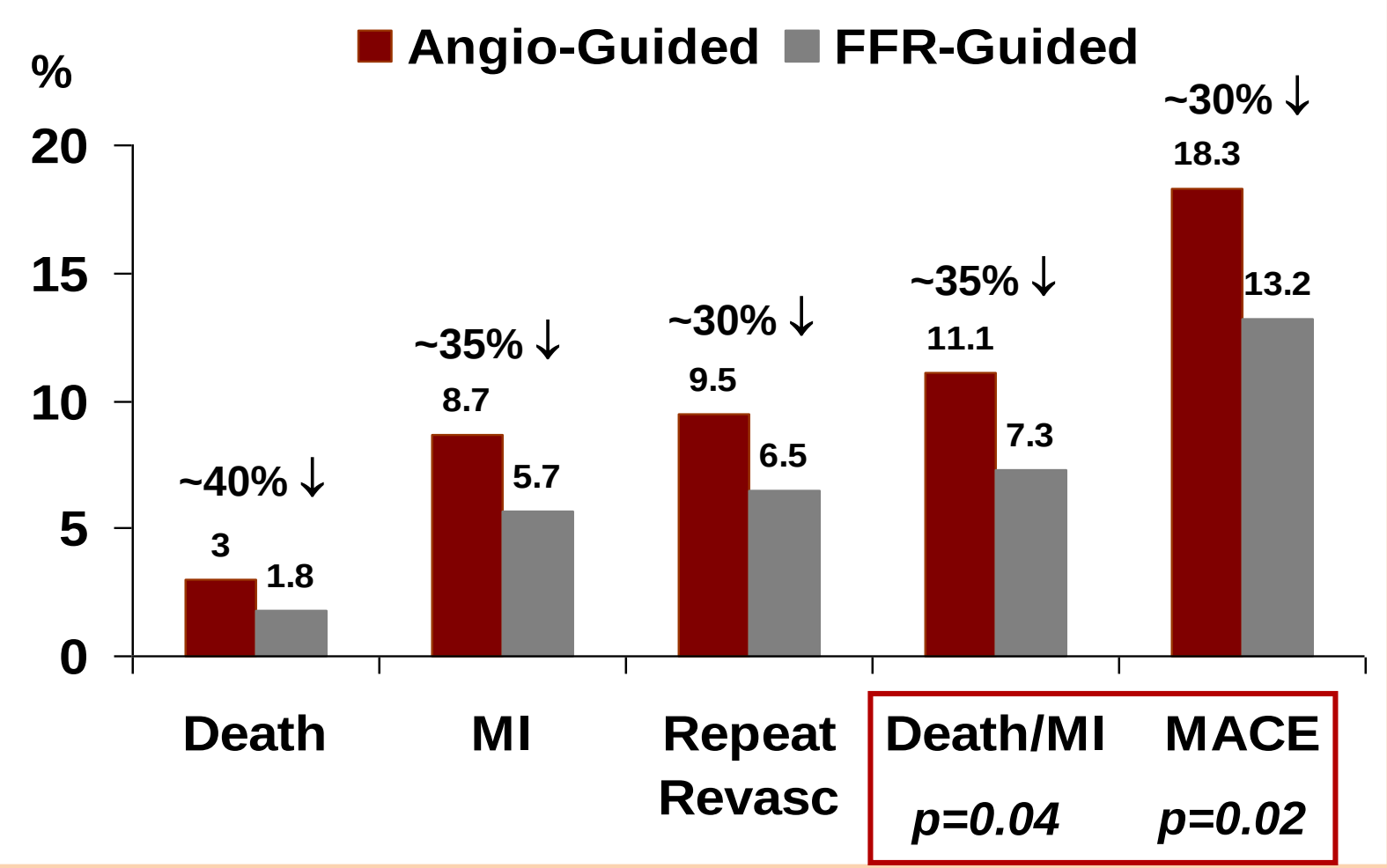
Presented by Gotberg & SWEDEHEART Investigators

Change from treatment plan before randomization to actual treatment after iFR/FFR



FAME 1: One Year Outcomes

1,005 patients with multivessel CAD randomized to FFR-guided vs angiography-guided PCI



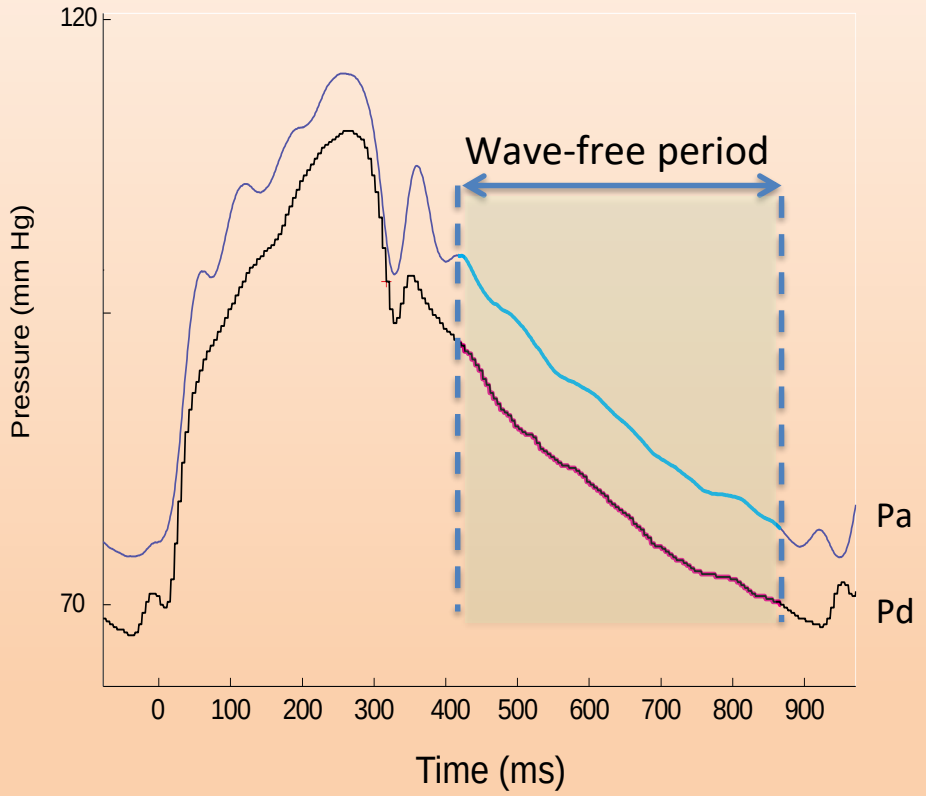
Tonino, et al. New Engl J Med 2009;360:213-24.

iFR = instantaneous wave-free ratio

A resting index of stenosis severity that does not need adenosine

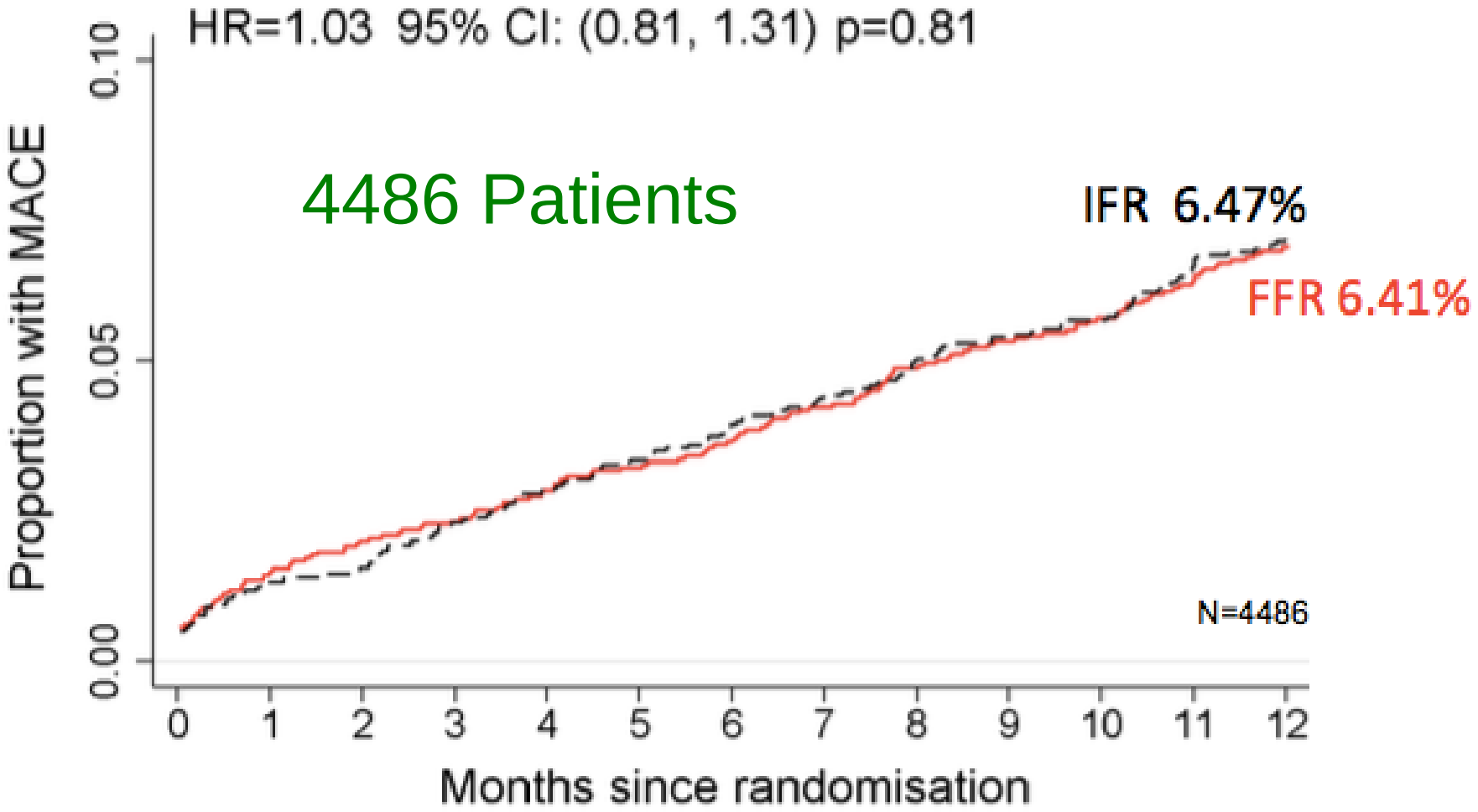
Definition:

Instantaneous pressure ratio, across a stenosis during the wave-free period, when resistance is naturally constant and minimised in the cardiac cycle



Sen S, ..., Davies J: J Am Coll Cardiol 2012;59:1392-402

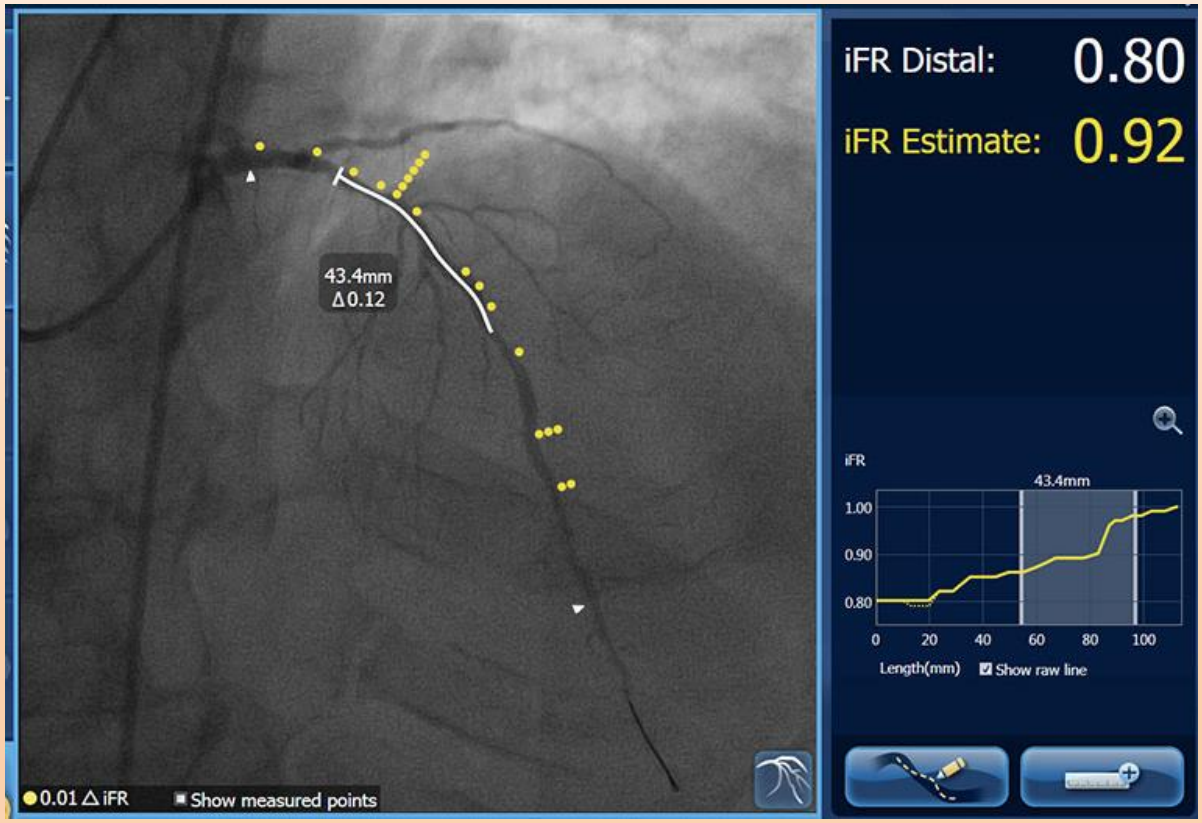
Combined results of iFR-Swedeheart and Define-Flair



MACE similar and low at 1 year after iFR- and FFR-based revascularization decision-making

Role of invasive functional assessment: iFR Co-registration

- Mapping of pressure drops onto the angiogram to better assess diffuse disease
- Precise lesion severity, location and length assessment
- No need for motorised pullback



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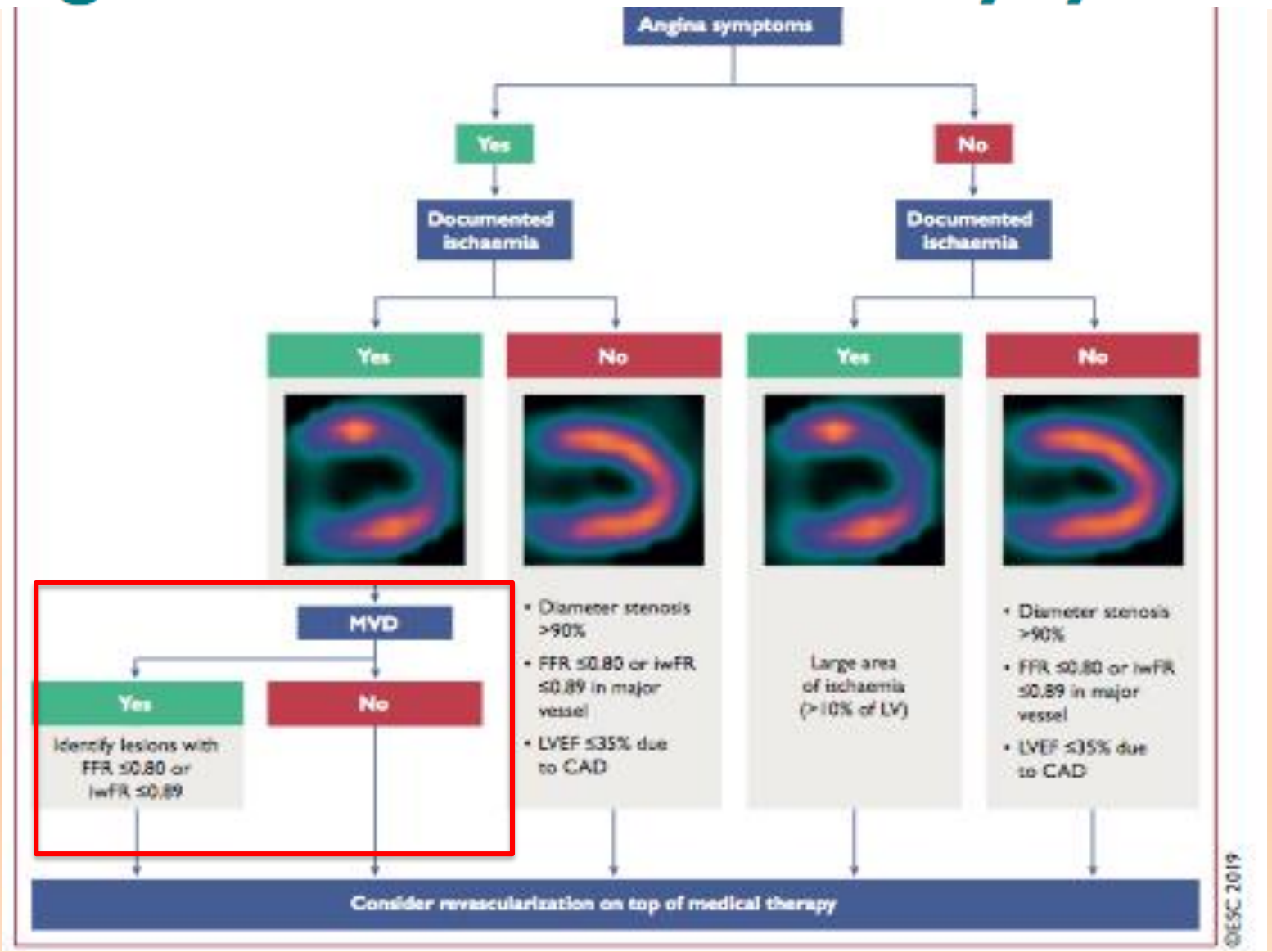

Perform PCI: Search for Ischaemia/viability in severe HF is of Limited Value

Conclusion

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