Management of the high-risk SIHD patient:
PCI vs CABG for multi-vessel disease

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European Heart Journal (2016) **37**, 1873–1882
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REVIEW

Clinical update

Revascularization in stable coronary artery disease: a combined perspective from an interventional cardiologist and a cardiac surgeon

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REVIEW

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Received December 2014, revised & accepted January 2016

What's the difficulty?

- **Data interpretation**
  - Numerous studies over >20 years
  - Era comparability
  - Evolving technology and techniques
  - Power
  - Inclusion
    - **RCTs**: Selection bias (eg: age, gender, ethnicity)
    - Unsuitability for randomisation
    - **Registries:** Unmeasured confounding factors (eg: frailty)
  - Duration of follow-up
- **Comparability**
  - Disease severity
  - Symptoms
  - Extent & severity of ischaemia
  - Extrapolation of findings to other patient groups
- **Relative values for outcomes**

Consensus

"…….adherence to **guideline-based medical therapy** are the cornerstones of treatment in patients with stable-CAD, and **revascularization** (PCI or CABG) should always be considered as **a supplemental therapeutic strategy**. Furthermore, the indication for revascularization should be clearly defined on **symptomatic and/or prognostic grounds**."

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Consensus

Table 1 Patients with stable coronary artery disease: essential tenets of care

(1) Aggressive risk-factor control and adherence to guideline-based medical therapy

(2) Consideration of revascularization using either PCI or CABG in addition to guideline-based medical therapy

(3) Establishment and implementation of a Heart Team approach for evaluation of patients with complex coronary anatomy

(4) Communicating risk/benefit for proposed revascularization in a patient-centric care model

(5) Optimizing follow-up care plans

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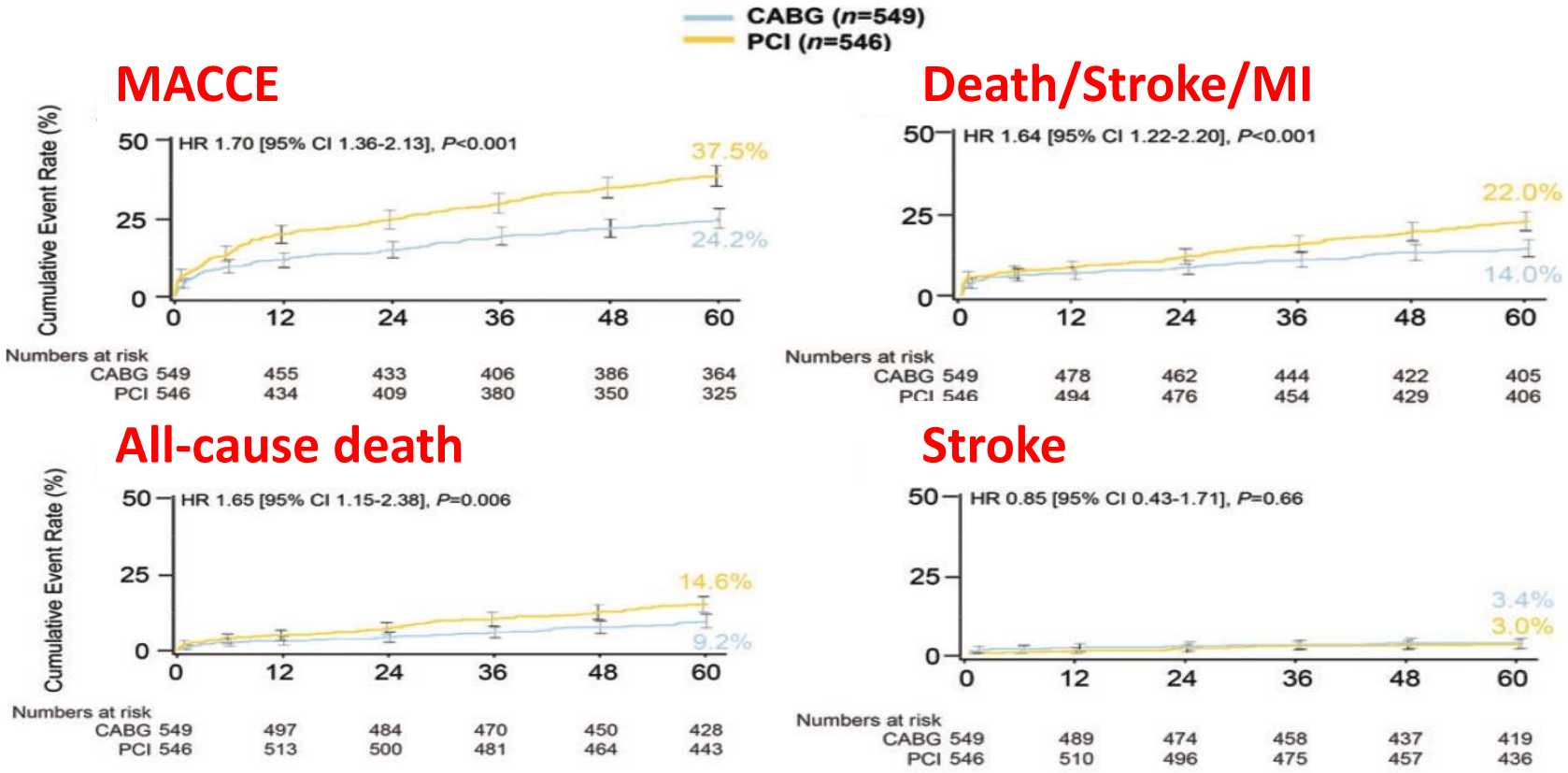
Factors to consider

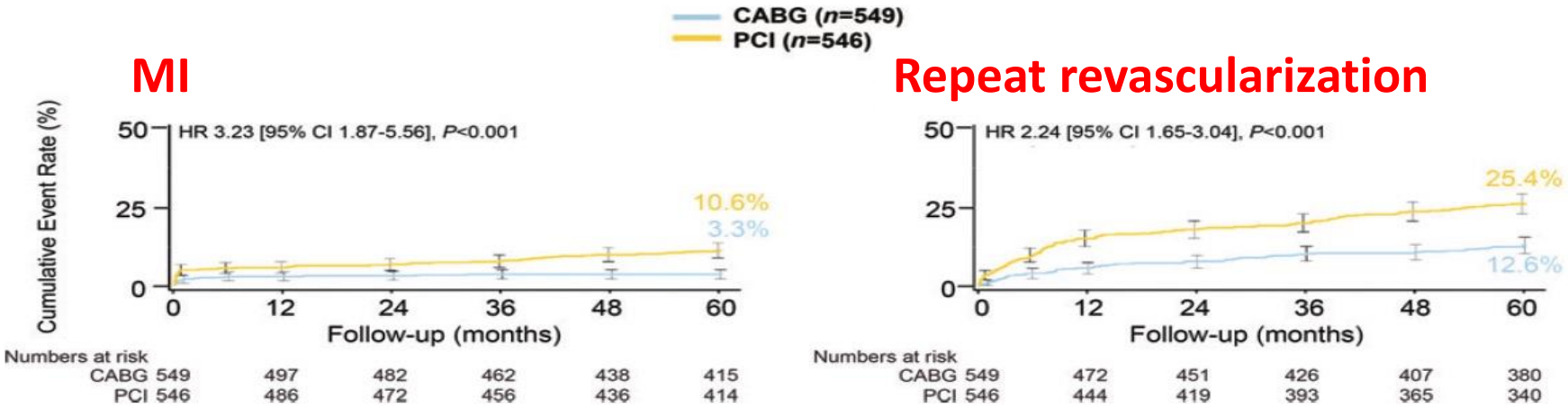
- Anatomical extent & severity of disease
- Co-morbidity as it affects:
  - Outcomes
  - Procedural risk
- Presence & extent of myocardial ischaemia and viability
- Level of symptoms
- Patient choice

PCI vs CABG for 3VCAD



SYNTAX Trial – 5-year follow-up. Eur Heart J 2014;35:2821-2830

PCI vs CABG for 3VCAD



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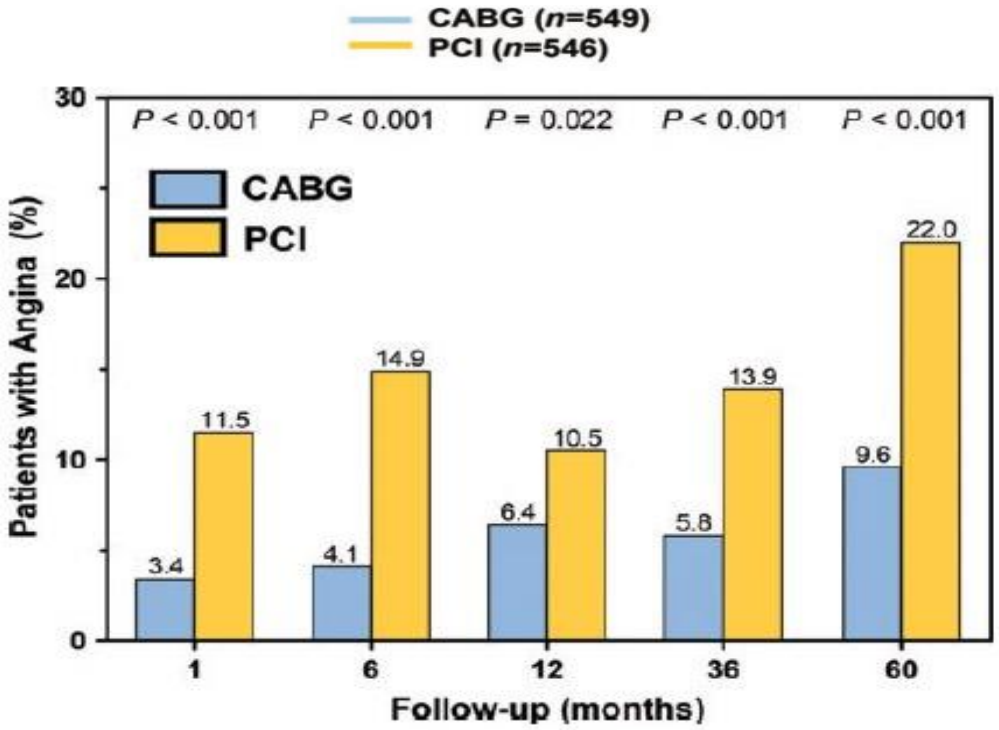
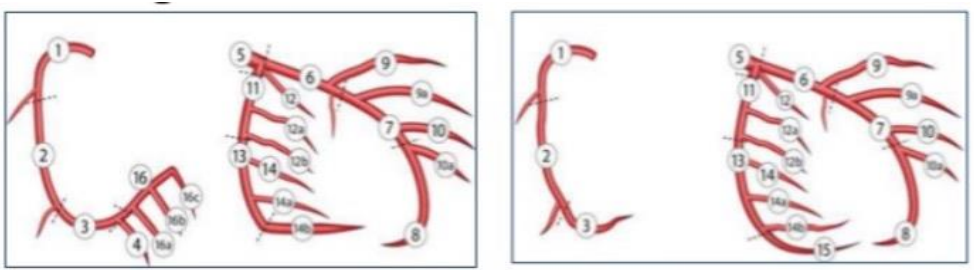
Angina



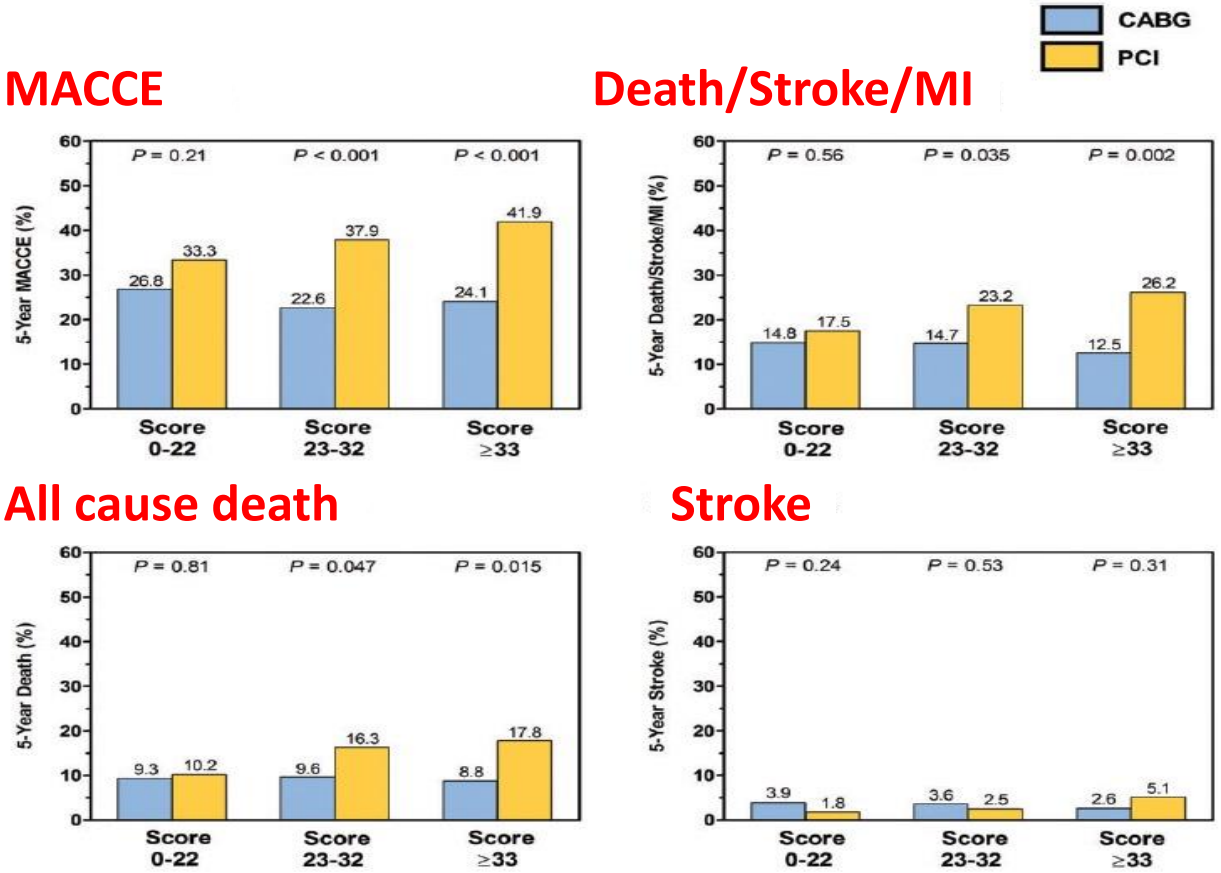
SYNTAX Trial – 5-year follow-up. Eur Heart J 2014;35:2821-2830

SYNTAX Score
(0-22, 23-32, >33)

- Composite score from sum of points assigned to coronary lesions of >50% narrowing, in vessels >1.5mm
- Coronary circulation divided into 16 segments according to AHA classification and ‘weighted’ by importance



Effect of SYNTAX Score



SYNTAX Trial – 5-year follow-up. Eur Heart J 2014;35:2821-2830

European Heart Journal (2014) 35, 2541–2619
doi:10.1093/eurheartj/ehu278

2014 ESC/EACTS Guidelines on myocardial revascularization

Recommendation for the type of revascularization (CABG or PCI) in patients with SCAD with suitable coronary anatomy for both procedures and low predicted surgical mortality

Recommendations according to extent of CAD	CABG		PCI		
	Class[a]	Level[b]	Class[a]	Level[b]	Ref[c]
One or two-vessel disease without proximal LAD stenosis.	IIb	C	I	C	
One-vessel disease with proximal LAD stenosis.	I	A	I	A	107,108,160, 161,178,179
Two-vessel disease with proximal LAD stenosis.	I	B	I	C	108,135,137
Left main disease with a SYNTAX score ≤ 22.	I	B	I	B	17,134,170
Left main disease with a SYNTAX score 23–32.	I	B	IIa	B	17
Left main disease with a SYNTAX score >32.	I	B	III	B	17
Three-vessel disease with a SYNTAX score ≤ 22.	I	A	I	B	17,157,175,176
Three-vessel disease with a SYNTAX score 23–32.	I	A	III	B	17,157,175,176
Three-vessel disease with a SYNTAX score >32.	I	A	III	B	17,157,175,176

CABG = coronary artery bypass grafting; LAD = left anterior descending coronary artery; PCI = percutaneous coronary intervention; SCAD = stable coronary artery disease.
[a]Class of recommendation.
[b]Level of evidence.
[c]References.

SYNTAX II Score

- Combination of anatomical and clinical factors
  - Age,
  - Creatinine clearance
  - Left ventricular (LV) function
  - Gender
  - Chronic obstructive pulmonary disease
  - Peripheral vascular disease
- Predicts long-term mortality in complex 3V or LMS disease
- Superior to the conventional SYNTAX score in guiding decision-making between CABG and PCI in the SYNTAX trial

The NEW ENGLAND JOURNAL of MEDICINE

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Strategies for Multivessel Revascularization in Patients with Diabetes

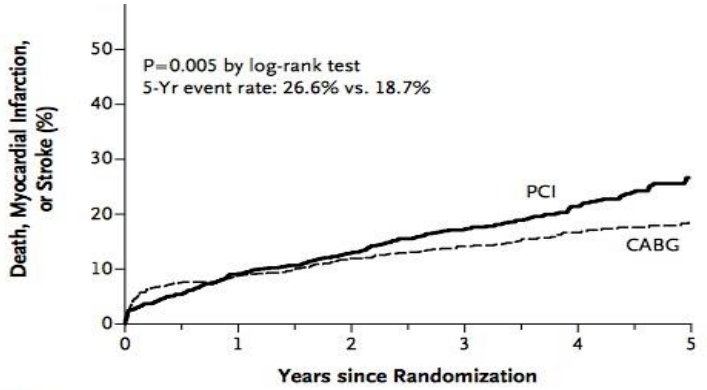
Michael E. Farkouh, M.D., Michael Domanski, M.D., Lynn A. Sleeper, Sc.D., Flora S. Siami, M.P.H., George Dangas, M.D., Ph.D., Michael Mack, M.D., May Yang, M.P.H., David J. Cohen, M.D., Yves Rosenberg, M.D., M.P.H., Scott D. Solomon, M.D., Akshay S. Desai, M.D., M.P.H., Bernard J. Gersh, M.B., Ch.B., D.Phil., Elizabeth A. Magnuson, Sc.D., Alexandra Lansky, M.D., Robin Boineau, M.D., Jesse Weinberger, M.D., Krishnan Ramanathan, M.B., Ch.B., J. Eduardo Sousa, M.D., Ph.D., Jamie Rankin, M.D., Balram Bhargava, M.D., John Buse, M.D., Whady Hueb, M.D., Ph.D., Craig R. Smith, M.D., Victoria Muratov, M.D., M.P.H., Sameer Bansilal, M.D., Spencer King III, M.D., Michel Bertrand, M.D., and Valentin Fuster, M.D., Ph.D., for the FREEDOM Trial Investigators*

N Engl J Med 2012;367:2375-84.
DOI: 10.1056/NEJMoa1211585

FREEDOM Trial

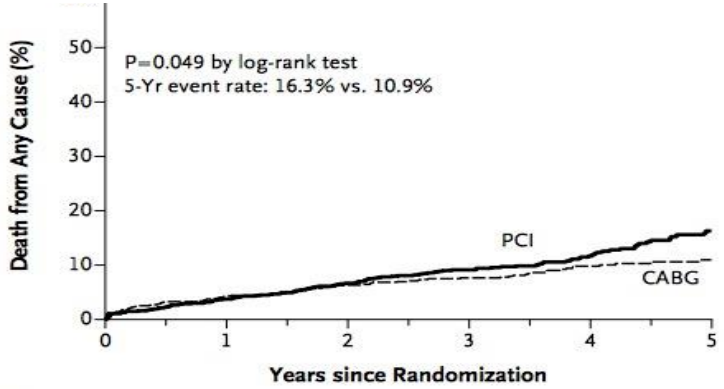
PCI vs CABG in Diabetes

Primary outcome



No. at Risk						
PCI	953	848	788	625	416	219
CABG	947	814	758	613	422	221

Death



No. at Risk						
PCI	953	897	845	685	466	243
CABG	947	855	806	655	449	238

- Primary outcome: death, MI or stroke
- mean age 63.1±9.1 years; 29% were women
- 83% had three- vessel disease

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Ischaemia predicts outcome

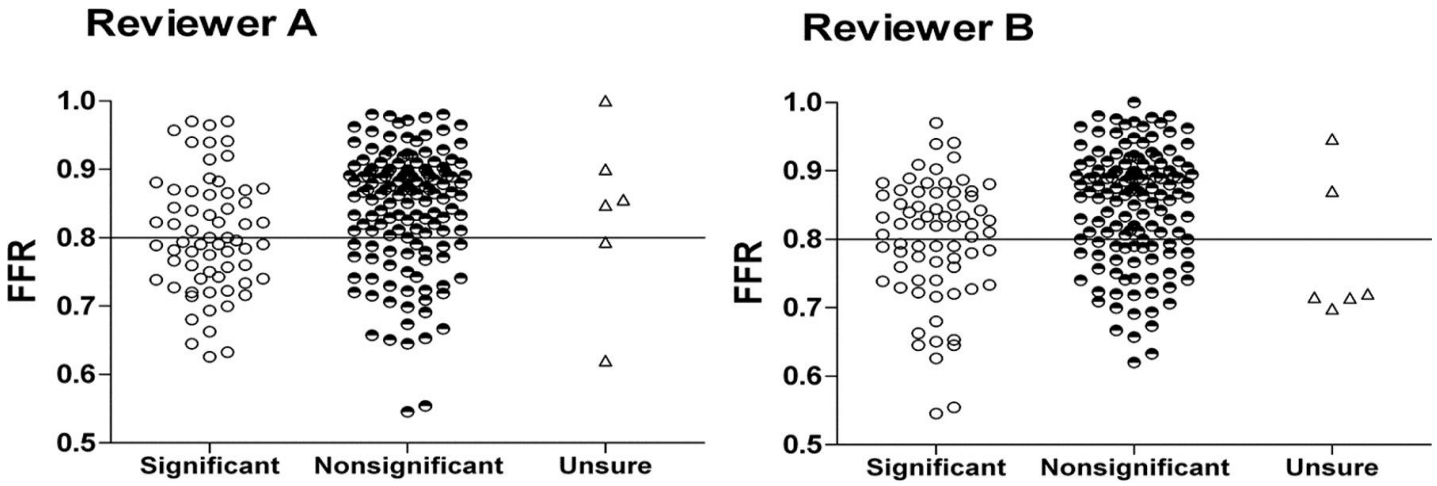
In patients with similar degree of anatomic disease, the most important predictor of outcome is the ***presence and extent of inducible ischemia***

- *12000 patients with MVD,*
- *Similar angiographic severity of CAD*
- **MIBI negative → 0.6 %** annual event rate (mortality/MI)
- **MIBI positive → 7.2%** annual event rate (mortality/MI)

Beller GA, Zaret BL*. Circulation 2000;101:1465-1478*
See also:
Pavin D, Delonca J, Siegenthaler M, et al. *Eur Heart J 1997;18:69 –77*
Shaw LJ, Iskandrian AE. J Nucl Cardiol 2004;11:171-85.
Shaw LJ, Berman DS, Maron DJ, et al. (COURAGE) trial nuclear substudy. *Circulation 2008;117:1283-91.*
Vanzetto G, Ormezzano O, Fagret D, et al. *Circulation 1999;100:1521–7*

We’re not very good at guessing LMS physiology from the angiogram

Relation between FFR values and the 2 reviewers’ visual estimations (LMS lesions were classified as significant, non-significant, and unsure).



Hamilos M et al. Circulation 2009;120:1505-1512

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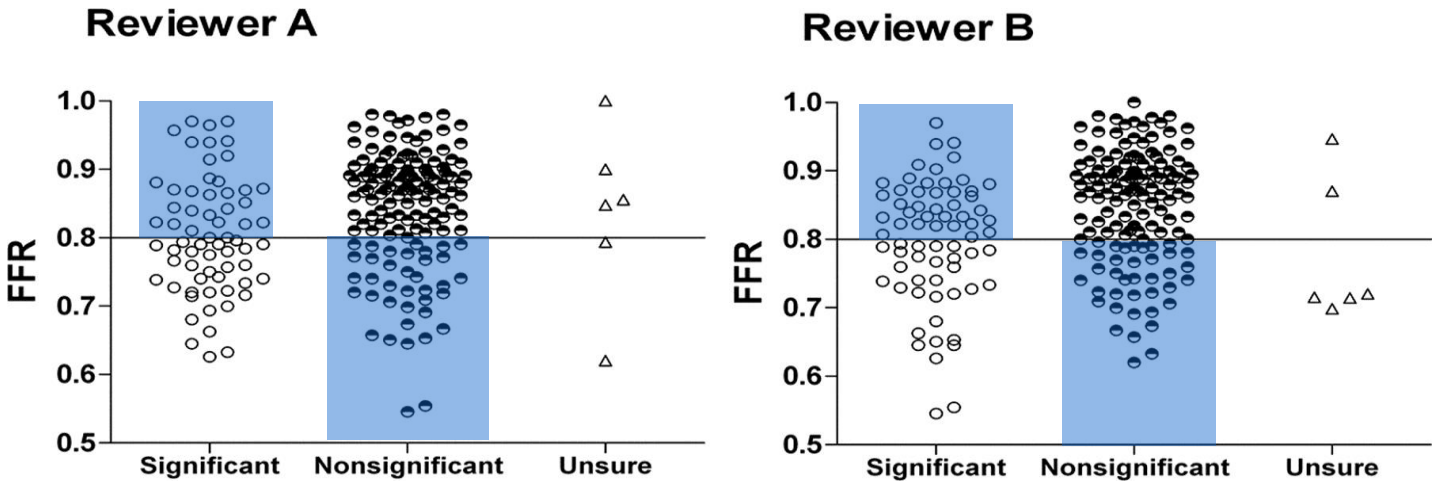

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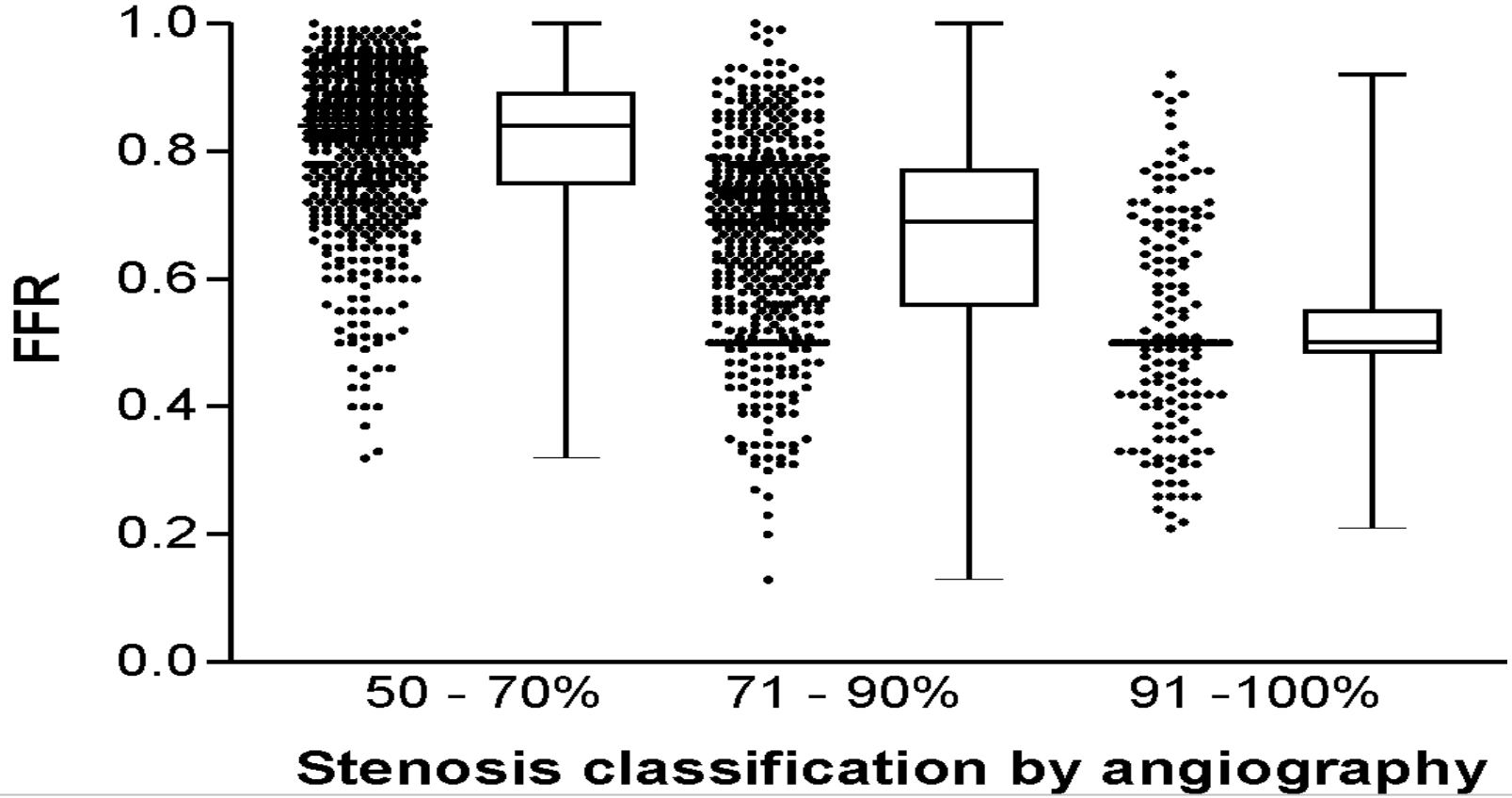
How did angio severity relate to FFR?



FAME Study. *NEJM 2009;360:213-224 & JACC 2010;56:177-184*

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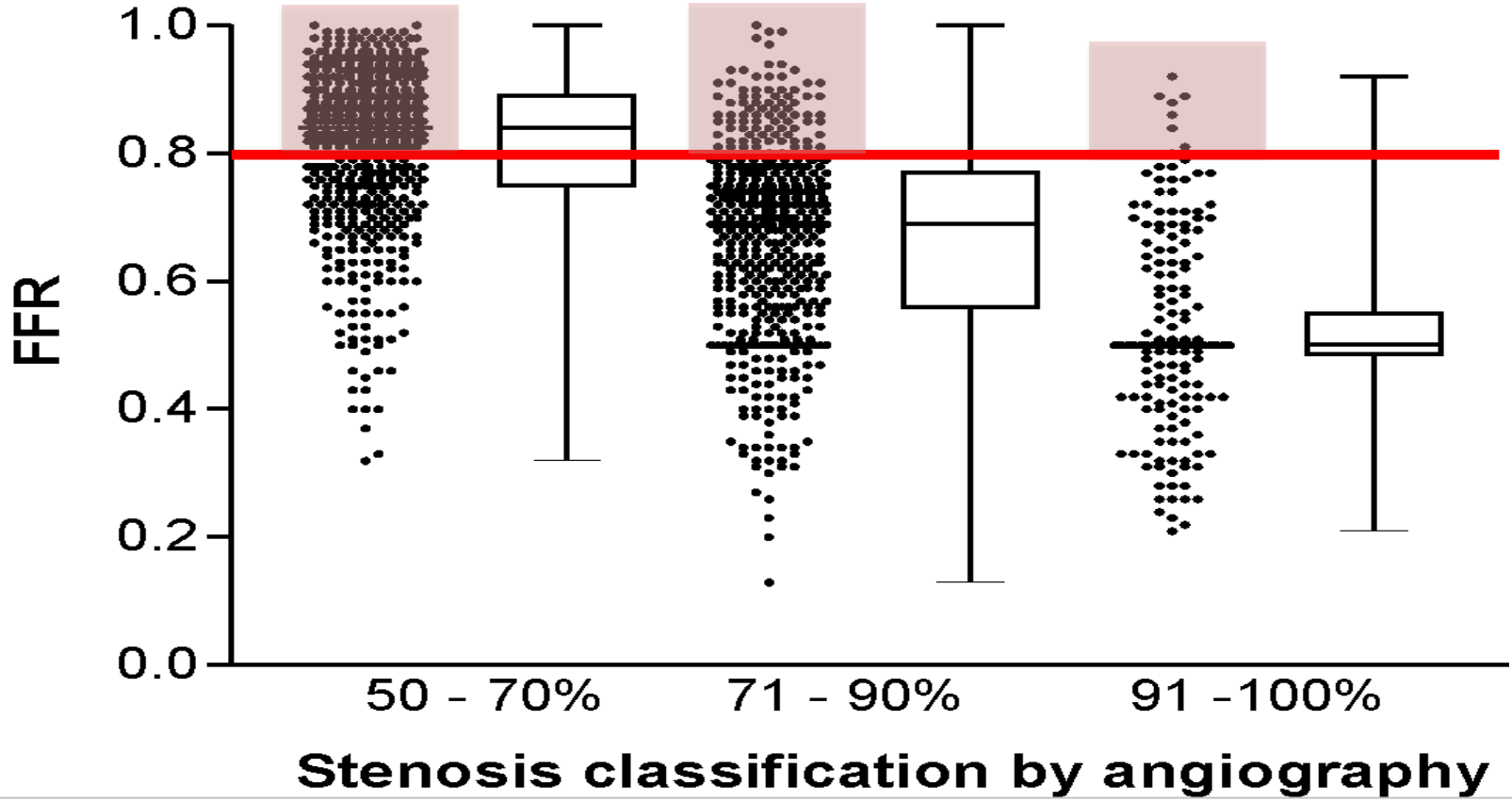


FAME Study. *NEJM 2009;360:213-224 & JACC 2010;56:177-184*

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Fractional Flow Reserve–Guided PCI for Stable Coronary Artery Disease

Bernard De Bruyne, M.D., Ph.D., William F. Fearon, M.D., Nico H.J. Pijls, M.D., Ph.D., Emanuele Barbato, M.D., Ph.D., Pim Tonino, M.D., Ph.D., Zsolt Piroth, M.D., Nikola Jagic, M.D., Sven Mobius-Winckler, M.D., Gilles Rioufol, M.D., Ph.D., Nils Witt, M.D., Ph.D., Petr Kala, M.D., Philip MacCarthy, M.D., Thomas Engström, M.D., Keith Oldroyd, M.D., Kreton Mavromatis, M.D., Ganesh Manoharan, M.D., Peter Verlee, M.D., Ole Frobert, M.D., Nick Curzen, B.M., Ph.D., Jane B. Johnson, R.N., B.S.N., Andreas Limacher, Ph.D., Eveline Nüesch, Ph.D., and Peter Jüni, M.D., for the FAME 2 Trial Investigators*

N Engl J Med 2014;371:1208-17.
DOI: 10.1056/NEJMoa1408758

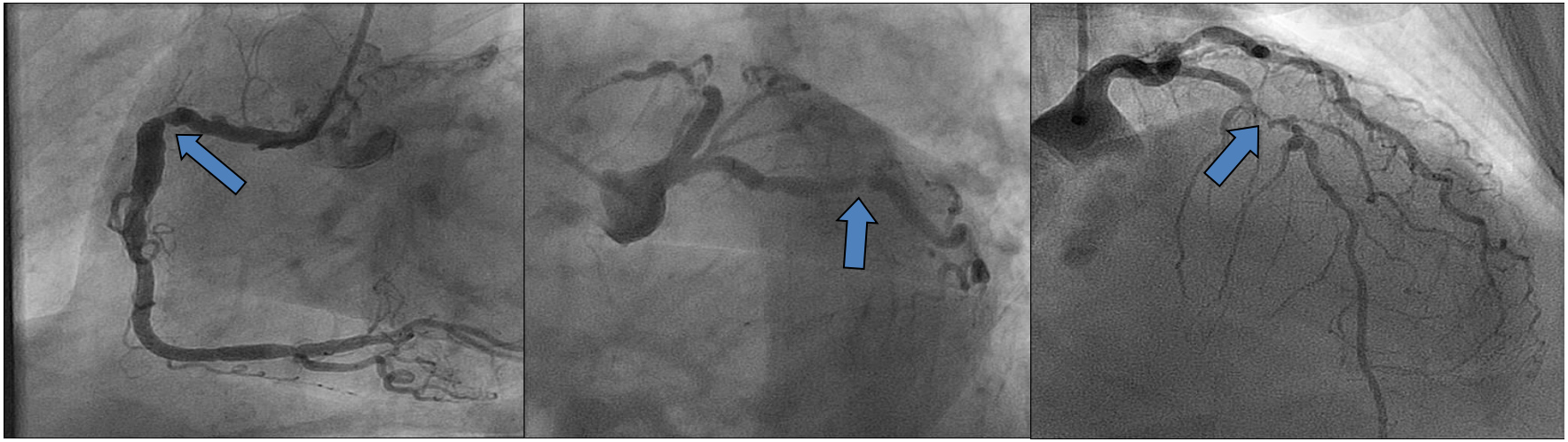
FAME-II

CONCLUSIONS

"In patients with stable CAD, FFR-guided PCI, as compared with medical therapy alone, improved the outcome. Patients without ischaemia had a favorable outcome with medical therapy alone."

N Engl J Med 2014;371:1208-17.
DOI: 10.1056/NEJMoa1408758

A Complex 3 vessel CABG case?



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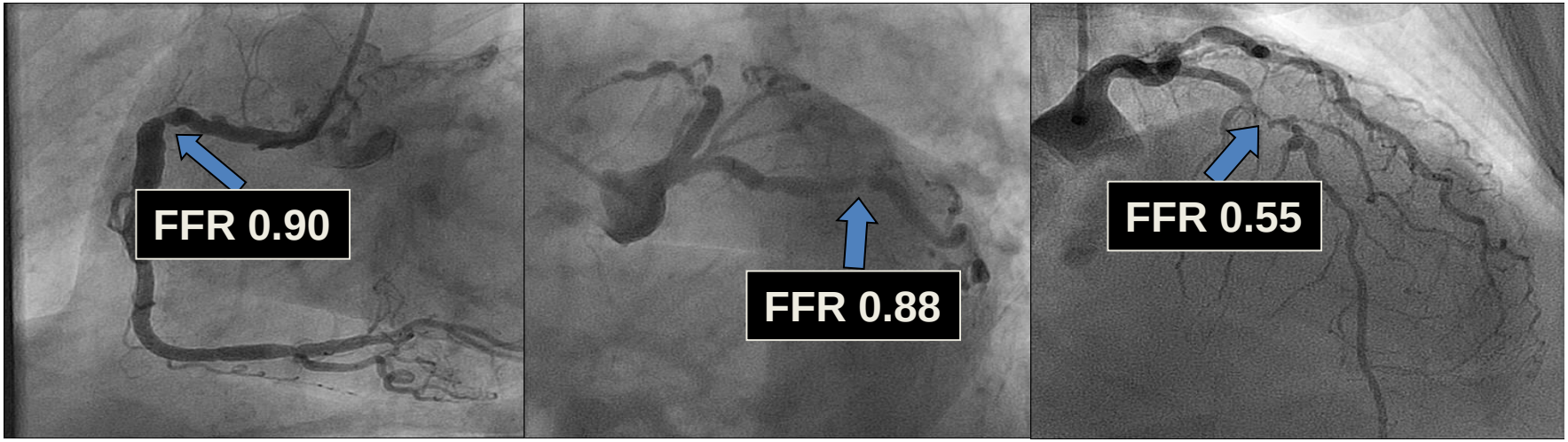

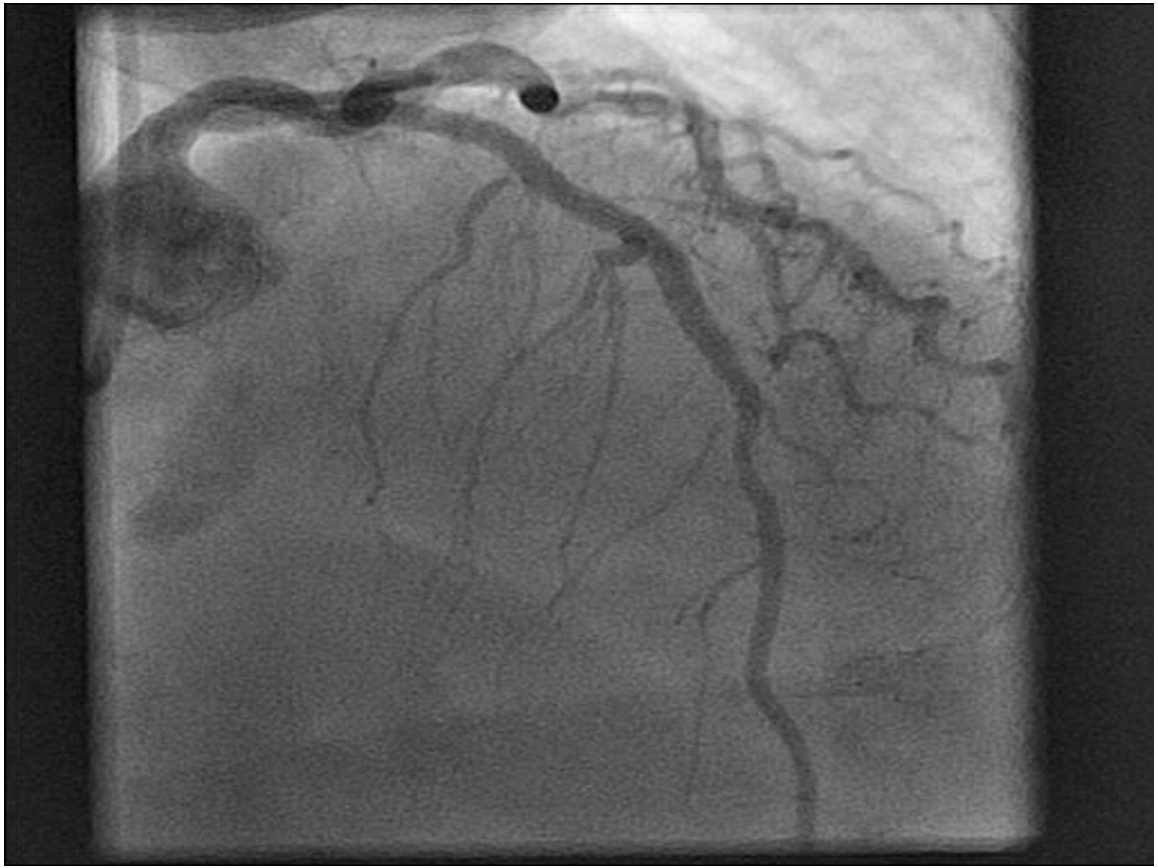

No further symptoms at follow-up

Factors influencing choice (patient and clinician)

- Co-morbidity
- Physician bias (‘Heart Team’)
- Inadequate patient information
- Patients’ misconceptions
- Patient’s ‘values’

Conclusions

In **stable multivessel** IHD:

- CABG and PCI can improve symptoms
- CABG is associated with better outcomes than PCI the more severe/extensive the disease, and in diabetics
- Presence and extent of myocardial ischaemia (& viability), and co-morbidity/procedural risk should be considered
- Physicians should avoid bias in recommending whether/what revascularisation strategy is recommended (‘Heart Team’)
- Patients should be as fully informed as possible
- A truly informed patient may choose differently than anticipated