The Lesson from EURO CTO Trial

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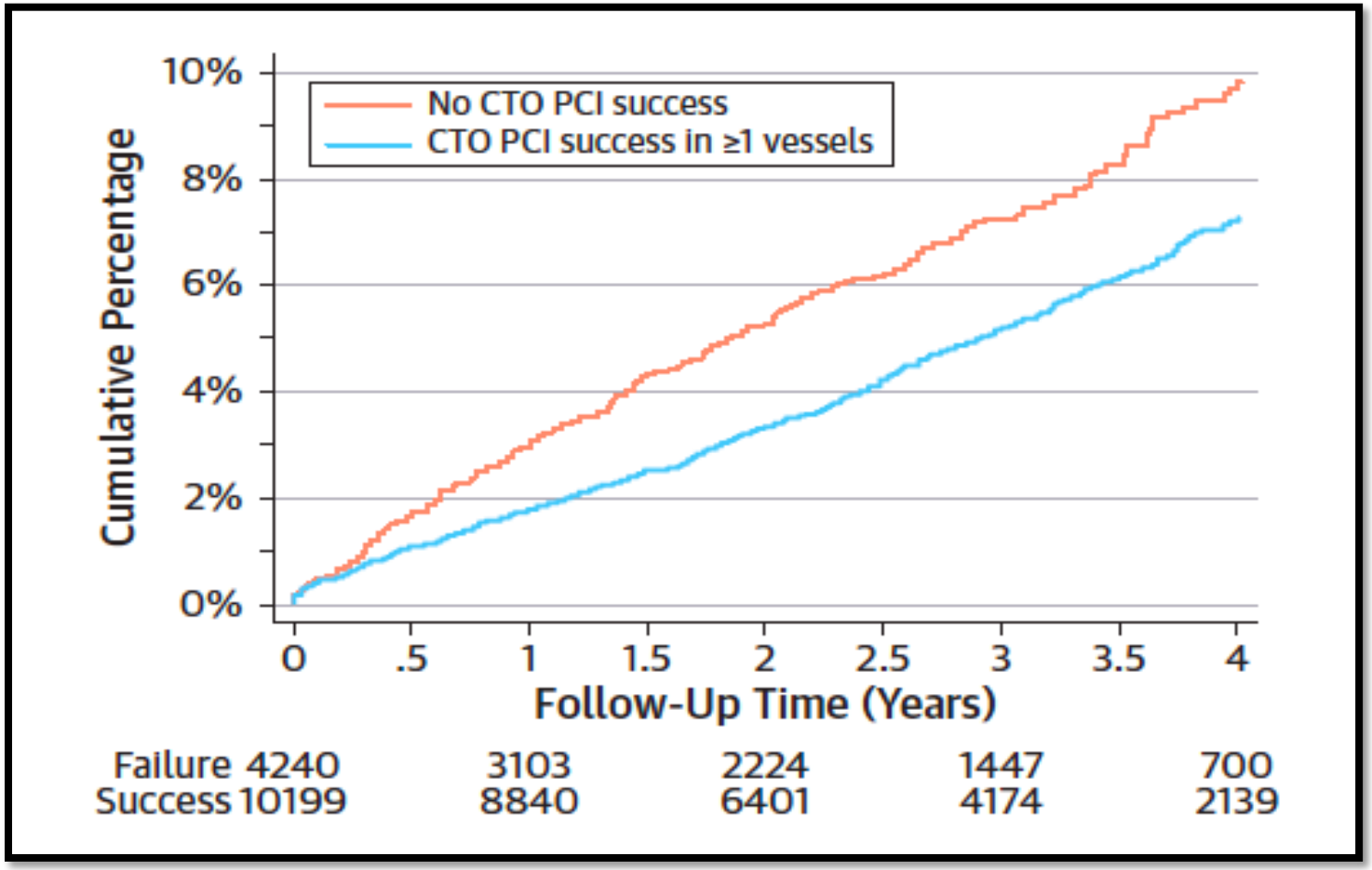
Conflict of interest

- I, Gerald S. Werner, MD, have no conflict of interest to declare with regard to the following presentation

The rational for CTO PCI

- **Improvement of clinical symptoms**
  - Relief of angina and ischemia
  - Improvement of physical capacity
  - Improved prognosis ?
- **But what can we realistically test in a RCT ?**

Overall Mortality and CTO Success

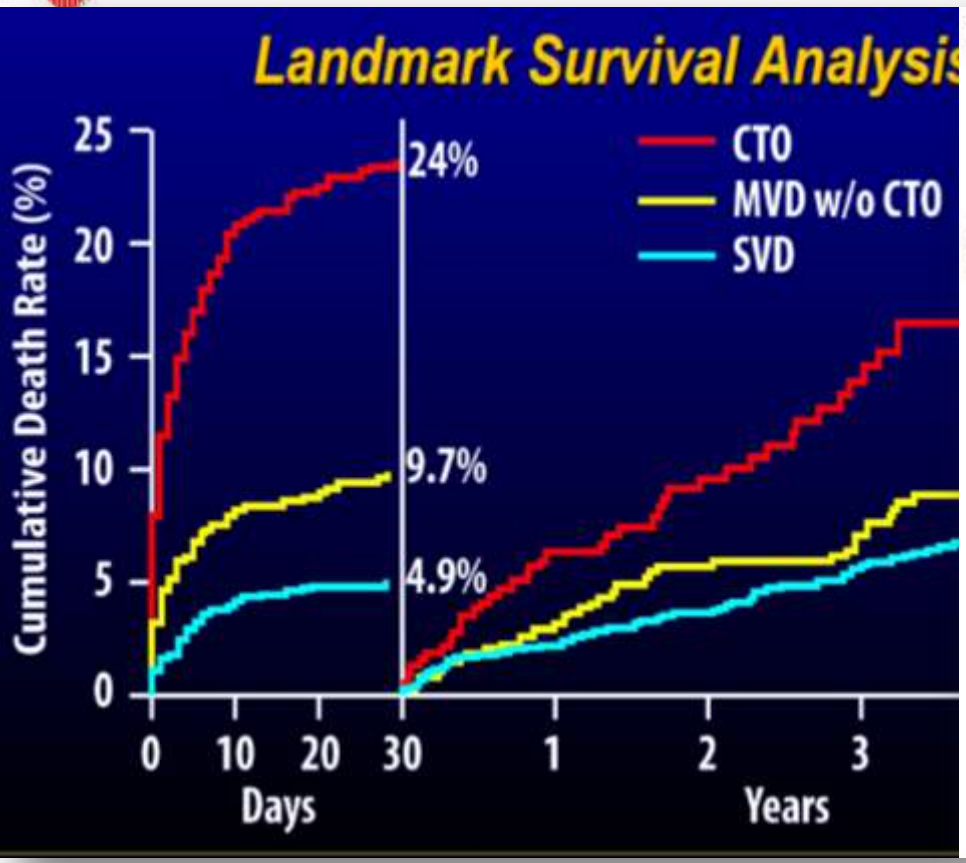


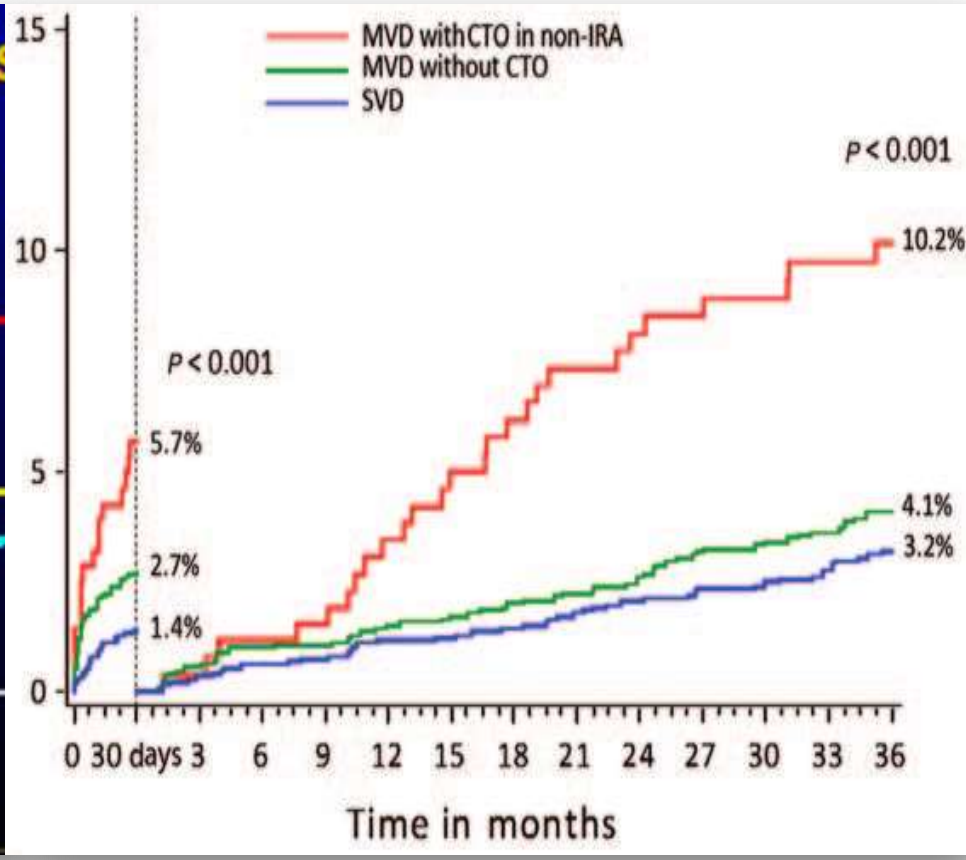
Successful PCI of at least 1 CTO was associated with improved survival

(hazard ratio [HR]: 0.72; 95% CI: 0.62 to 0.83; p < 0.001)

Sudhakar et al. *J Am Coll Cardiol.* 2014;64:235-243

Compare STEMI registry and RCT





Same effect of the presence of a CTO on survival with STEMI,
But on a much lower level

Claasen et al JACC Intervention 2009;2:1128

Claessen BE et al. Eur Heart J, 2012; epub

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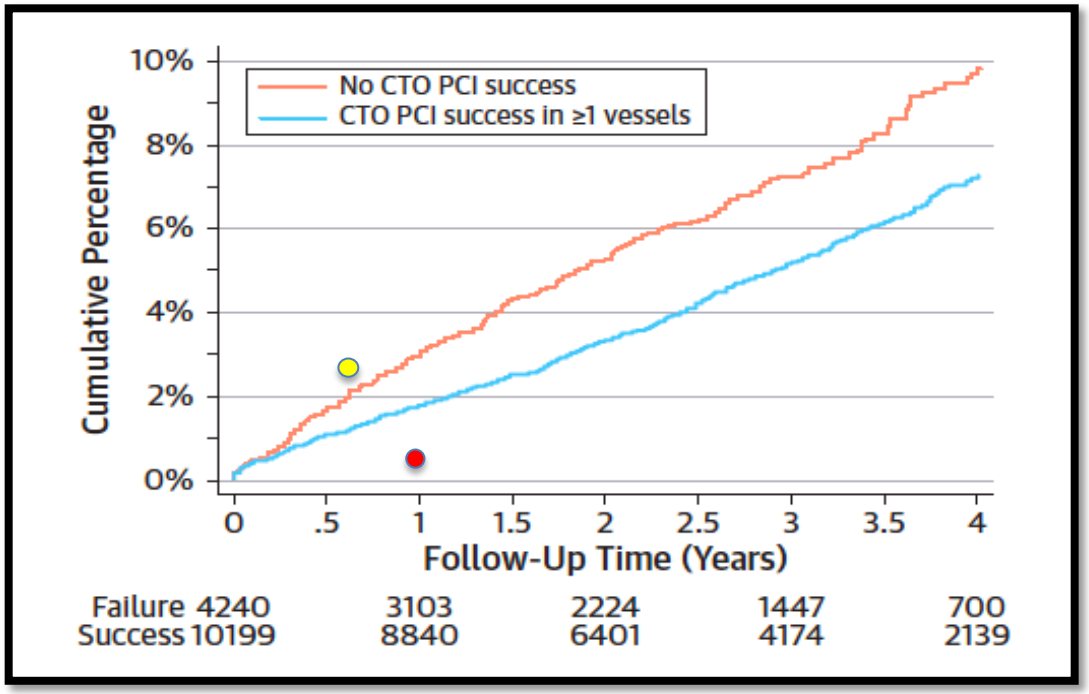


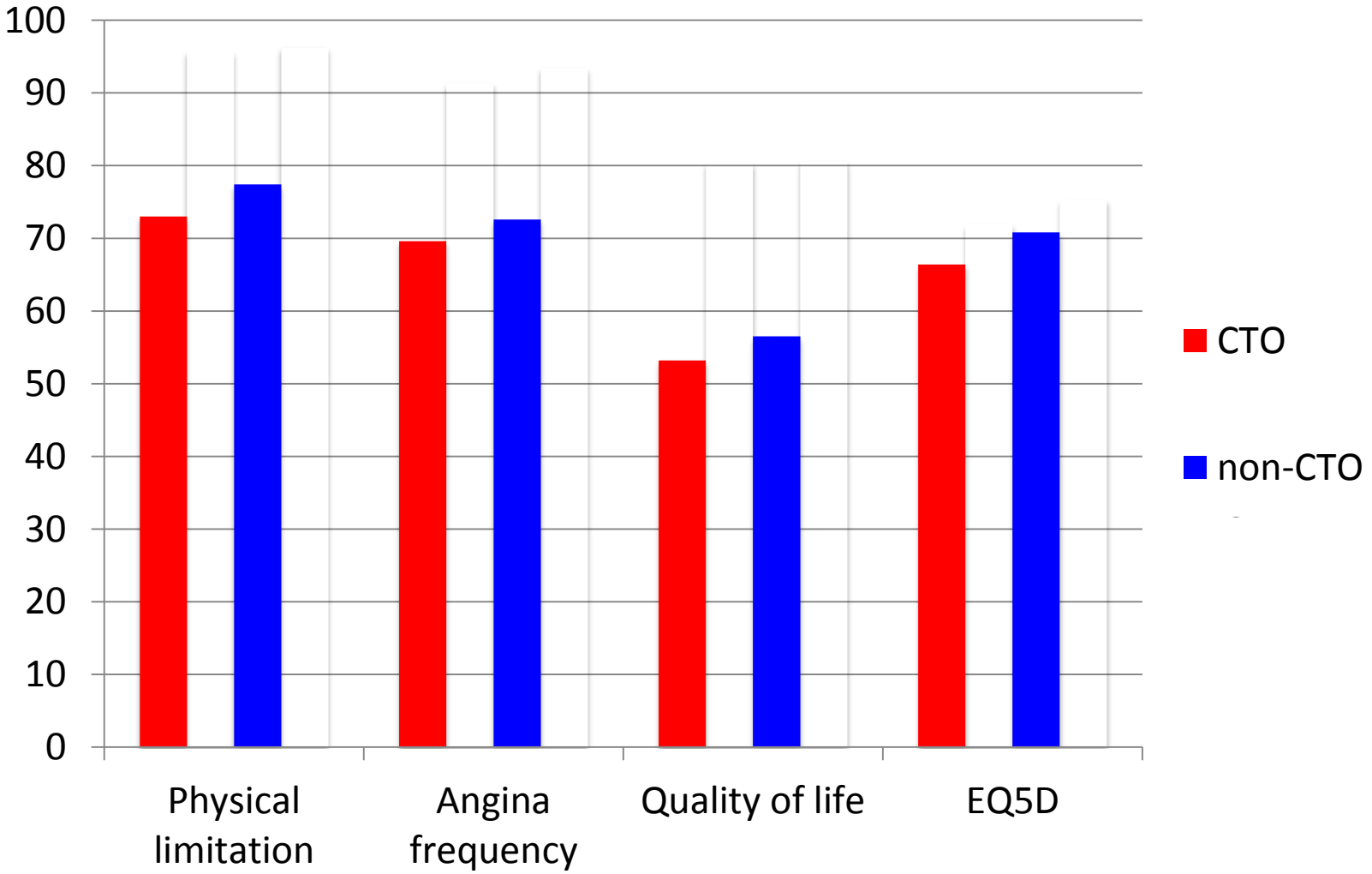
Mortality rate in	OPEN CTO: procedural: 0.9%;	6 months 2.8%
	DECISION CTO:	1 year <1%
	EURO CTO:	1 year 0.5%

Sudhakar et al. *J Am Coll Cardiol.* 2014;64:235-243

No RCT will show a mortality benefit for CTO PCI

- In RCT only less symptomatic patients are included if the alternative is OMT vs PCI
- Mortality improvement cannot be the primary goal of therapy in stable angina, but improvement of quality of life
- Better QoL is a valid goal of medical therapy

Quality of life in CAD



Safley DM et al. CCI 2013; e-pub

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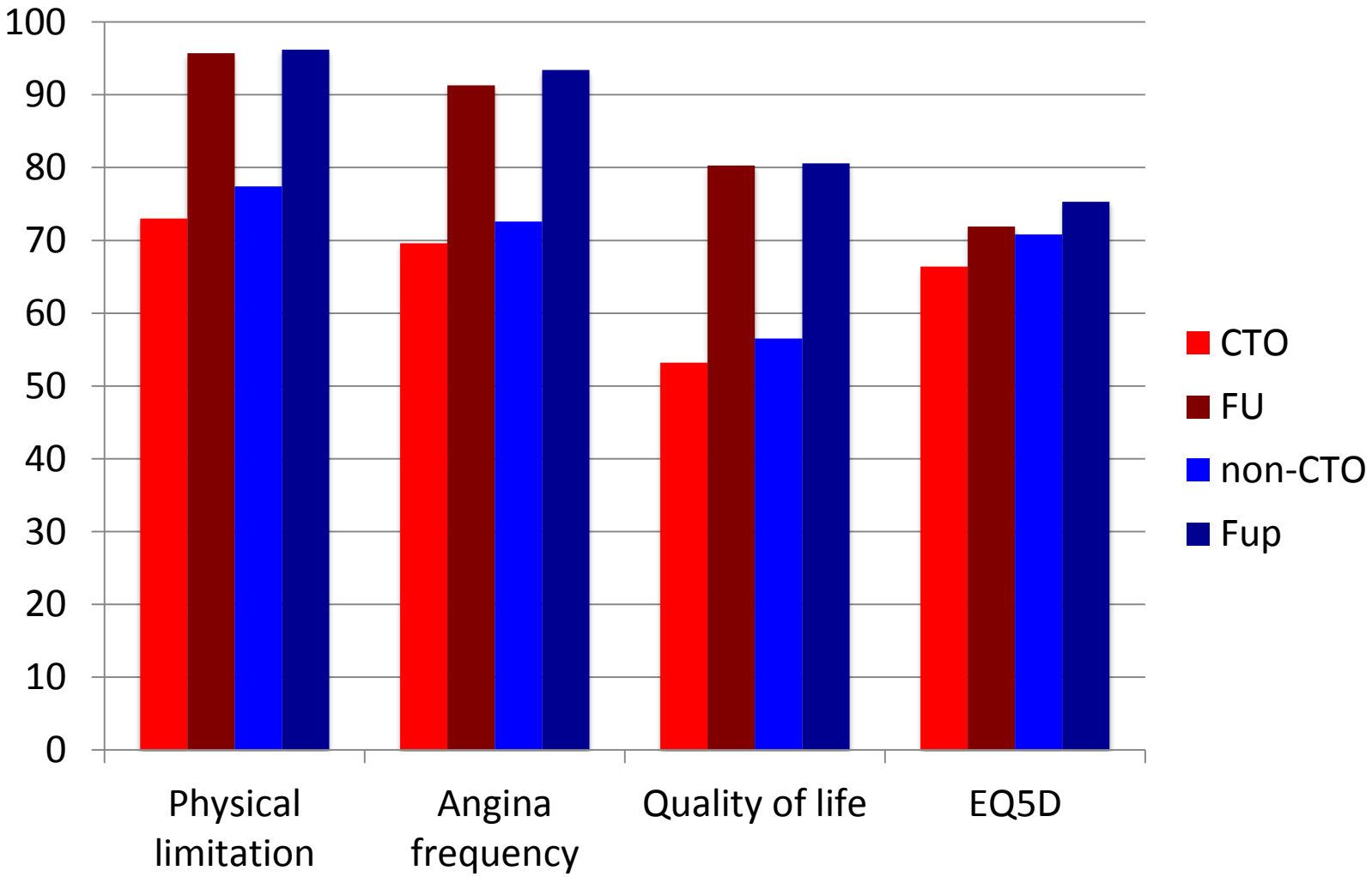

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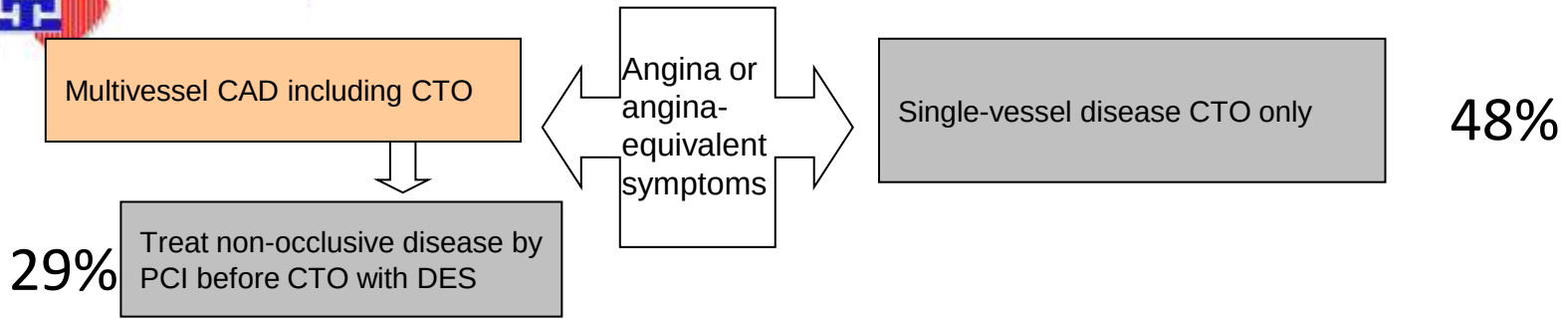
EURO-CTO Trial: Study flow chart



Major inclusion/exclusion criteria

- Patients with stable coronary artery disease and at least one CTO (TIMI 0, >3 months duration) with symptoms and/or ischemia and viability
- ***CTO location in a major artery (AHA 1-3, 6-7, 11) with a reference diameter ≥2.5mm***
- Patients with multi-vessel disease should receive PCI to significant non-CTO lesions before randomisation; if the CTO needed treatment first, the patient was excluded

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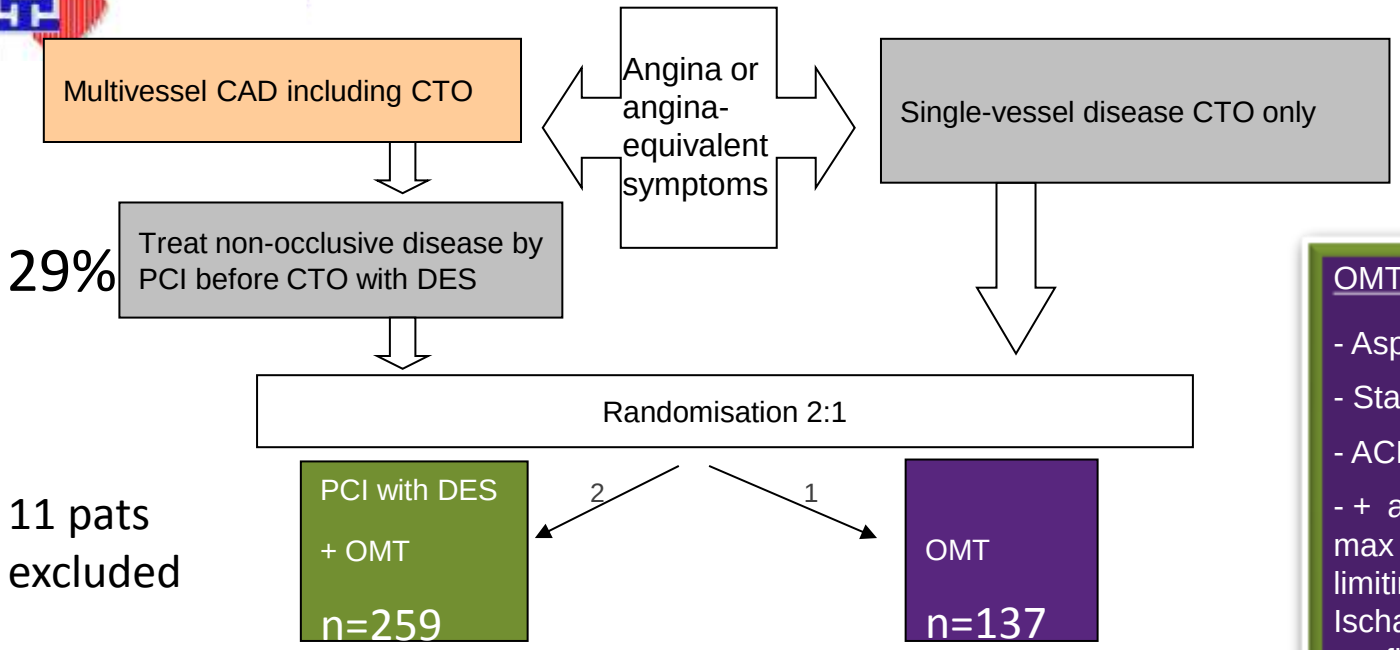

OMT to include:

- Aspirin,
- Statin,
- ACE-inhibitor where tolerated
- + at least 2 anti-anginal agents at max tolerated dose including rate-limiting agent where appropriate. Ischaemic symptoms should be confirmed with non-invasive test.

Efficacy: Health status @ 12 and 36 months
Safety: Death, non-fatal myocardial infarction (ITT, PP) @ 36 months

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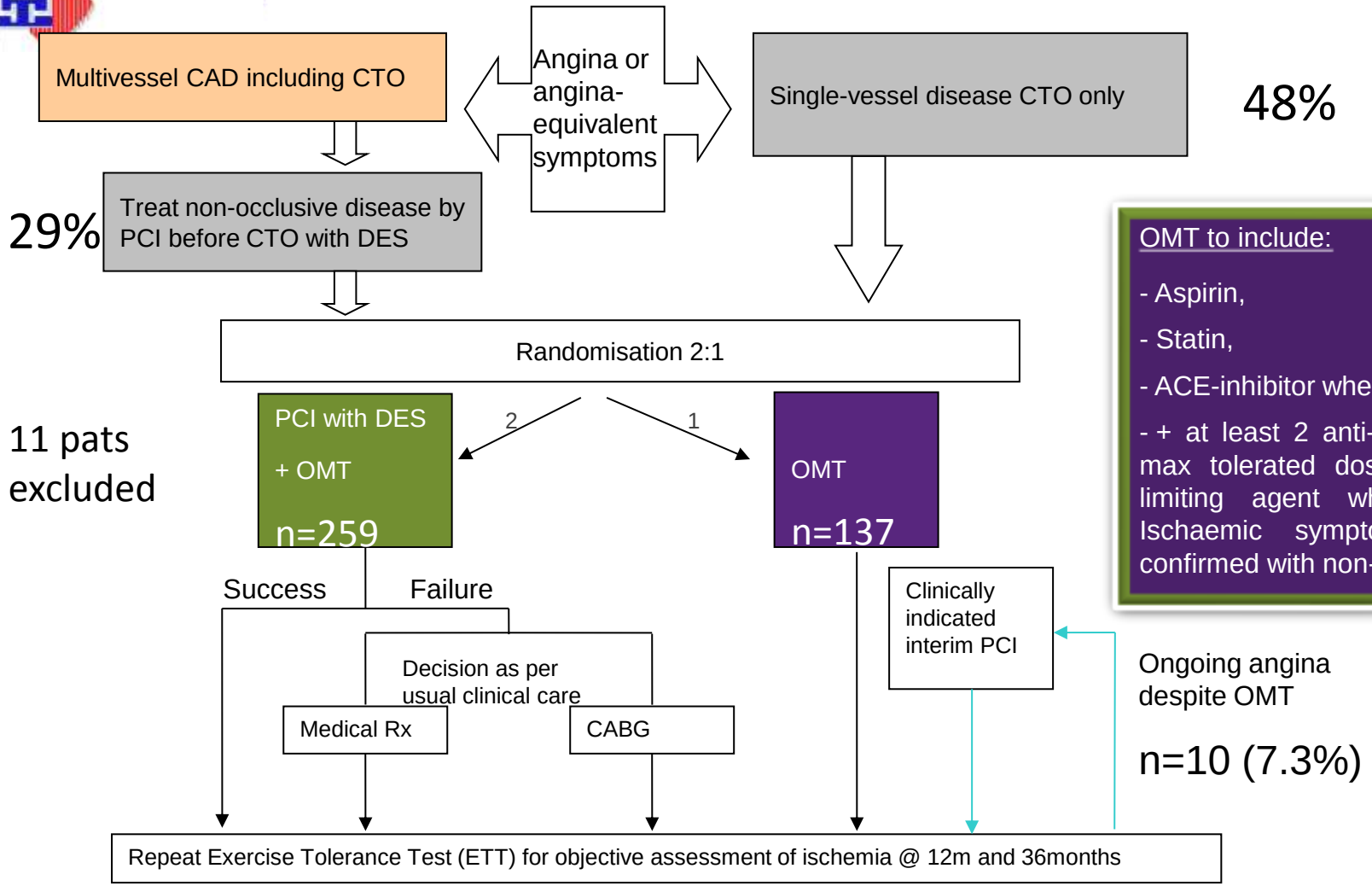

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Patient characteristics

	OMT (N=137)	PCI (N=259)
Age (years)	64.7 ± 9.9	65.2 ± 9.7
Male (%)	86.1	83.0
BMI (kg/m²)	28.3 ± 5.2	28.4 ± 4.9
Hypertension (%)	71.5	73.0
Diabetes mellitus	29.2	32.8
Previous MI (%)	18.3	22.8
Previous CABG (%)	7.3	13.1
Previous PCI (%)	51.8	56.0
PCI to facilitate study entry (%)	27.0	30.5
LVEF (%)	55.7 ± 10.8	54.5± 10.8

Lesion characteristics

	OMT (N=137)	PCI (N=259)
Target vessel		
RCA (%)	57.4	63.7
LAD (%)	27.0	25.5
LCX (%)	15.6	10.8
Reference diameter (mm)	3.0 ± 0.41	2.9 ± 0.44
Length of occlusion (mm)	26.5 ± 16.0	31.4 ± 20.5
Lesion calcifications (%)	36.1	37.3
Lesion tortuosity (%)	12.8	21.3
J-CTO score	1.67 ± 0.91	1.82 ± 1.07

PCI procedure in PCI group (n=255)

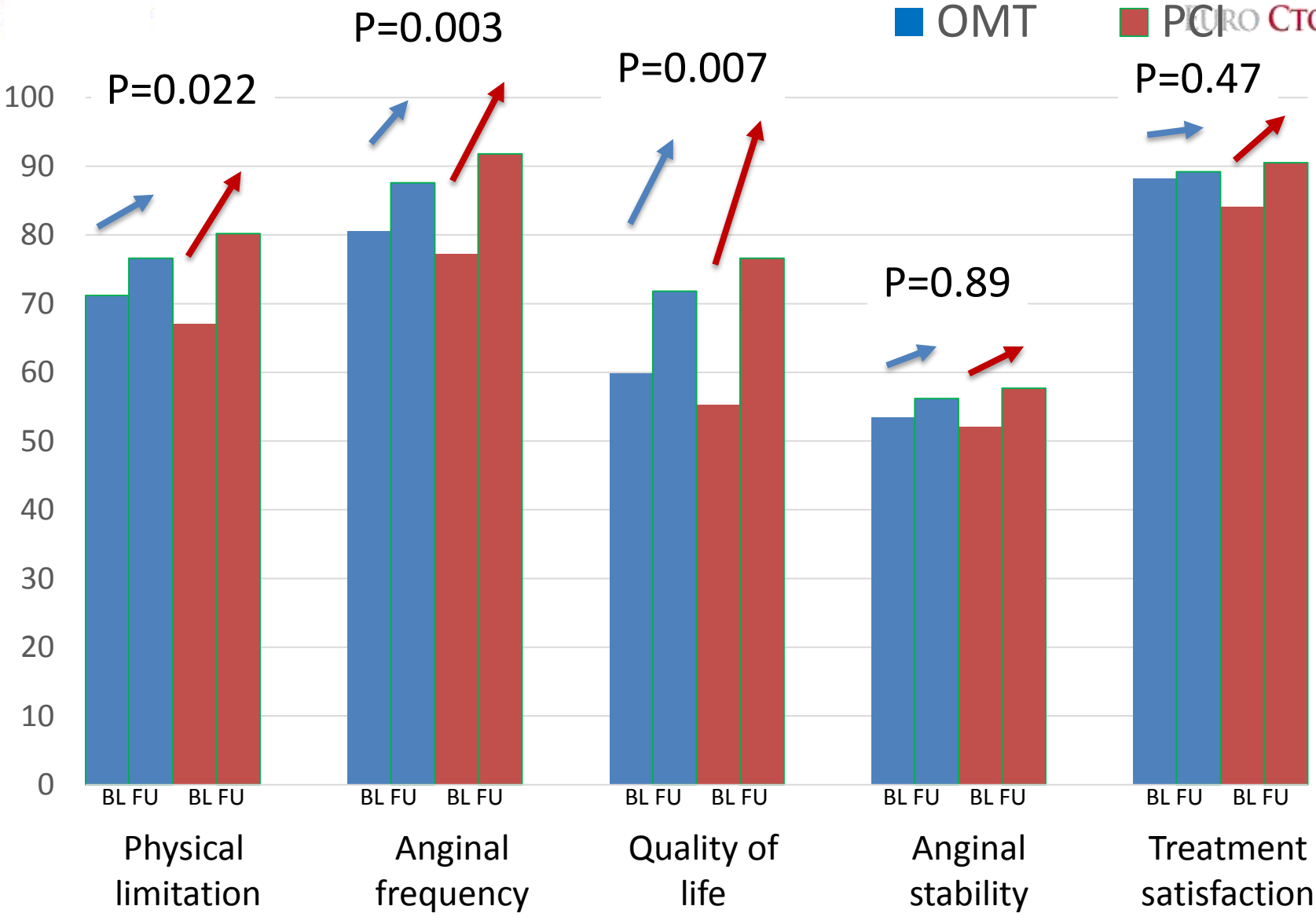
Radial approach for PCI (%)	34.3
Bilateral approach (%)	81.2
Retrograde approach (%)	35.8
Revascularisation successful (%)	86.3
Stents used	
Biomatrix (%)	91.1
Other DES (%)	8.9
Total length of stent used (mm)	65.9 ± 28.9
Width of largest stent (mm)	3.3 ± 2.49
Number of stents used	2.0 ± 1.32
Procedure duration (min)	118.1 ± 67.2
Fluoroscopy time (min)	48.8 ± 34.5

Procedural complications

Any complication N(%)	8 (2.9)
Death (%)	0
Q-wave MI (%)	0
Acute TVR/ emergency CABG (%)	0
Pericardial tamponade (%)	4 (1.5)
Vascular repair (%)	2 (0.7)
Blood transfusion (%)	2 (0.7)

- 6 post procedural CK >3 times ULN, including 2 CK > 5 times ULN,
- 4 troponine increase.
- None of the patients experienced pain or changes of the ECG and CEC did not adjudicate any of them as 4aMI (Universal definition)

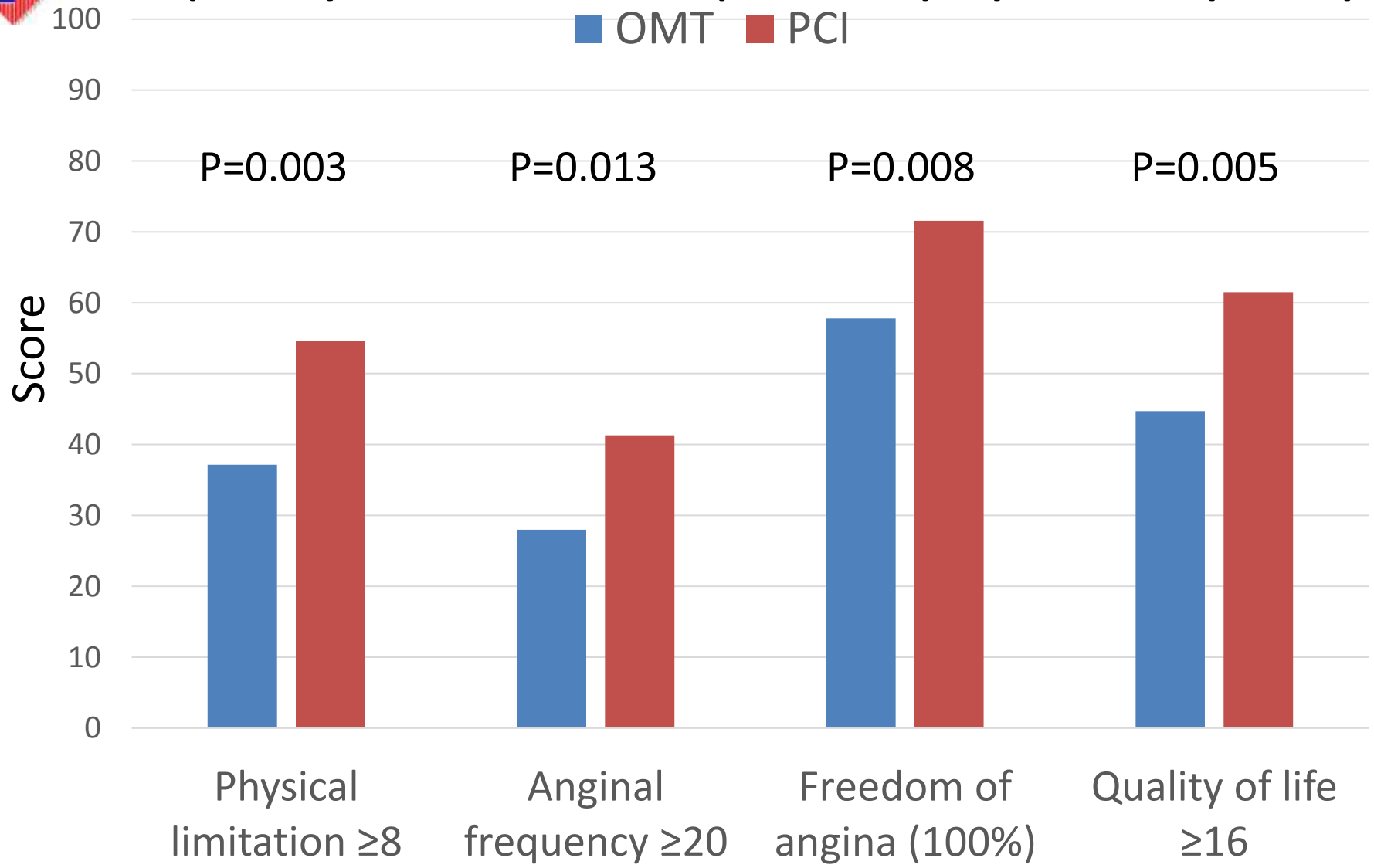
Primary Endpoint reached (ITT)



For multiple testing the significance level is 0.01

Eur Heart J 2018 in press

More patients were free of angina, had better quality of life and improved physical capacity *)



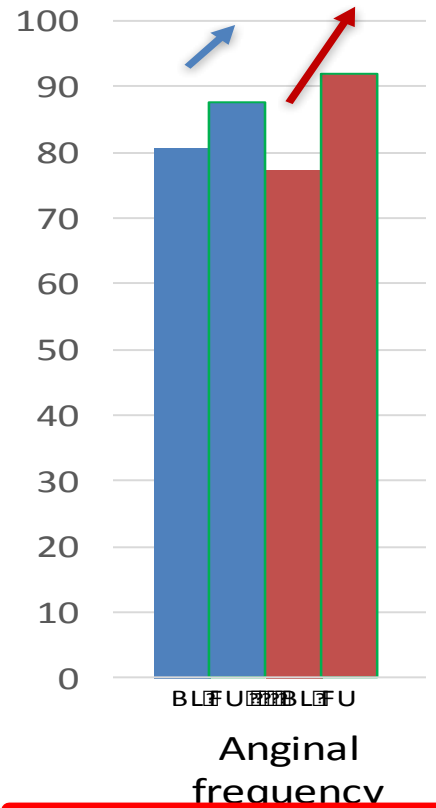
*) Spertus et al. JACC 1995;25:333-41

Eur Heart J 2018 in press

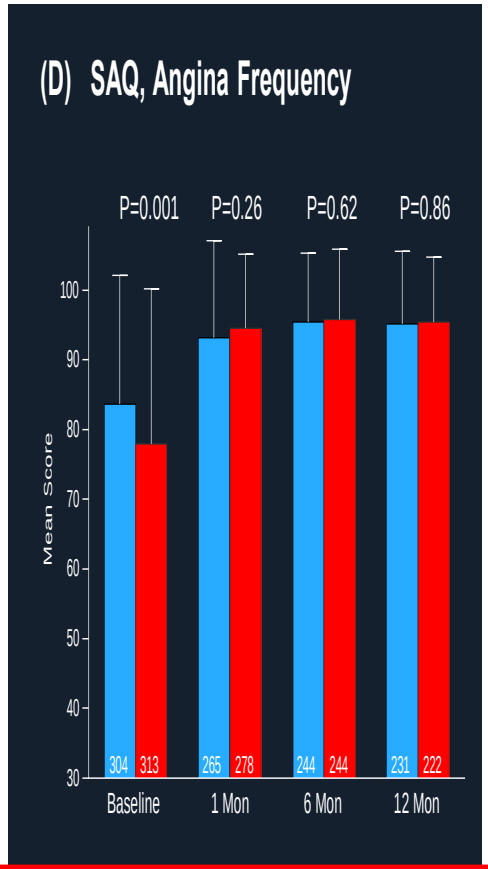
Higher baseline scores (less symptoms) in RCTs vs. registry data

EUROCTO

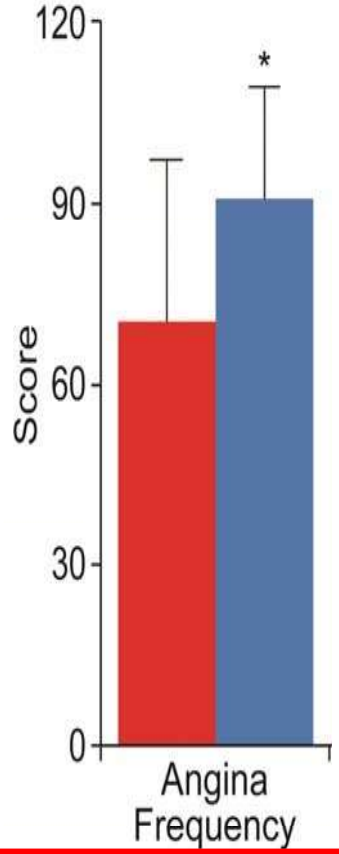
p=0.003



DECISION-CTO



OPEN-CTO Registry



Baseline	81 vs 77	83 vs 77	71 69 (failed)
FUP	87 vs 92 Δ 6 vs 15	95 vs 96 Δ 12 vs 19	92 Δ 21 84 Δ 15

Lessons from the EURO-CTO Trial

- Due to slow recruitment the number of patients in this study is below the preplanned number, but still the power is 81%.
- The primary endpoint was proven: PCI for CTO improved the health status regarding angina frequency, physical limitations, and quality of life as compared to OMT
- In experienced hands, periprocedural risk was low, and the 12 months MACCE rate was comparable to OMT, but the long-term safety remains to be evaluated at 36 months (Primary safety endpoint)