



**Do not reopen the vessel,
look at ischemia!**

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CTO PCI: To do or not to do it ?



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Don't do it ...

- Very complex PCI: Success rate lower than non CTO PCI, higher complication rate
- Collaterals protect against ischemia
- Poor scientific evidence
- Costs, Time
- Radiation
- Contrast

CTO PCI: To do or not to do it ?

Why not.....??

- Collaterals do not protect against ischemia
- Improvement in LV function
- Symptoms relief
- Reduction of arrhythmic risk
- “Protection” against future CV events
- Reduction of ischemic burden and mortality

CTO PCI: To do or not to do it ?

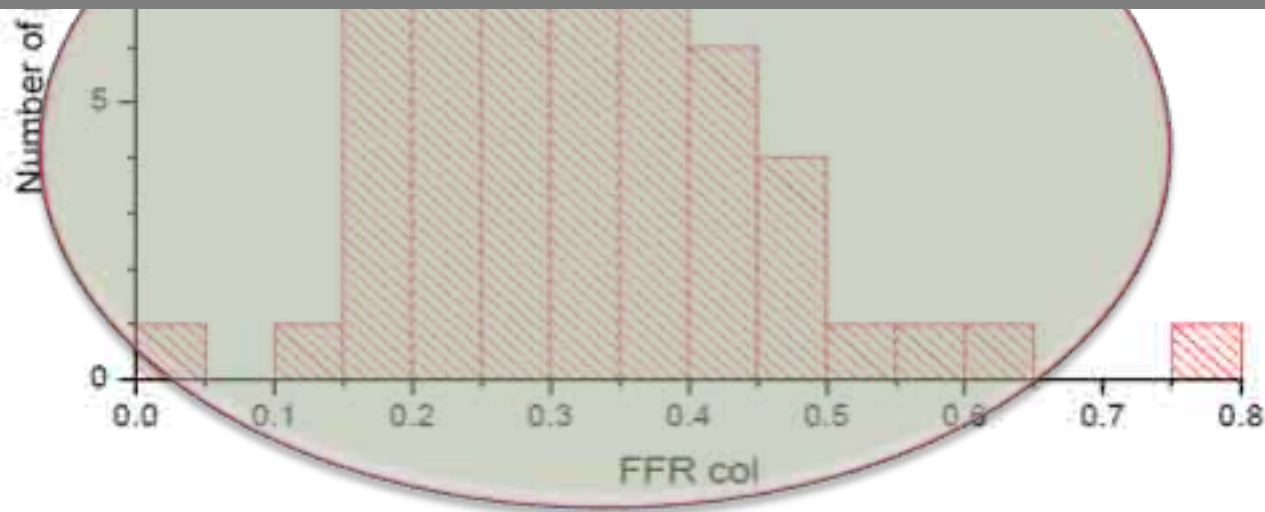
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Do collaterals protect from ischemia?

FFR in 59 pts after successful wire crossing of a CTO

95% of collaterals are no substitute for the open artery



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Improvement of LV function

Effects of successful percutaneous coronary intervention of chronic total occlusions on myocardial perfusion and left ventricular function



Wijnand J. Stuijzand^{1,2}, MD; Pieter H. Borchers^{1,2}, MD; Peter V. Reijnen¹, MD, PhD; René S. de Boer^{1,2}, MD; Stefan J. Schuurman¹, MD; Popo van Dieën¹, PhD; Jeffrey van der Wal¹, PhD; Erik H. van der Wal¹, MD, PhD; Adrian A. Lammertse¹, PhD; Jeroen E. Willeke¹, MD, PhD; Colin G. Humphry¹, MD, PhD; Joris C. Aengevaert¹, MD, PhD; Albert L. van Boven¹, PhD, PhD; Alexander Nijm¹, MD, PhD; Michiel van Rossum¹, MD, PhD; Paul Koenigs¹, MD, PhD

Table 6. Left ventricular function and volumes.

	Baseline	Follow-up	p-value
All patients (n=69)			
LVEDV (mL)	199±64	193±61	0.03
LVESV (mL)	112±60	106±59	<0.01
LVEF (%)	46.4±11.0	47.5±11.4	0.01
LV stroke volume (mL)	87±20	87±19	0.66
SWT CTO area (%)	53.8±22.4	56.4±25.4	0.18

CTO: chronic total occlusion; LV: left ventricle; LVEDV: left ventricular end-diastolic volume; LVEF: left ventricular ejection fraction; LVESV: left ventricular end-systolic volume; SWT: segmental systolic wall thickening

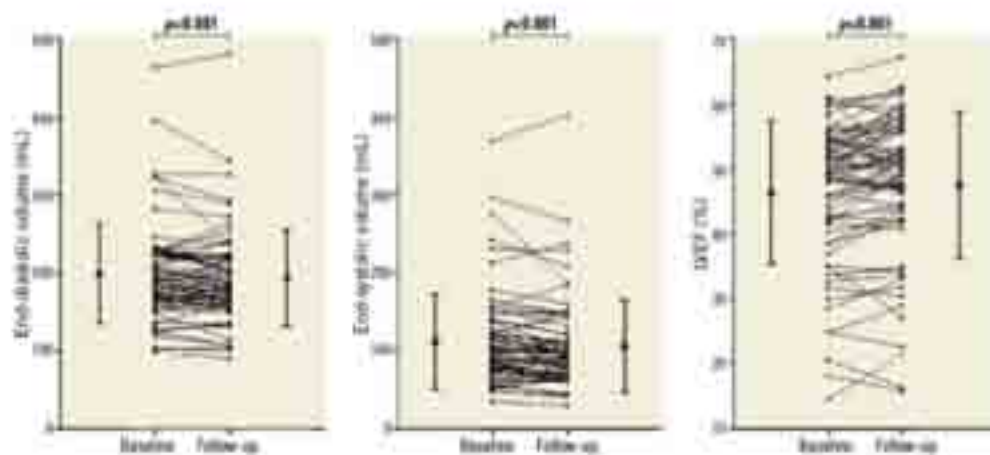


Figure 3. Left ventricular volumes and function between baseline and follow-up: CMR imaging

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Do CTO recanalization improve symptoms?



ESC

European Society of Cardiology
European Association of Percutaneous Cardiovascular Interventions

CLINICAL RESEARCH

INTERVENTIONS

A randomized revascularization therapy for the total coronary

Gerald S. Werner¹*, Vasil Georgios Stanos², Valery

Table 4 Seattle signs questionnaire health status changes at 12 months in patients with a randomized to optimal medical therapy or percutaneous coronary intervention

	OMT (N = 137)	PCI (N = 200)
Angina severity		
Baseline	85.4 ± 28.7 (137)	77.3 ± 33.6 (200)
Follow-up	67.4 ± 28.7 (136)	75.4 ± 34.7 (199)
Follow-up after correction for baseline	86.8 (81.5–90.0) (136)	78.2 (69.6–94.6) (199)
Physical limitation		
Baseline	71.2 ± 24.7 (137)	67.1 ± 24.9 (200)
Follow-up	76.8 ± 22.8 (136)	80.3 ± 23.4 (199)
Follow-up after correction for baseline	75.9 (71.5–80.3) (136)	81.7 (77.4–86.0) (199)
Quality of life		
Baseline	69.8 ± 26.3 (137)	65.2 ± 24.9 (200)
Follow-up	71.8 ± 25.5 (136)	76.9 ± 22.0 (199)
Follow-up after correction for baseline	20.0 (15.9–24.1) (136)	27.3 (15.3–40.6) (199)
Anginal disability		
Baseline	53.4 ± 25.4 (137)	63.0 ± 22.7 (200)
Follow-up	56.2 ± 20.2 (136)	62.7 ± 19.6 (199)
Follow-up after correction for baseline	55.9 (51.3–60.5) (136)	57.8 (54.4–61.2) (199)
Treatment satisfaction		
Baseline	88.3 ± 15.7 (137)	84.3 ± 17.4 (200)
Follow-up	88.2 ± 13.9 (136)	86.0 ± 15.3 (199)
Follow-up after correction for baseline	88.1 (86.2–89.8) (136)	86.3 (84.0–88.6) (199)

Baseline and follow-up mean ± standard deviation (no. of patients with baseline [1] Follow-up after correction for baseline represents regression to the mean, due to baseline differences. Data are all CCI patients, not just patients who received a follow-up intervention (n = 136).

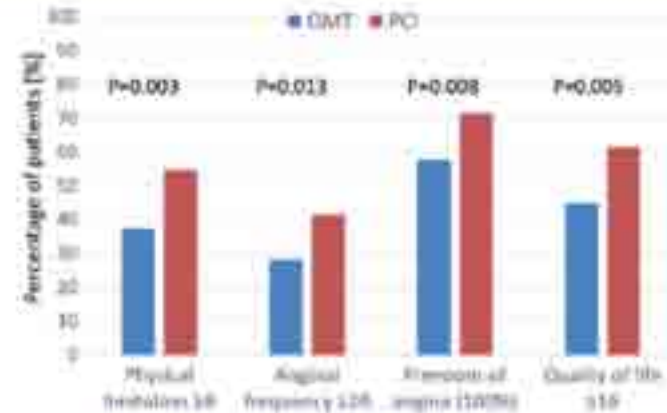


Figure 4 Comparison of significant changes in the Seattle signs questionnaire (regression to the mean) at follow-up between optimal medical therapy and percutaneous coronary intervention

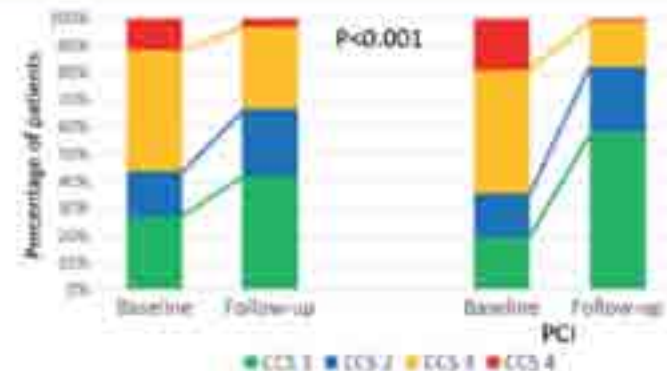


Figure 5 Comparison of changes in CCI classification from baseline to follow-up between optimal medical therapy and percutaneous coronary intervention. CCI: Canadian Cardiovascular Society

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Reduction of arrhythmic risk

JACC: Clinical Electrophysiology
Volume 4 | Number 1 | January 2018
DOI: 10.1016/j.jacep.2017.11.001

Impact
Occlusal
Outcomes

A Systematic

Wai Kin Chi, MD, PhD

Sumitranagar P, MD

Wai Kin Chi, MD, PhD

A

CTO and occurrence of VT/VF or appropriate ICD therapy (univariate)

Study name

Statistics for each study

Hazard ratio and 95% CI

B

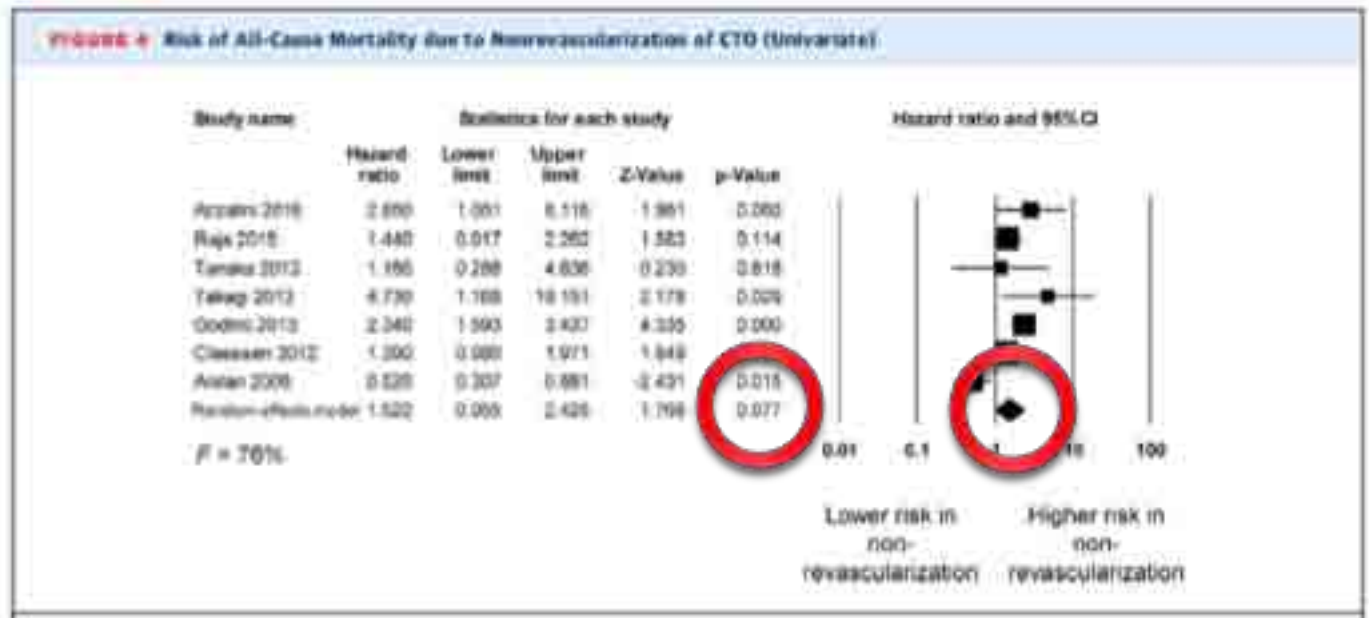
CTO and occurrence of VT/VF or appropriate ICD therapy (multivariate)

Study name

Statistics for each study

Hazard ratio and 95% CI

Yap 2017
Nombela-
Sugizaki
Labine 20
Nombela-
Raja 2018
Random-
 $R^2 = 91$

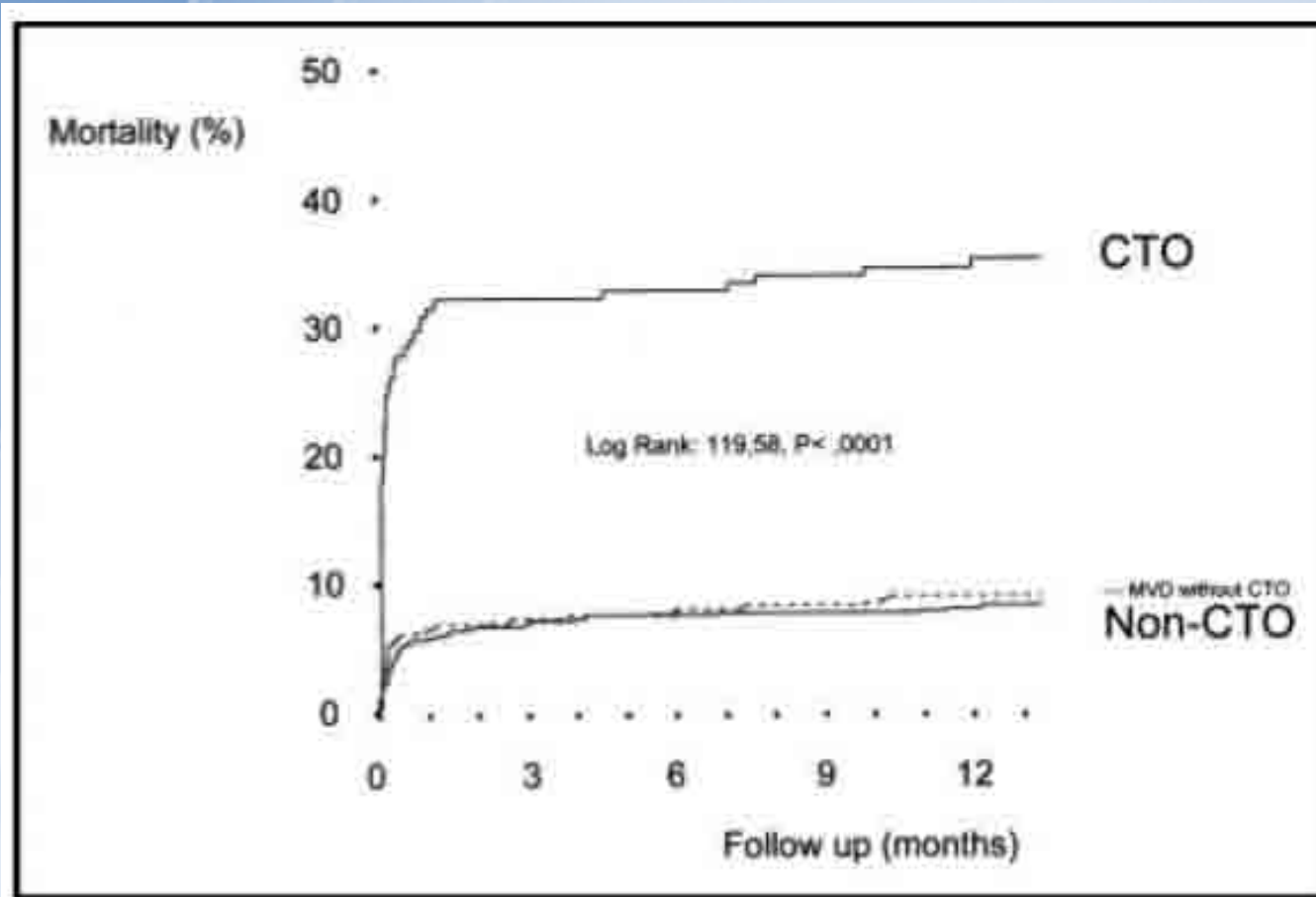


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Protection against CVD events in patients with previous STEMI



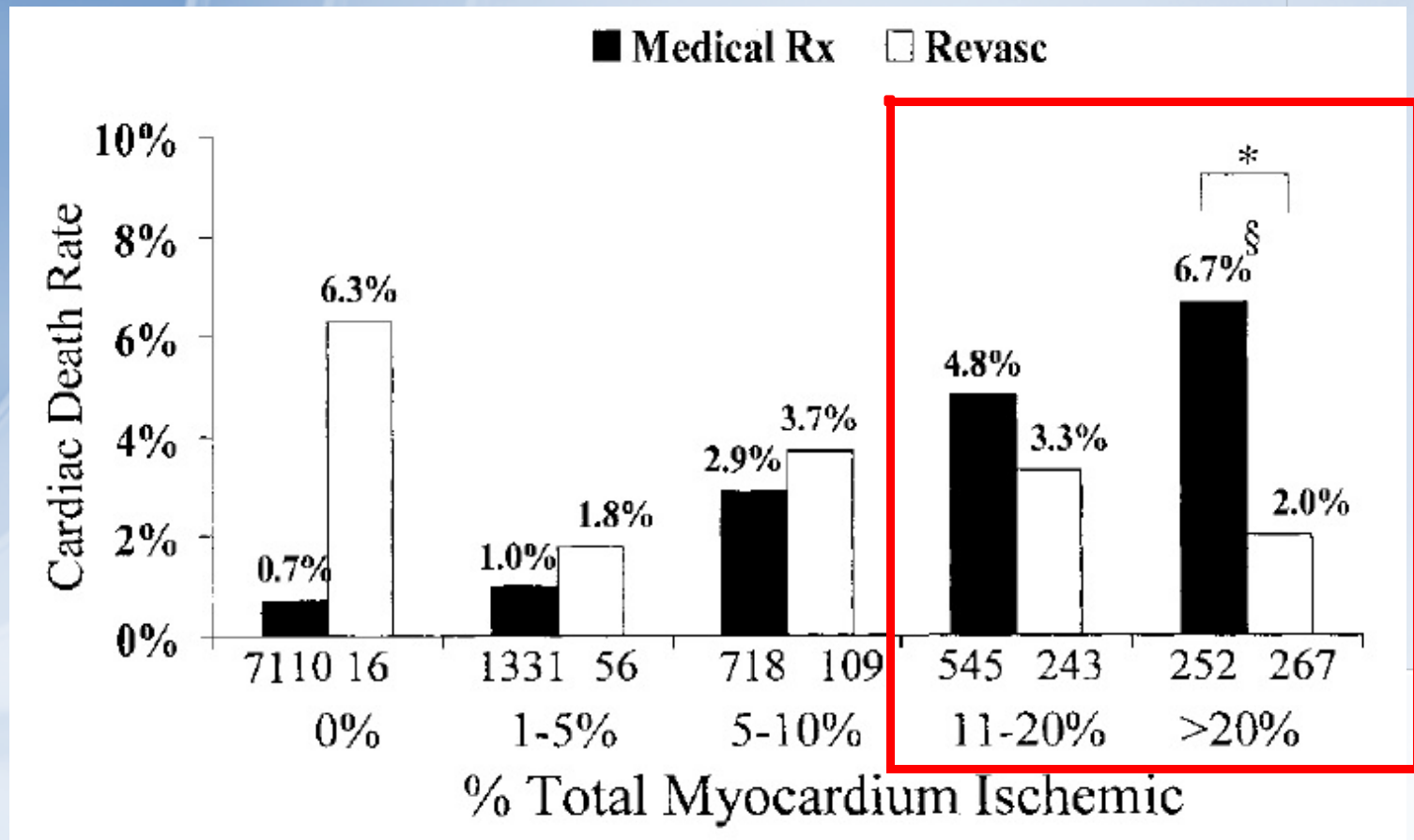
van der Schaaf RJ et al. Am J Cardiol 2006;98(9):1165-9.

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Reduction of ischemic burden and mortality



Hachamovitch R et al. Circulation 2008;107:2900-2906.

Reduction of ischemic burden and mortality

301 patients undergoing SPECT/PET before and after CTO PCI

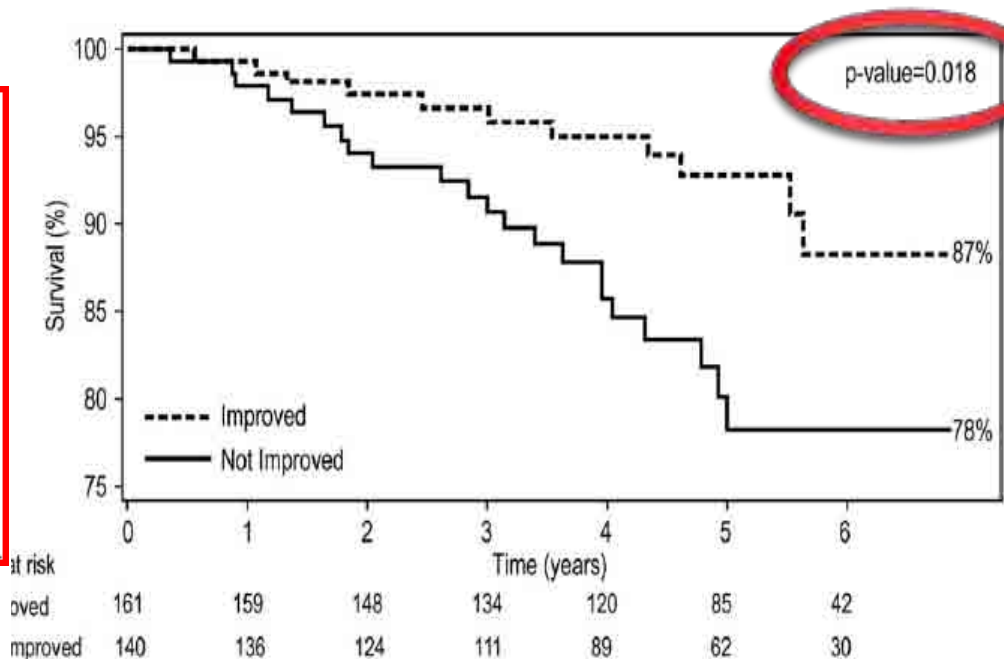
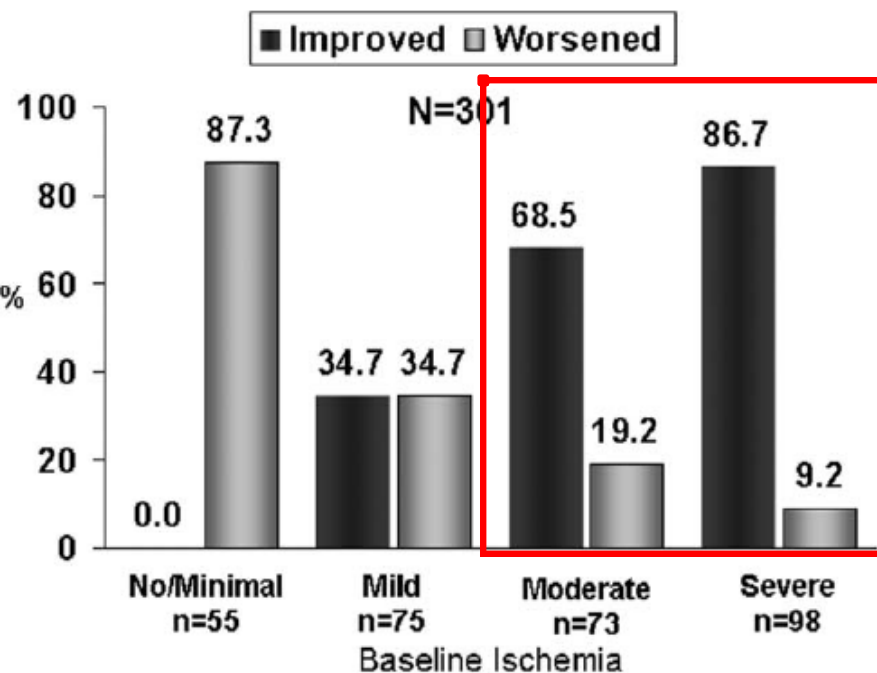


Fig. 3. Kaplan-Meier survival in patients with vs. without improvement in ischemia on myocardial perfusion imaging.

Safley et al, Cathet Cardiovasc Interv 2011;78:337–343

Any randomized trial?

DECISION-CTO

834 patients randomized
from 2010.3.22 to 2016.10.10

Optimal Medical Therapy With or Without

- **OBJECTIVE:** To compare the effectiveness of OMT alone with PCI compared with OMT plus PCI in patients with CTO.

- **RE**
for

Premature Termination of Trial
Because enrollment was slower
than anticipated

- A one-sided type I error rate : 0.025
- Power : 80%
- Dropout rate: 5%
- Assumed sample size: 1,284 patients

Guidelines: what they suggest?



ESC

European Society
of Cardiology

European Heart Journal (2018) 00, 1–96
doi:10.1093/eurheartj/ehy394

ESC/EACTS GUIDELINES

2018 ESC/EACTS Guidelines on myocardial

re

The
Soc
Ca

Percutaneous revascularization of CTOs should be considered in patients with angina resistant to medical therapy or with a large area of documented ischaemia in the territory of the occluded vessel.^{629,659–663}



Recommendations on specific lesion subsets

Recommendations	Class ^a	Level ^b
	IIa	B
In true bifurcation lesions of the left main, the double-kissing crush technique may be preferred over provisional T-stenting. ⁶²⁰	IIb	B

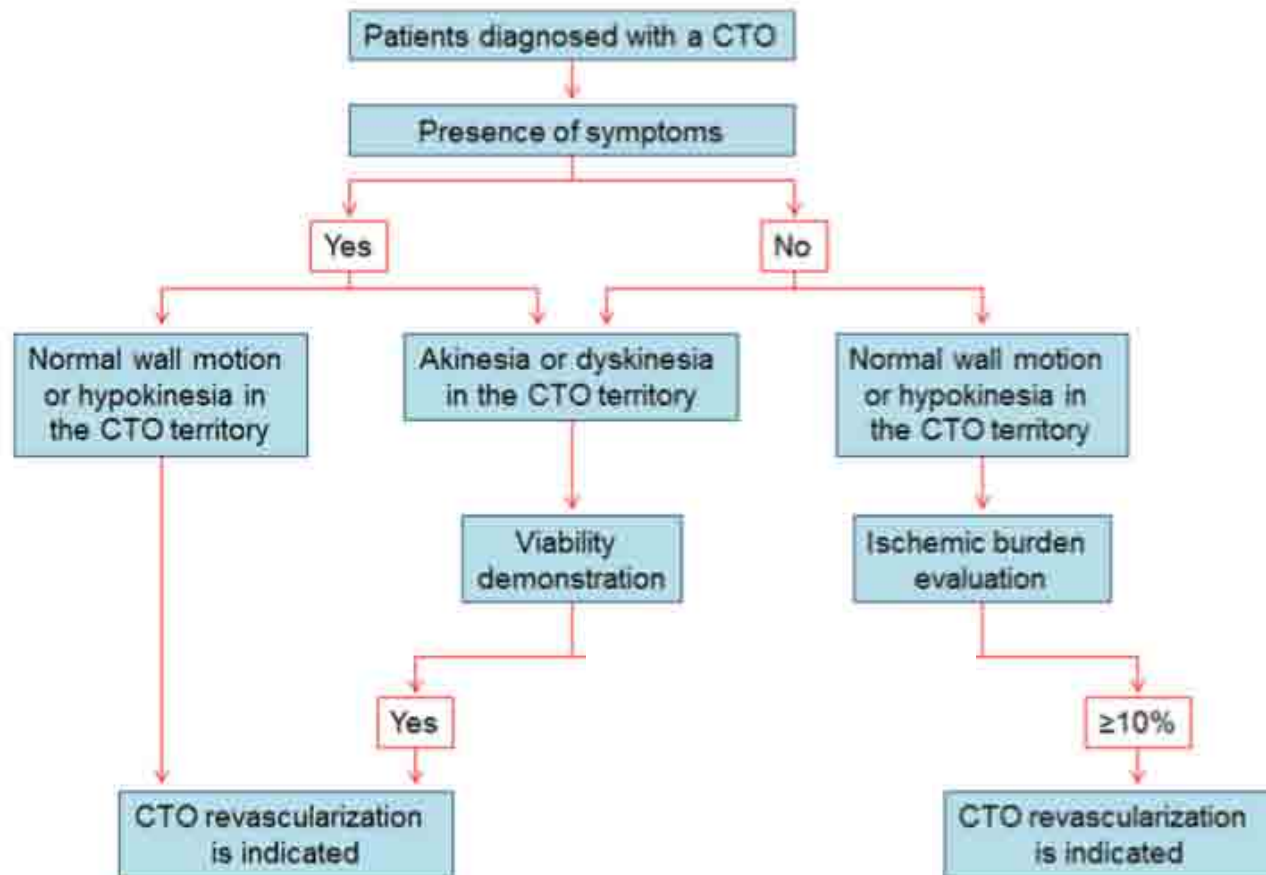
CTO = chronic total occlusion; PCI = percutaneous coronary intervention.

^aClass of recommendation.

^bLevel of evidence.

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Is there any algorithm to consider?



Take home messages

- CTOs are not "benign" lesion
- Recanalization of a CTO lead to better outcomes
- Ischemic burden is a strong predictor of future CV events
- Guidelines suggest to consider the reopening of a CTO in case of refractory angina or large ischemic and viable area in the CTO territory

**Thank you
for the attention**