CTO PCI,
Where Is the Benefit ?
Insight from DECISION CTO study

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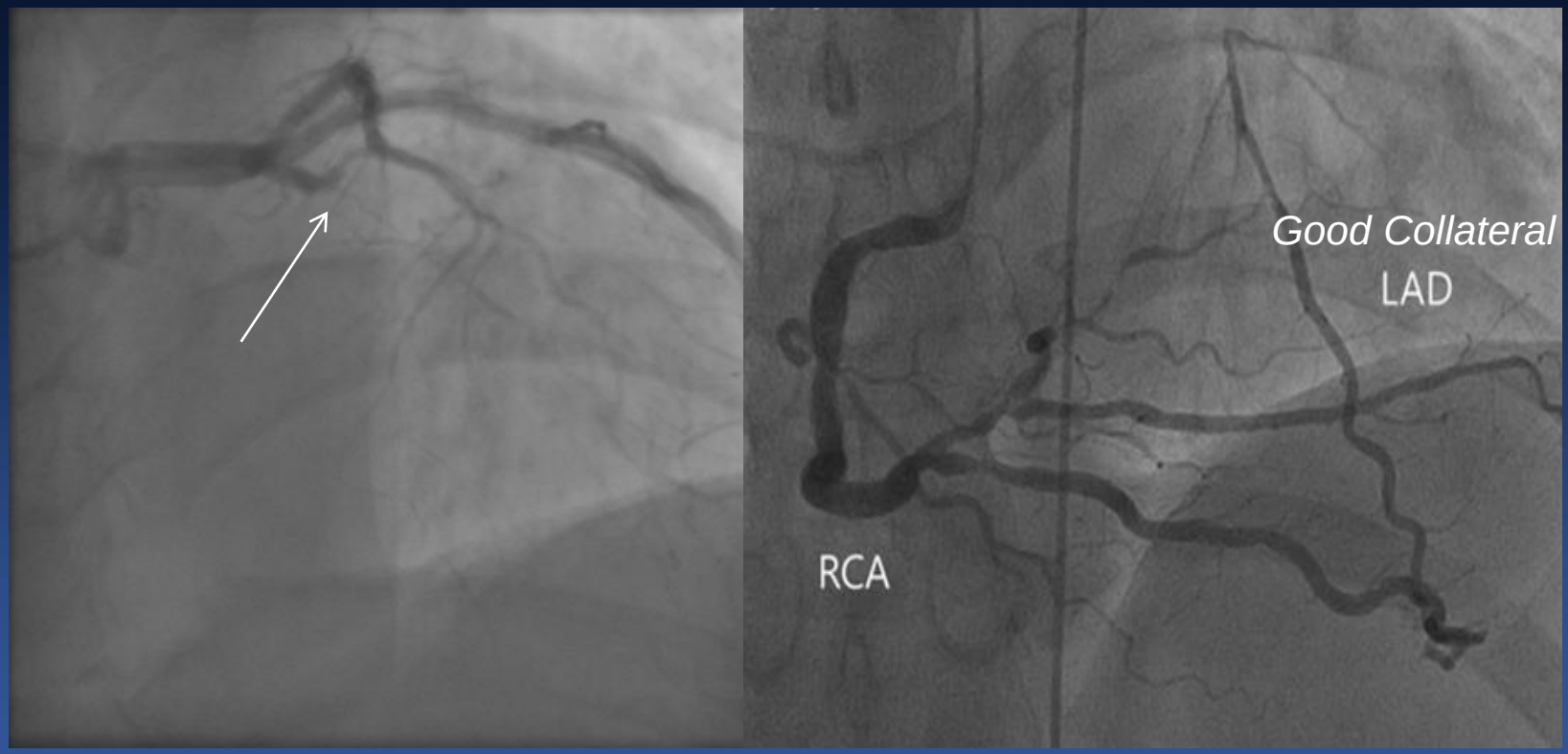
43/M, LAD CTO with Good Collateral

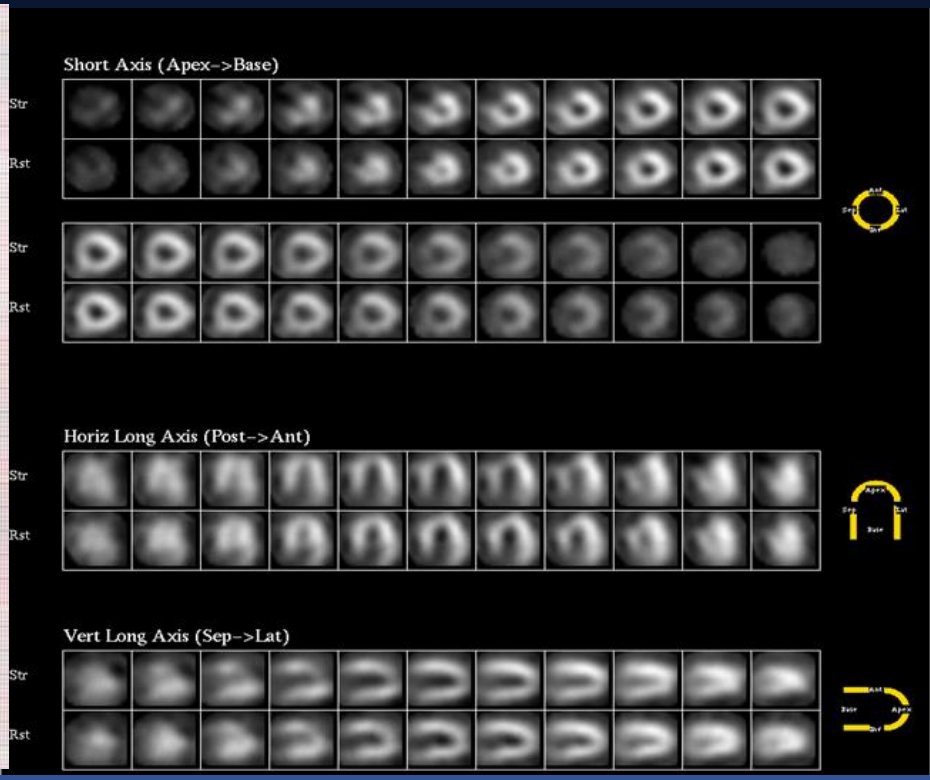
No Symptom



43/M, LAD CTO with Good Collateral

No Symptom, Negative TMT

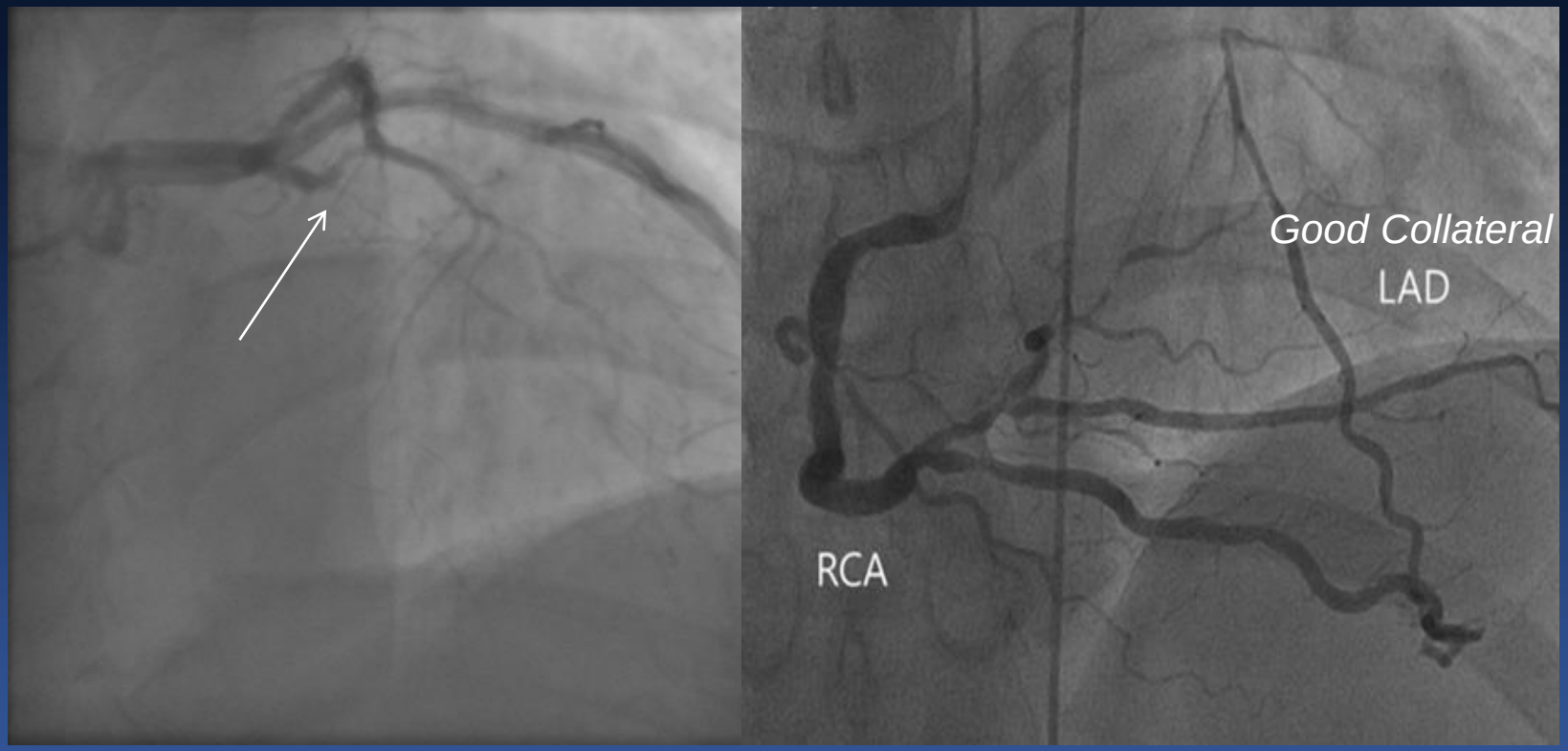
Normal Thallium Perfusion Scan,



43/M, LAD CTO with Good Collateral

No Symptom, Negative TMT

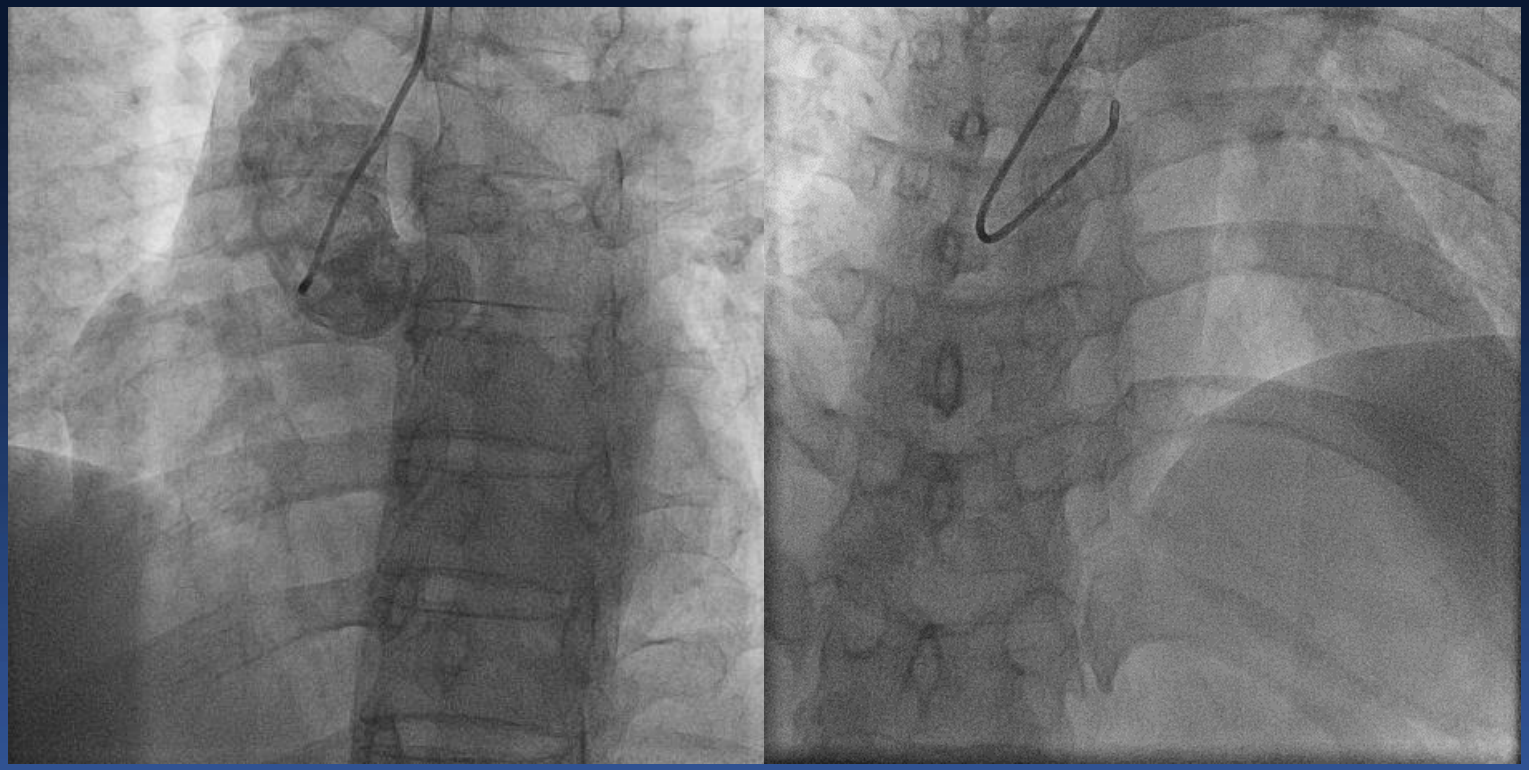
Normal Thallium Perfusion Scan,



Do You Want to Open ?

48/F, RCA CTO with Good Collateral

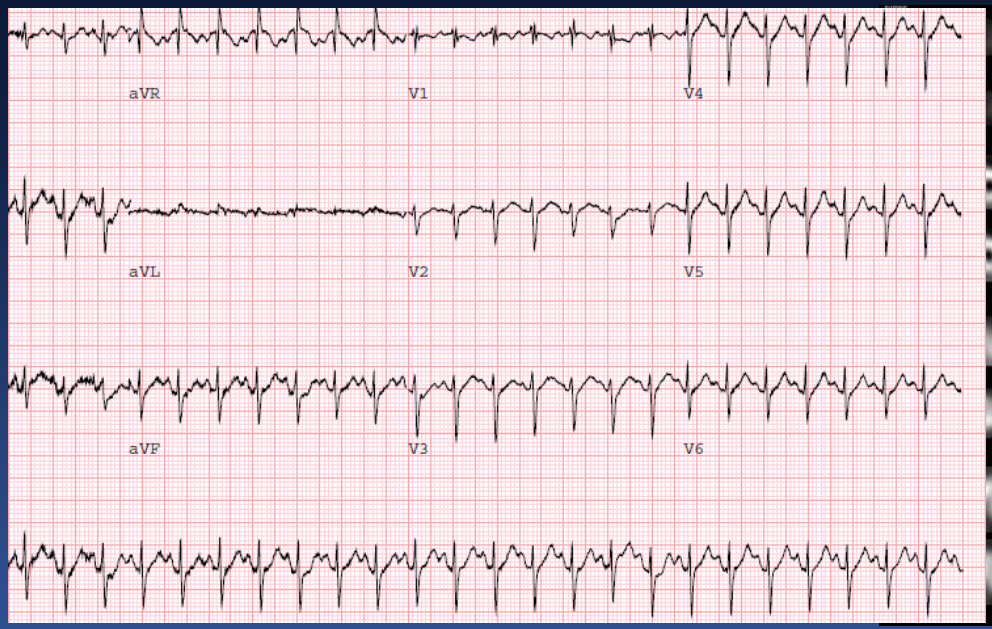
No Symptom

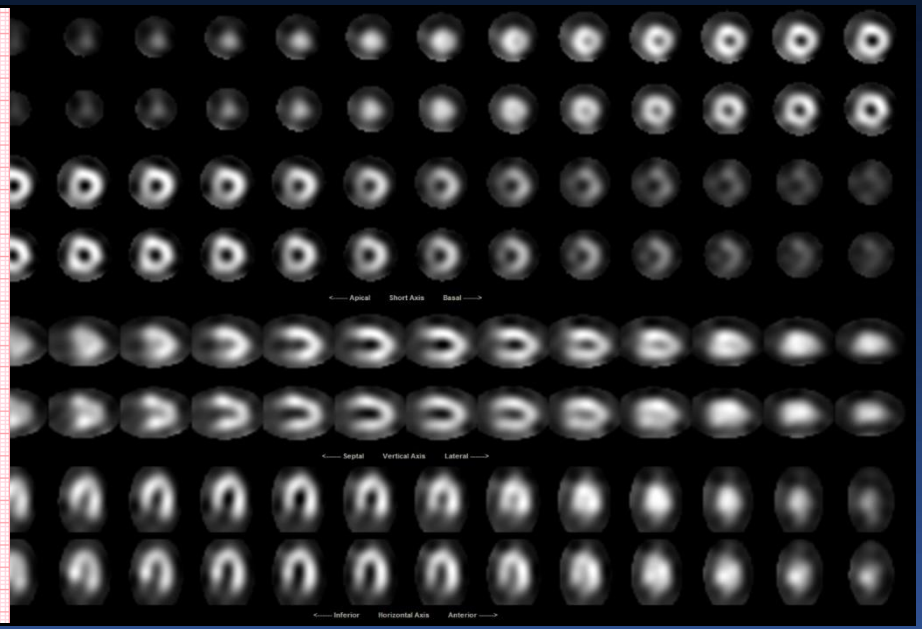


48/F, RCA CTO with Good Collateral

No Symptom, Negative TMT

Normal Thallium Perfusion Scan,

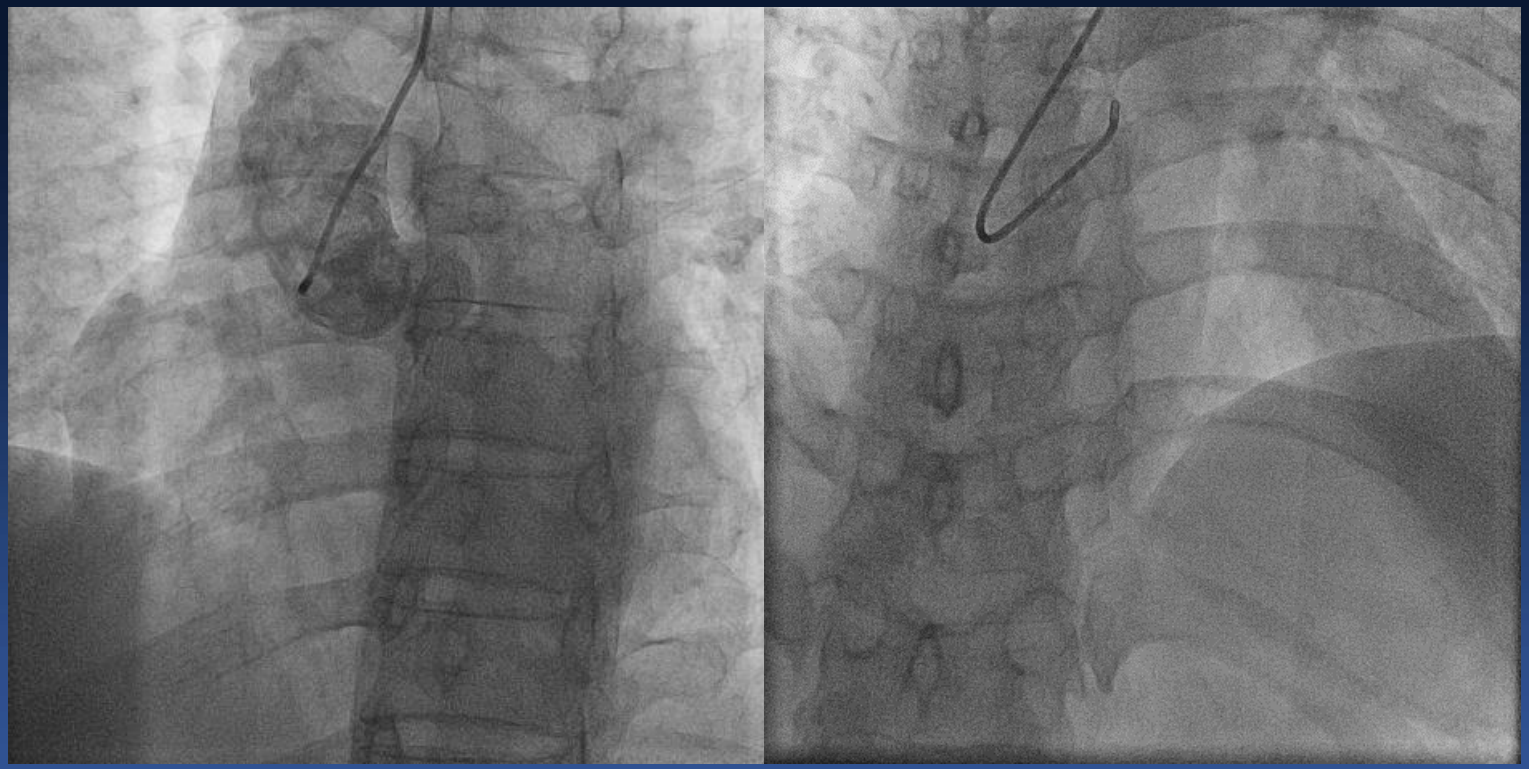




48/F, RCA CTO with Good Collateral

No Symptom, Negative TMT

Normal Thallium Perfusion Scan,

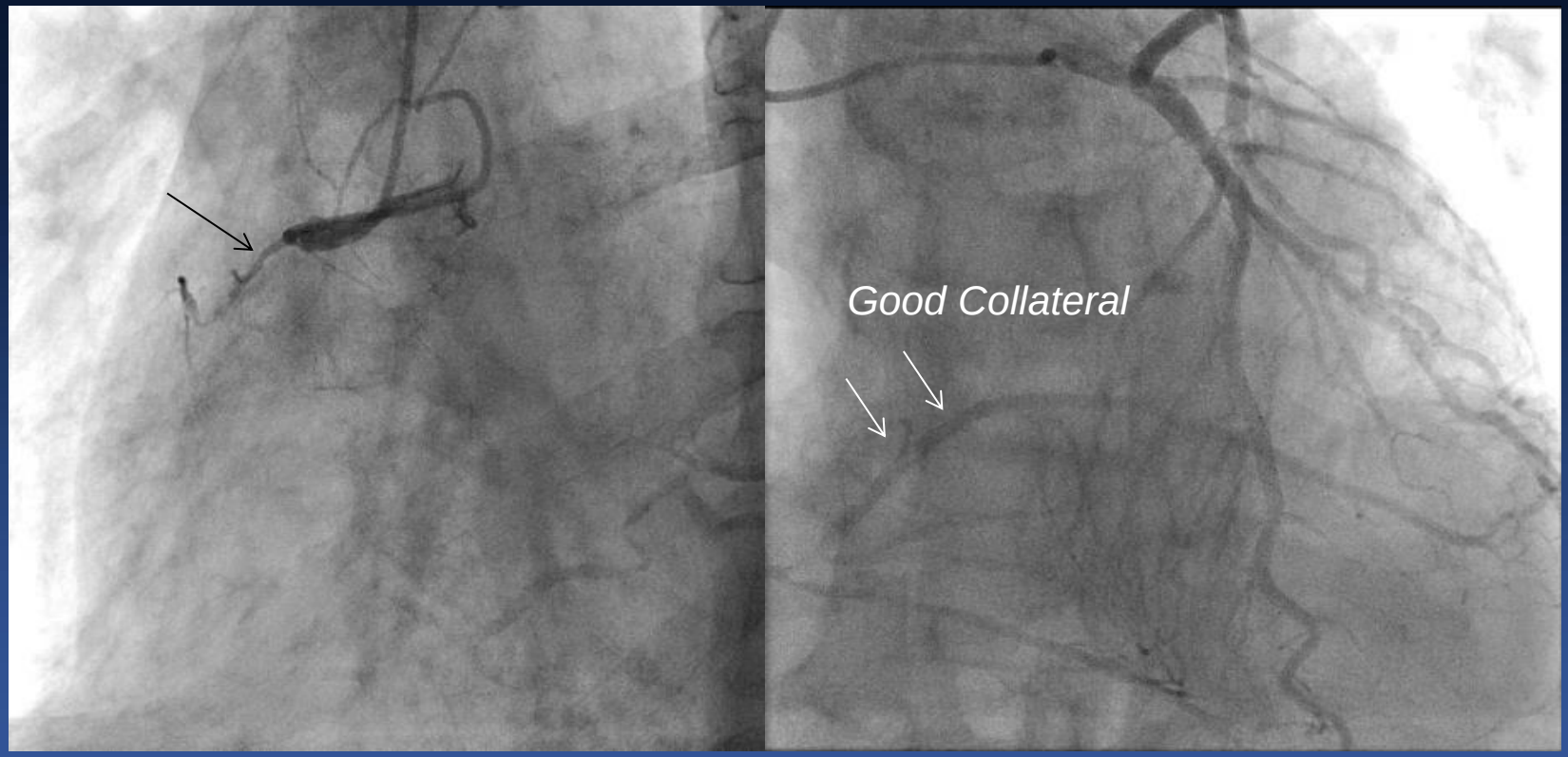


Do You Want to Open ?

75/M, RCA CTO with Good Collateral

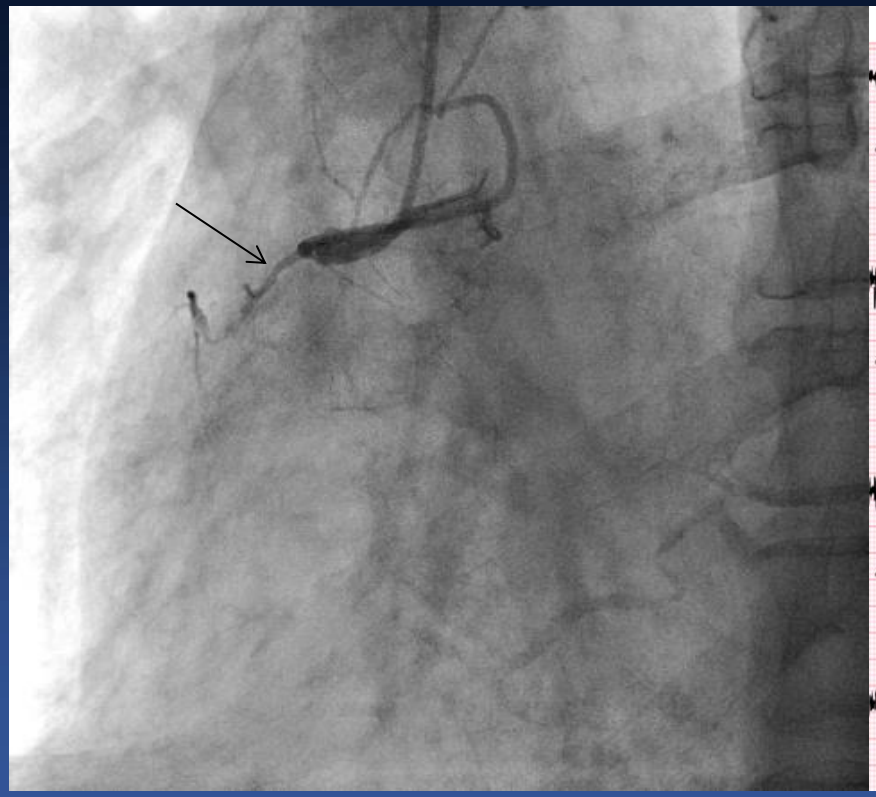
No Symptom,

Medium Sized Reversible Ischemia,



75/M, RCA CTO with Good Collateral

No Symptom,
Medium Sized Reversible Ischemia,
Negative TMT



Do You Want to Open ?

Do You Still Want to Open ?

43/M, 48/F

No Symptom, No Ischemia
Good Exercise performance

75/M,

No Symptom, Small Ischemic Myocardium
Good Exercise Performance

PCI Classification

Cosmetic Angioplasty	*Symptomatic Angioplasty*	*Survival Angioplasty*
Non-Viable, Asymptomatic, Small Ischemic Myocardium, FFR >0.80, No Evidence of Ischemia,	For Angina Relieve	Left Main and 3 Vessel-Disease *For Large Ischemic Burden*

Different Pathophysiologic Consideration of CTO Lesions

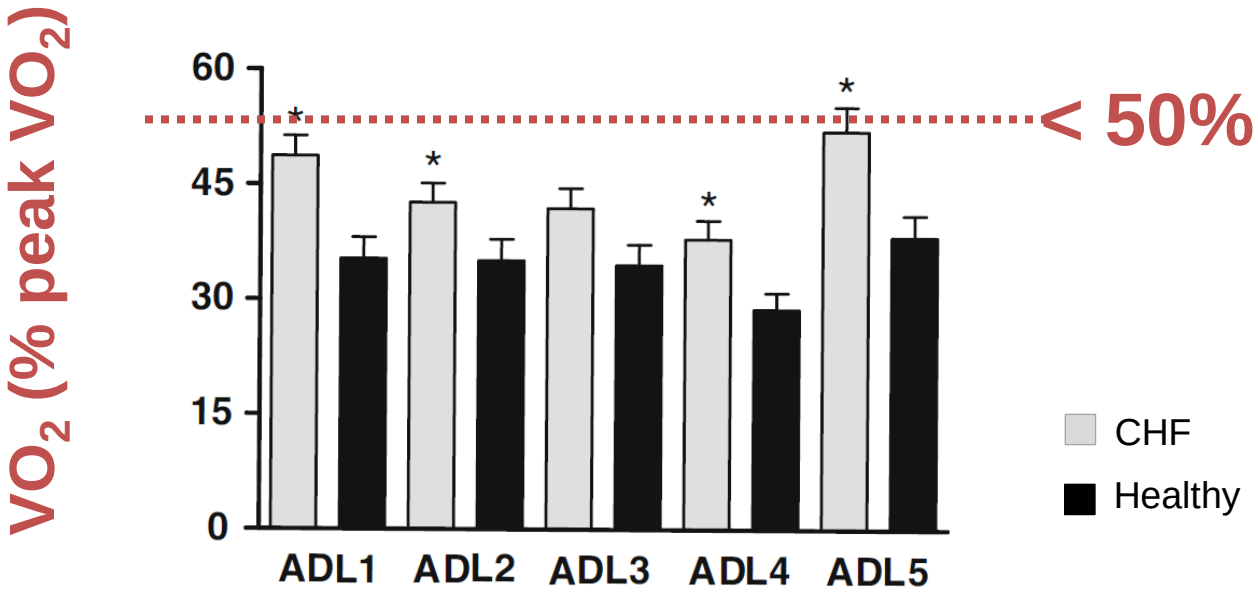
1. *Various Ischemic Threshold*
   due to Various Collateral Circulation.
2. *No ruptures !*
   Clinically Stable.

Improved Quality of Life ?

They Are Already
Functionally Good Enough !

Activities of Daily Life (% Peak VO_2) in CHF Patients and Healthy Subjects

ADL1: putting on two socks, two shoes, and a vest
ADL2: folding eight towels
ADL3: putting away groceries in the cupboard
ADL4: washing up 4 dishes, 4 cups and 4 saucers
ADL5: sweeping the floor for 4 min



Eur J Appl Physiol (2011) 111:1679–1686

Survival Benefit ?

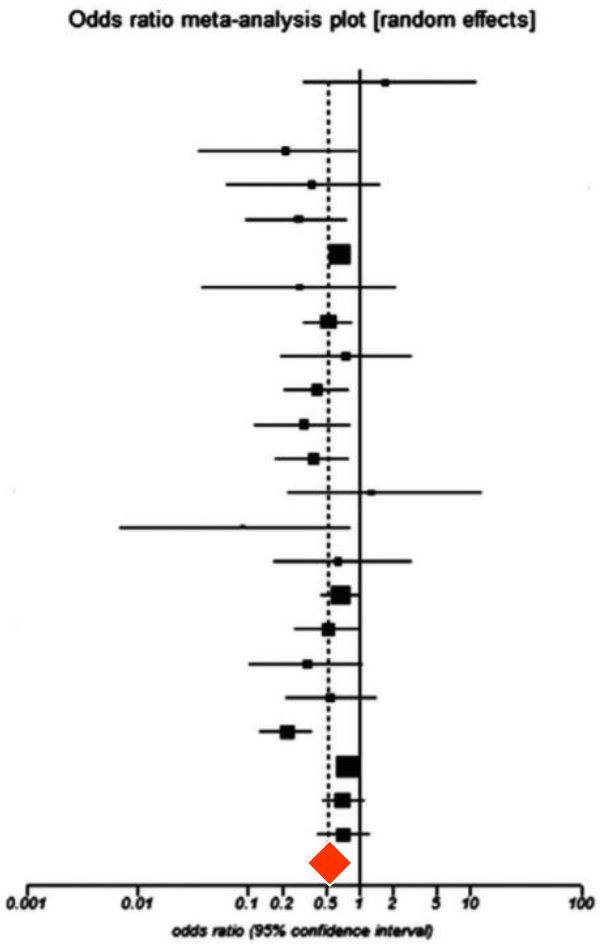
Successful vs. Failed CTO PCI

All Biased Registry Data

All-cause Mortality

Meta-analysis of CTO PCI (n=28,685)

Study	PCI Success		PCI Failure			Odds ratio
	Events	Total	Events	Total	Weight	[95%CI]
Finci	5	100	3	100	0.29	1.70 [0.32, 11.23]
Warren	0	26	0	18	0	* (excluded)
Ivanhoe	3	317	7	163	0.94	0.21 [0.04, 0.95]
Angioi	3	93	9	108	0.83	0.37 [0.06, 1.54]
Noguchi	7	134	15	92	1.74	0.28 [0.09, 0.78]
Suero	395	1491	180	514	20.22	0.67 [0.54, 0.84]
Olivari	3	286	3	83	0.47	0.28 [0.04, 2.16]
Hoye	37	567	36	304	4.50	0.52 [0.31, 087]
Drozd	7	280	5	149	0.65	0.74 [0.20, 3.01]
Arslan	19	117	37	115	3.21	0.41 [0.21, 0.80]
Aziz	9	377	12	166	1.67	0.31 [0.12, 0.83]
Valenti	17	344	17	142	2.35	0.38 [0.18, 0.83]
Labriole	7	127	2	45	0.29	1.25 [0.23, 12.81]
Chen	2	132	3	20	0.53	0.09 [0.01, 0.84]
Lee	8	251	4	82	0.60	0.64 [0.17, 3.00]
Mehran	74	1226	49	565	6.48	0.68 [0.46, 1.01]
Jolicoeur	22	213	24	133	2.72	0.52 [0.27, 1.03]
Yang	7	87	10	49	1.01	0.34 [0.10, 1.09]
Borgia	19	237	9	65	1.34	0.54 [0.22, 1.44]
Jones	26	582	44	254	6.01	0.22 [0.13, 0.38]
George S	492	10199	259	4240	35.78	0,78 [0.67, 0.91]
Yamamoto	92	1192	35	332	5.19	0.71 [0.47, 1.10]
Kim	56	2045	20	523	3.18	0.71 [0.41, 1.26]
TOTAL	**1310**	**20423**	**783**	**8262**	**100.00**	**0.52 [0.43, 0.63]**

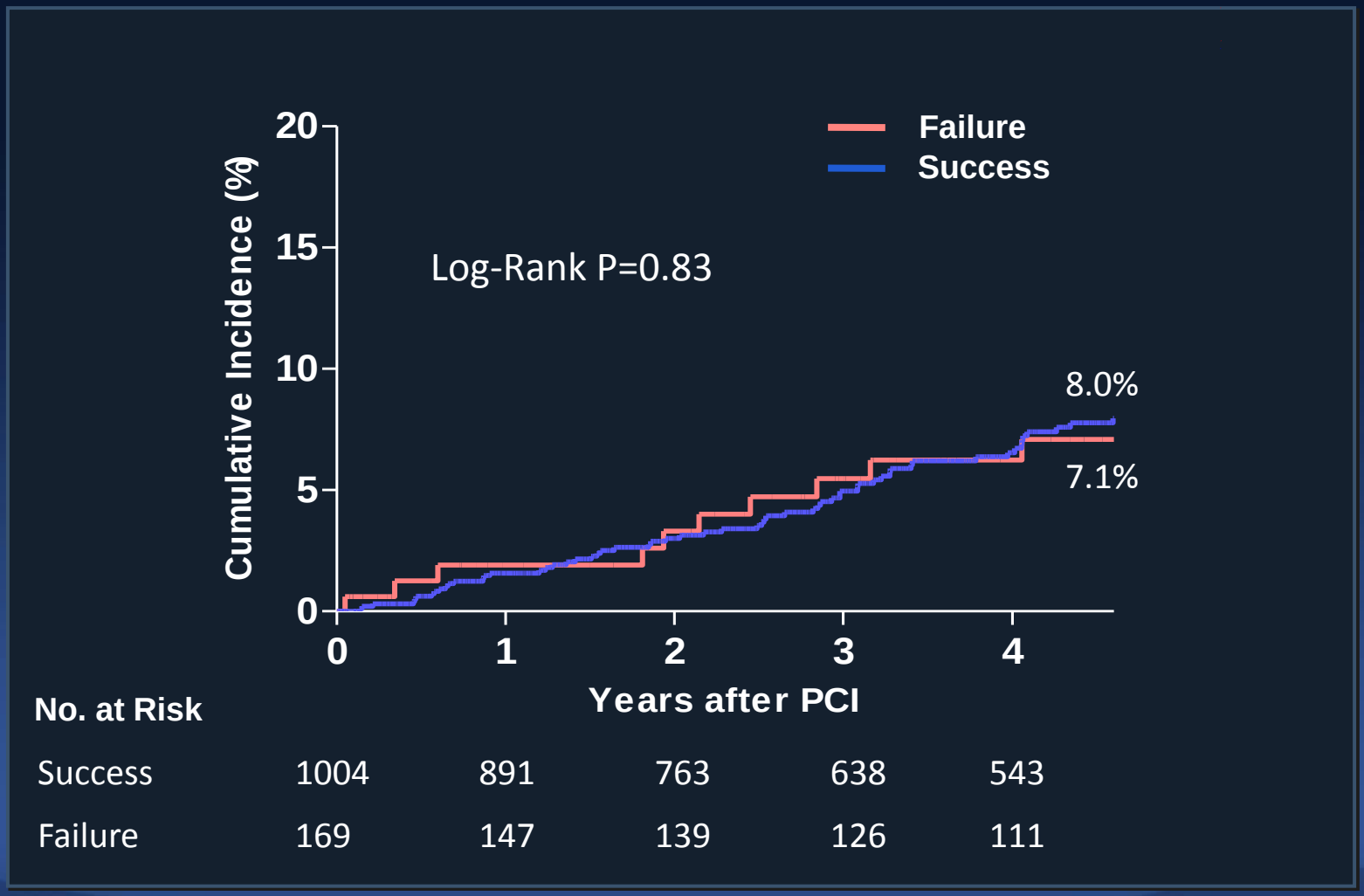


Favors Success **Favors Failure**

Am J Cardiol. 2015;115;1367-1375

Unadjusted Kaplan-Meier Curve

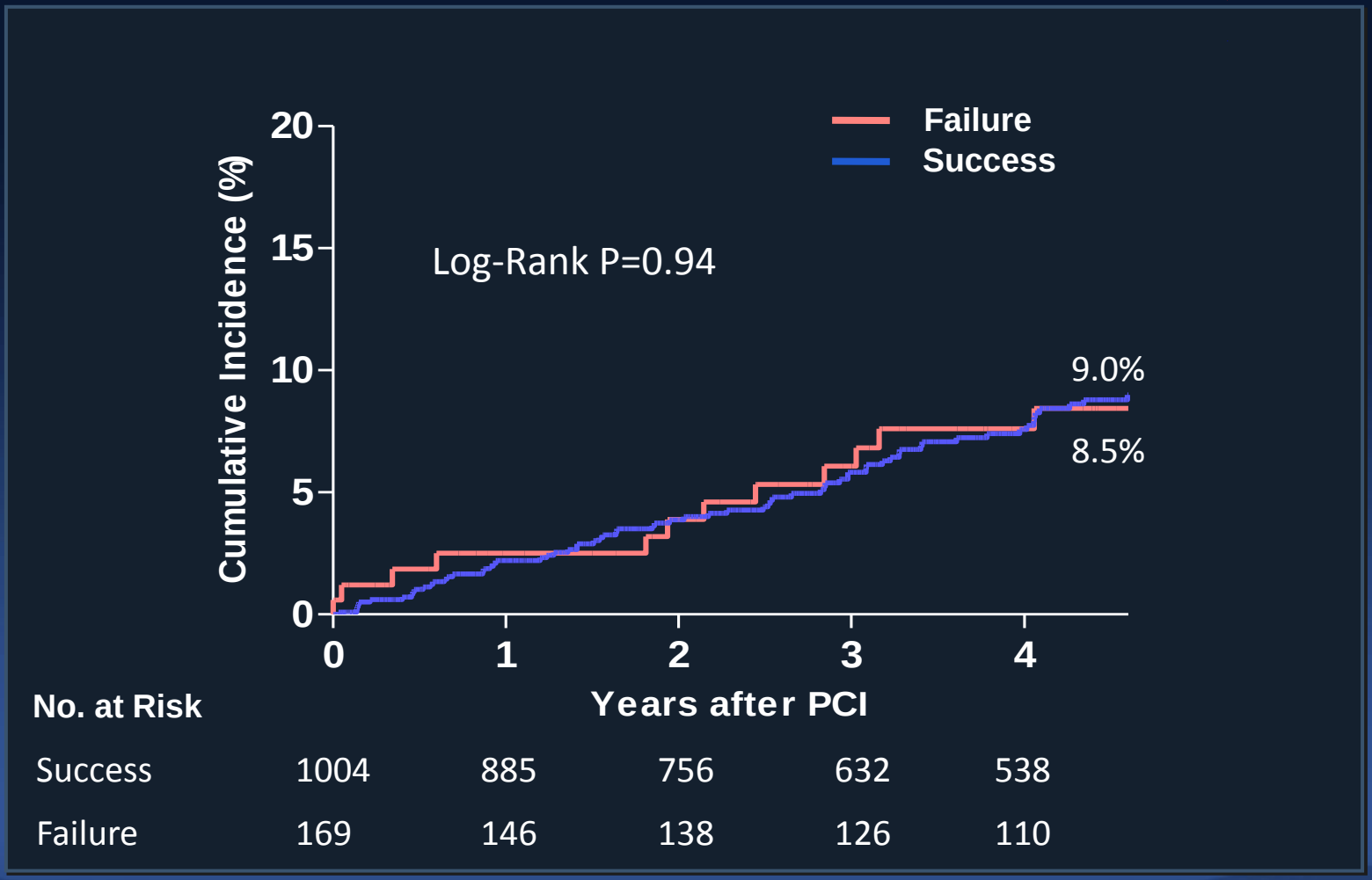
Death



Lee et al. JACC Cardiovasc Interv. 2016;9:530-8, AMC CTO Registry Data (n=1,173)

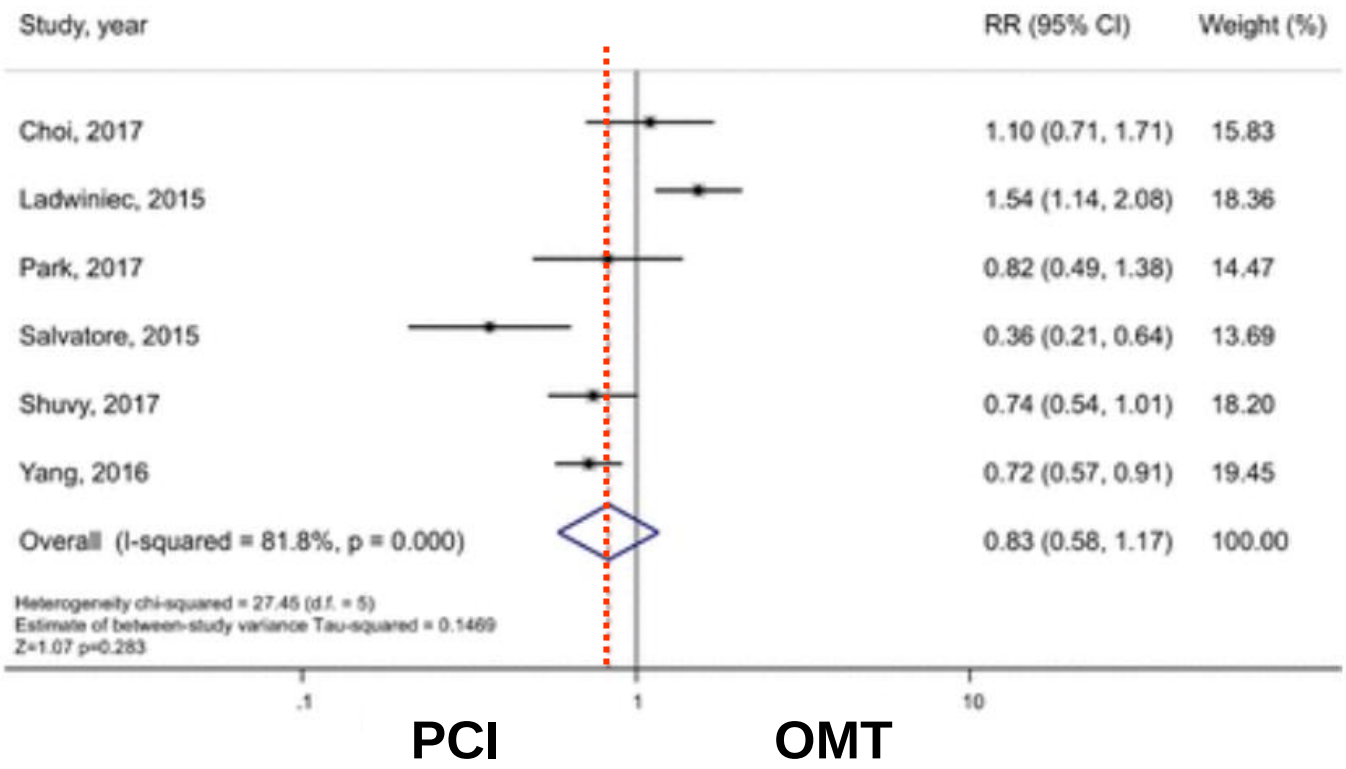
Unadjusted Kaplan-Meier Curve

Death or Q-wave MI



Lee et al. JACC Cardiovasc Interv. 2016;9:530-8, AMC CTO Registry Data (n=1,173)

A SYSTEMATIC REVIEW AND META-ANALYSIS;
5,518 CTO patients (2,667 PCI and 2,851 OMT)



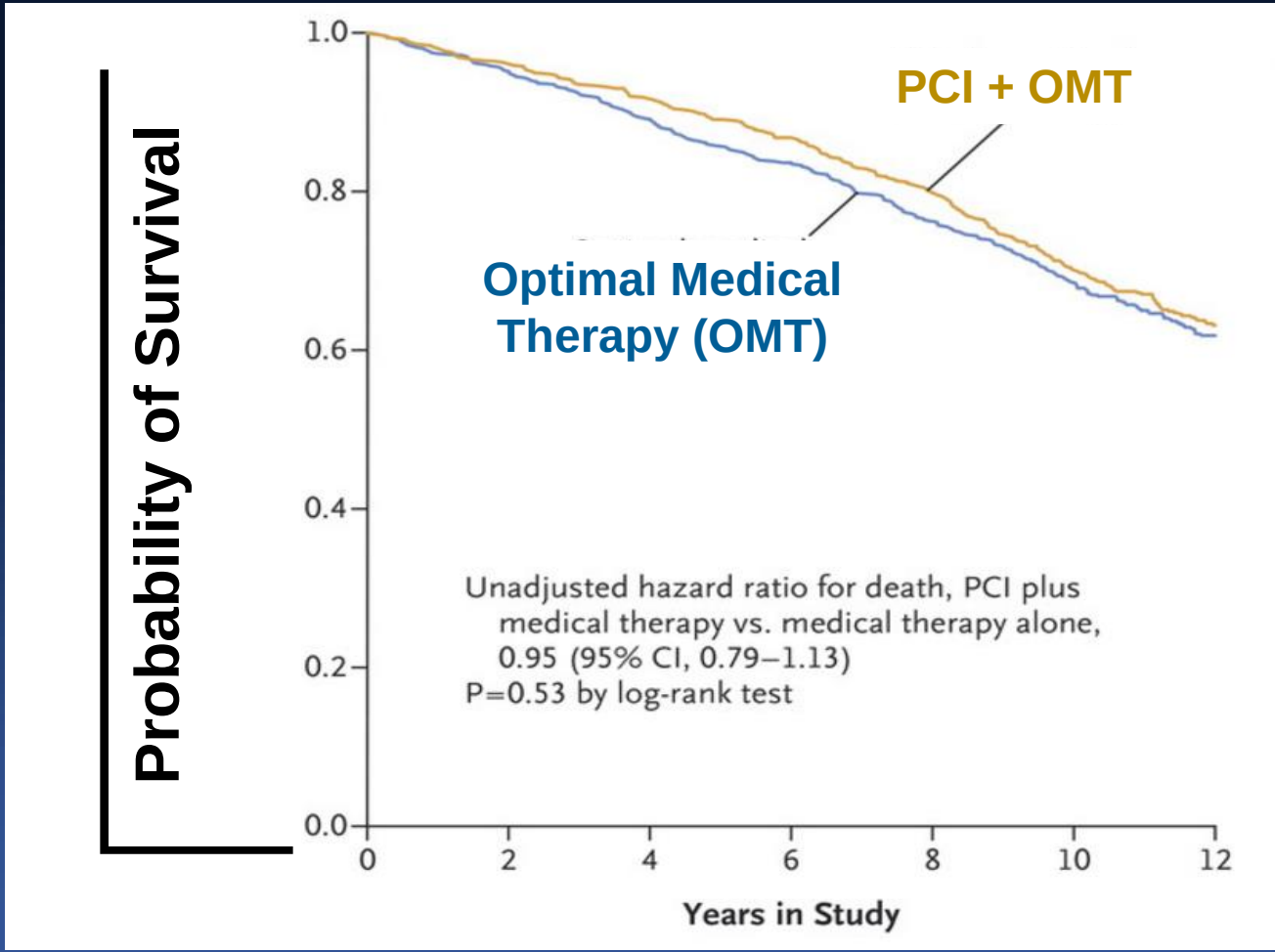
PCI was not significantly associated with decreased risk of MACE (pooled risk ratio =0.83, 95 % confidence interval: 0.58-1.17, p = 0.28, I2=81.8%)

Klomjit S, et al JACC Supplement March 2018

Survival Benefit ?

The Survival Benefit of CTO PCI Is Not Different from Other PCIs.

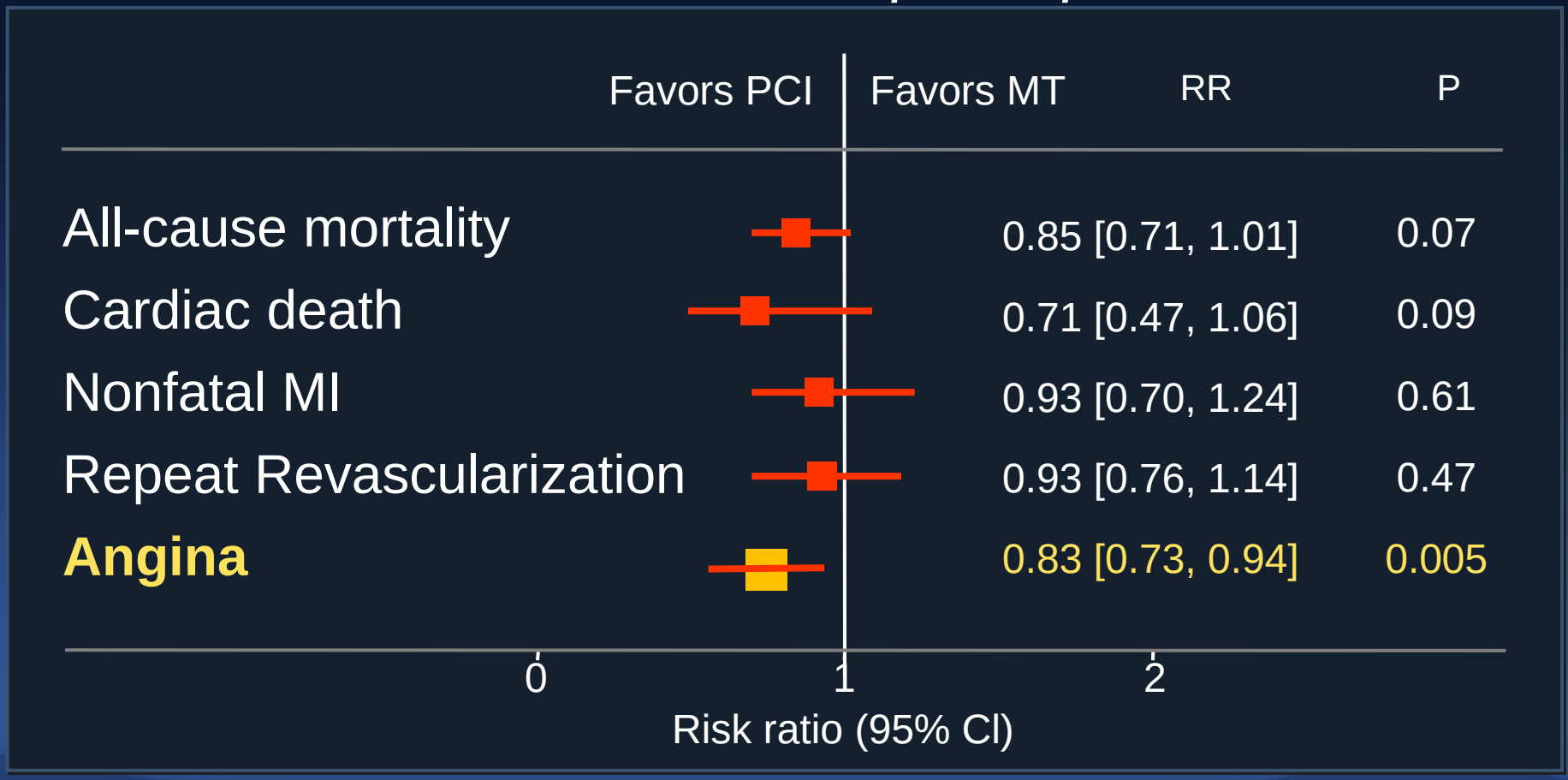
COURAGE at 15 Years: No Survival Benefit for PCI



Sedlis SP, et al. N Engl J Med. 2015;373:1937

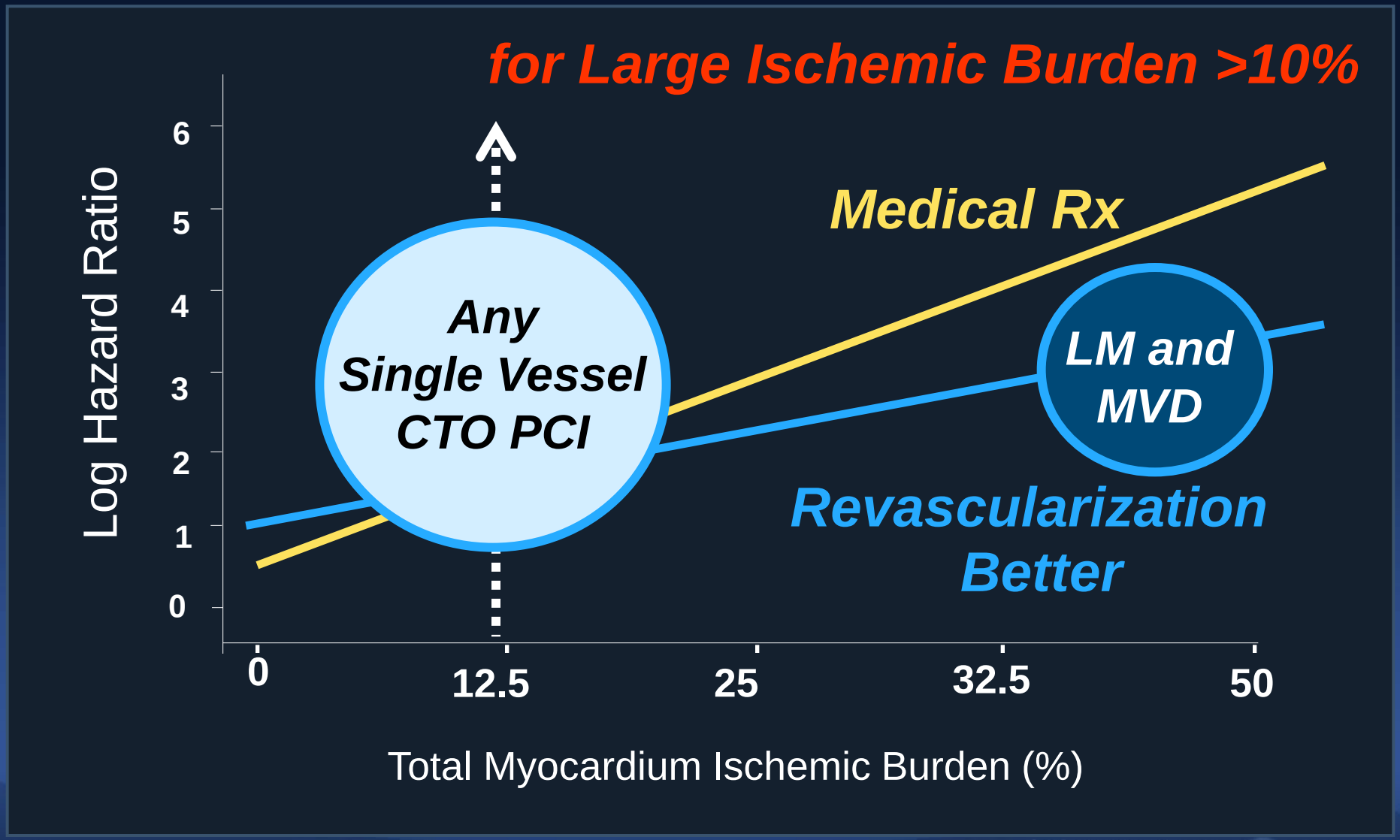
No Survival Benefit of PCI Over Medications in Stable Disease

12 RCTs, 7182 participants



Pursnani et al, Circ CV Intv 2012

Survival Benefit of Revascularization



Hachamovitch R, Circulation. 2003;107:2900-2906

Survival Benefit ?
Of Any Single Vessel CTO PCI;

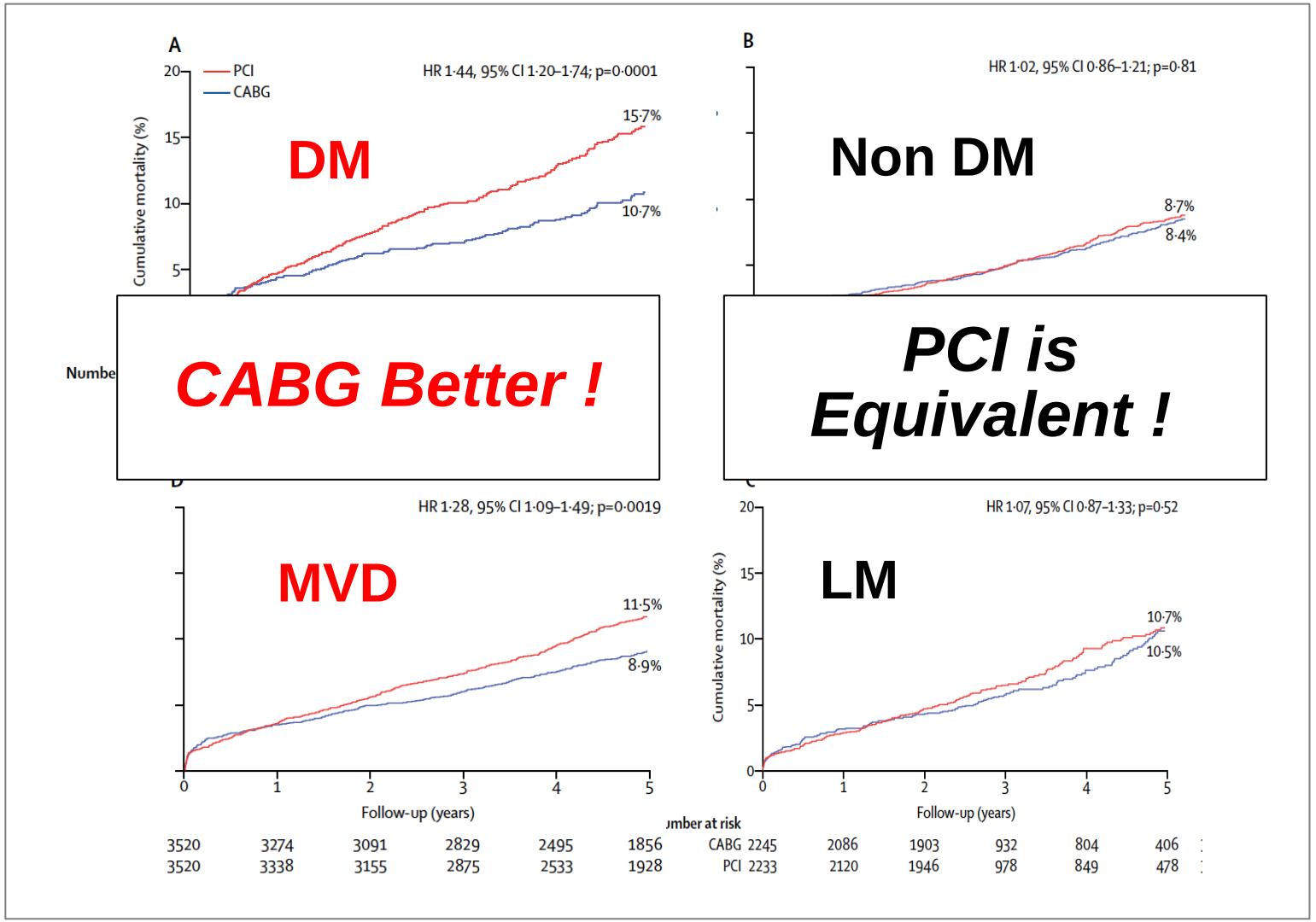
No Survival Benefit !

Survival Benefit ?
Of Multi-Vessel Disease Revascularization

Survival Benefit !

PCI vs. CABG ?
CABG is Better !

Cumulative Mortality



Head SJ et al. Lancet February 22, 2018 ; *Patient-level Meta-Analysis of 11,518 Patients with 11 RCTs (ERACI II, ARTS, MASS-II, SoS, SYNTAX, PRECOMBAT, FREEDOM, VA CARDS, BEST, NOBLE, and EXCEL)*

Why CABG Is Better For Multi-Vessel Disease ?

1. *Diffuse and Large Atherosclerotic Burden in Diabetic Patients.*
2. *Issue of Incomplete Revascularization.*

ESC Guidelines 2018
Elective PCI for 3 Vessel Disease

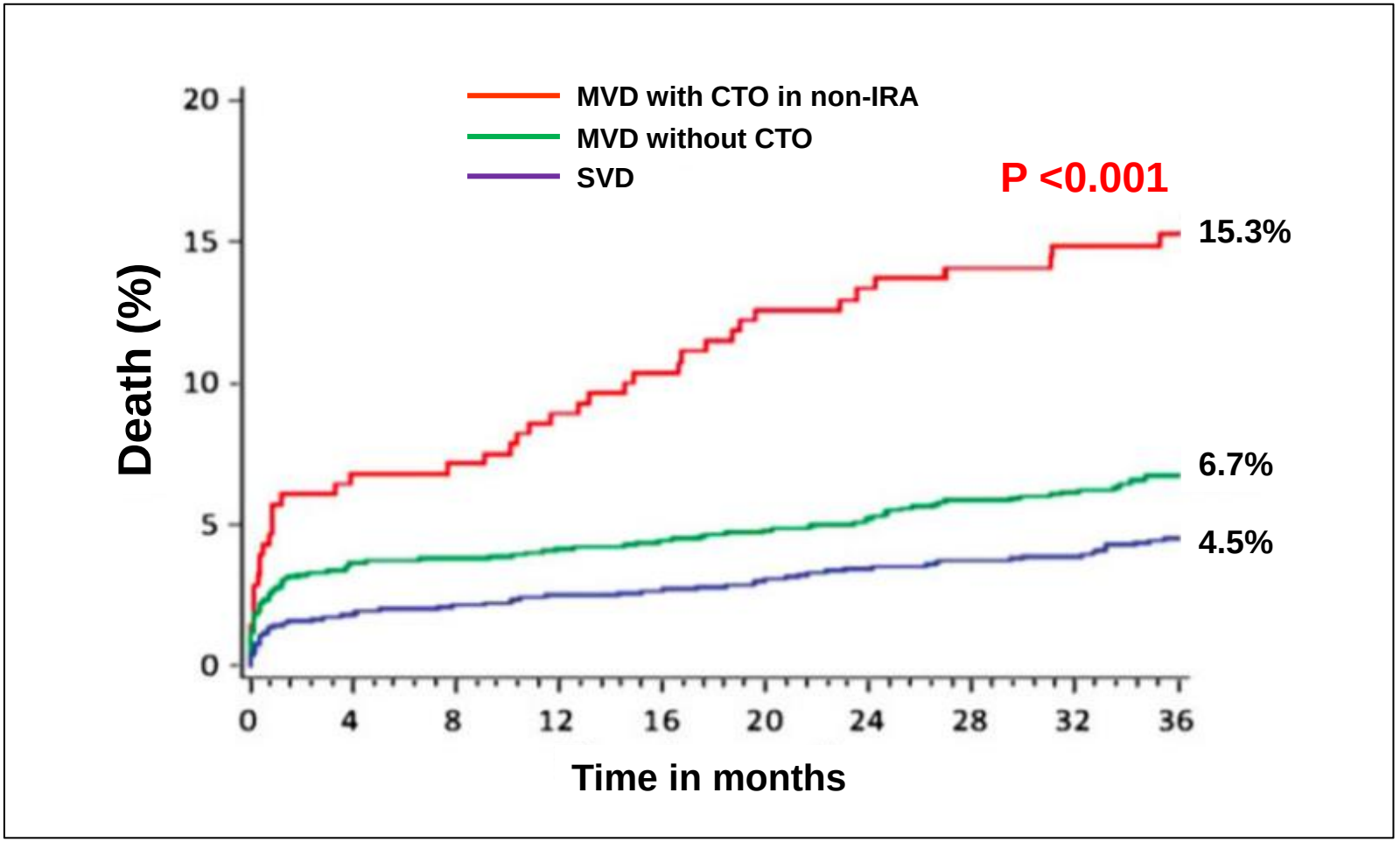
	CABG		PCI	
3-VD without Diabetes Mellitus	**Class**	**Level**	**Class**	**Level**
3 VD with low SYNTAX score (0-22)	I	A	I	A
3 VD with intermediate of high SYNTAX score (>22)	I	A	III	A
3-VD with Diabetes Mellitus				
3 VD with low SYNTAX score (0-22)	I	A	IIb	A
3 VD with intermediate of high SYNTAX score (>22)	I	A	III	A

MVD with CTO lesion

Is It More Dangerous ?

Diseased Non-CTO vessel should Supply Larger Ischemic Burden including CTO Territory, and MVD with CTO lesion is More At Risk.

Higher Mortality in MVD with CTO



Claessen BE, Eur Heart J 2012;33:768-75

MVD with CTO lesion

How Would You Treat ?

Case 1

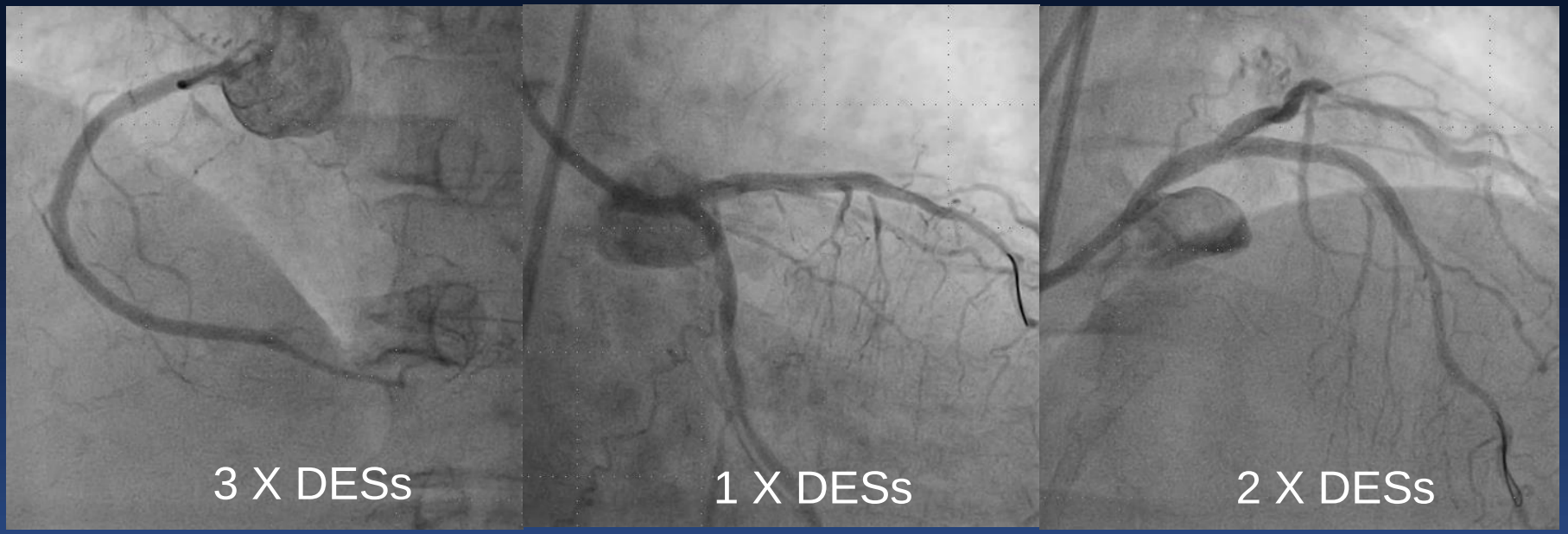
73/F, *3 VD with RCA CTO lesion (SS 32, JCTO score 3)*

RCA CTO

LCX disease,
RCA Collateral
from LAD and LCX

LAD disease

What I Did



Complete Revascularization with Multiple DESs

Case 2

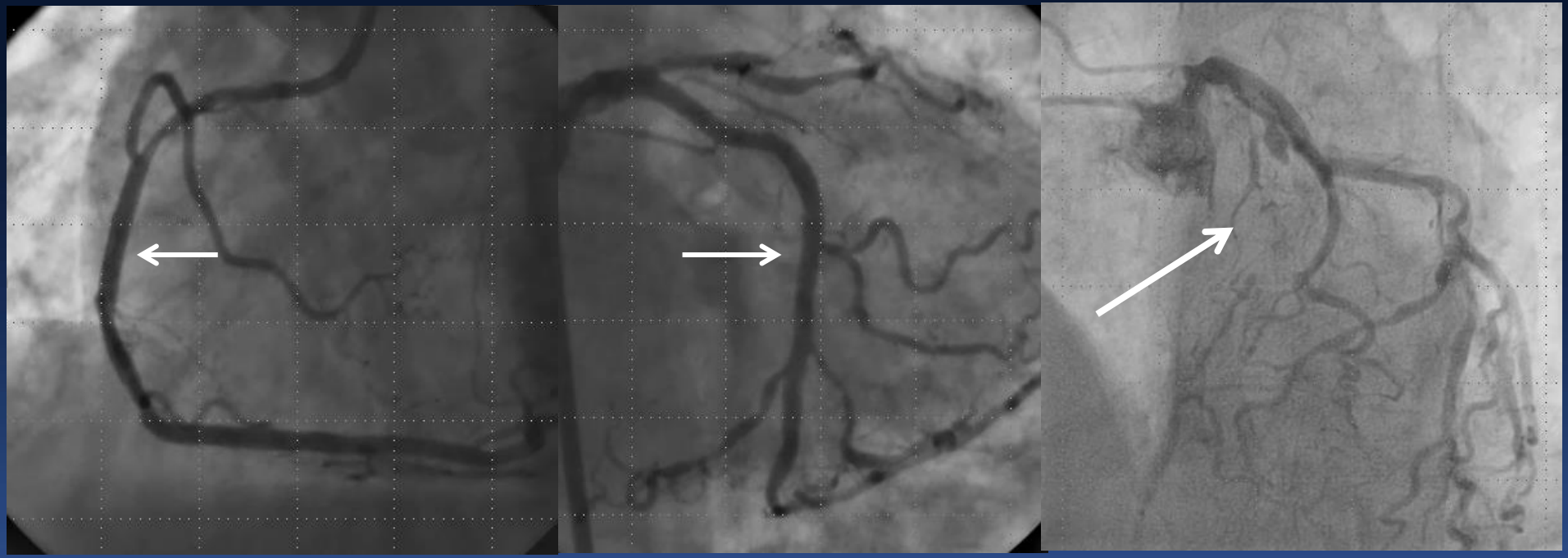
76/M, *3 VD with LAD CTO lesion (High SS 33, JCTO score 3)*

RCA 85%

LCX 90%

LAD CTO

What I Did



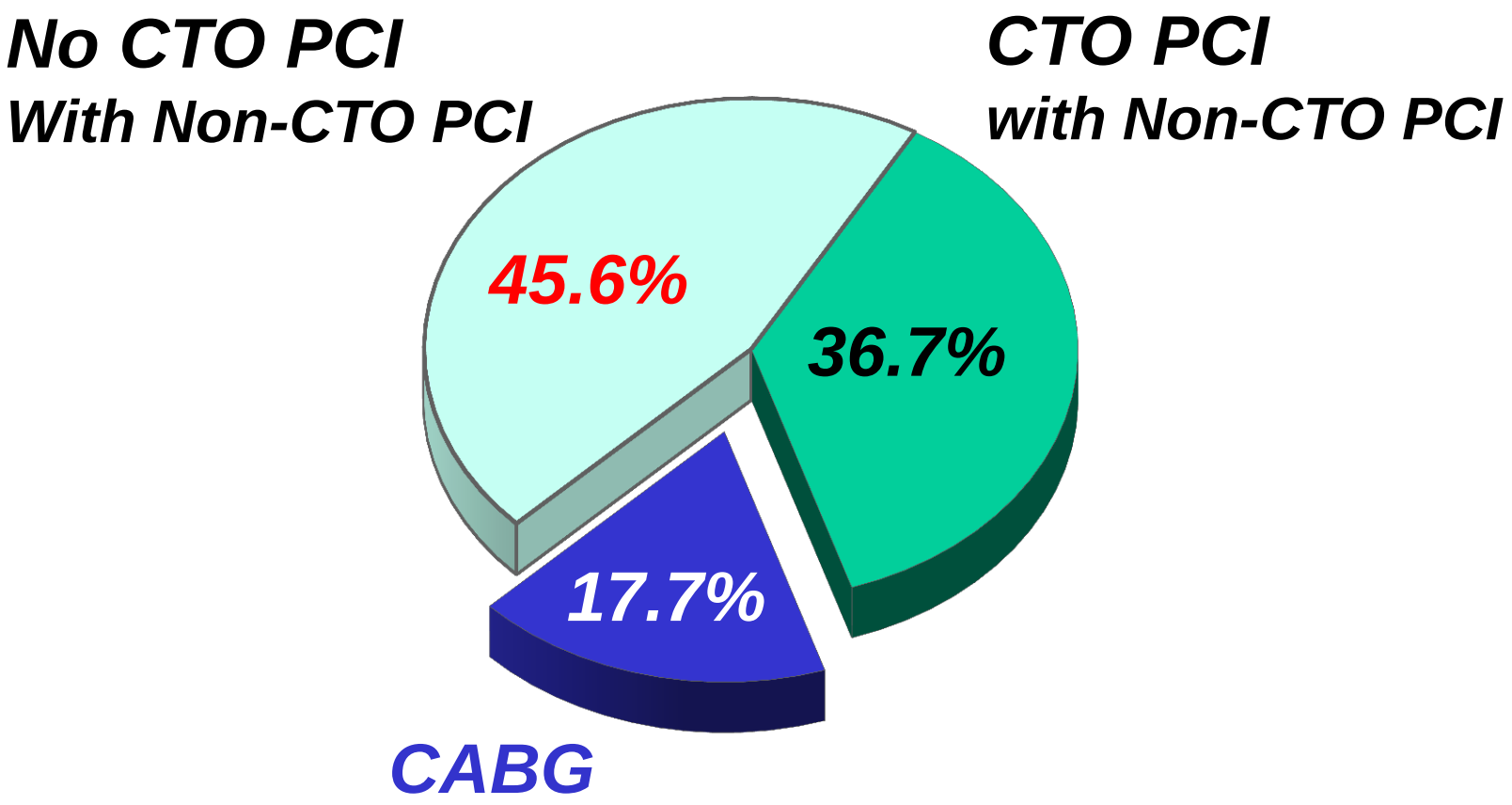
PCI
for Non-CTO lesions

OMT
for LAD CTO

Treatment for MVD with CTO lesion

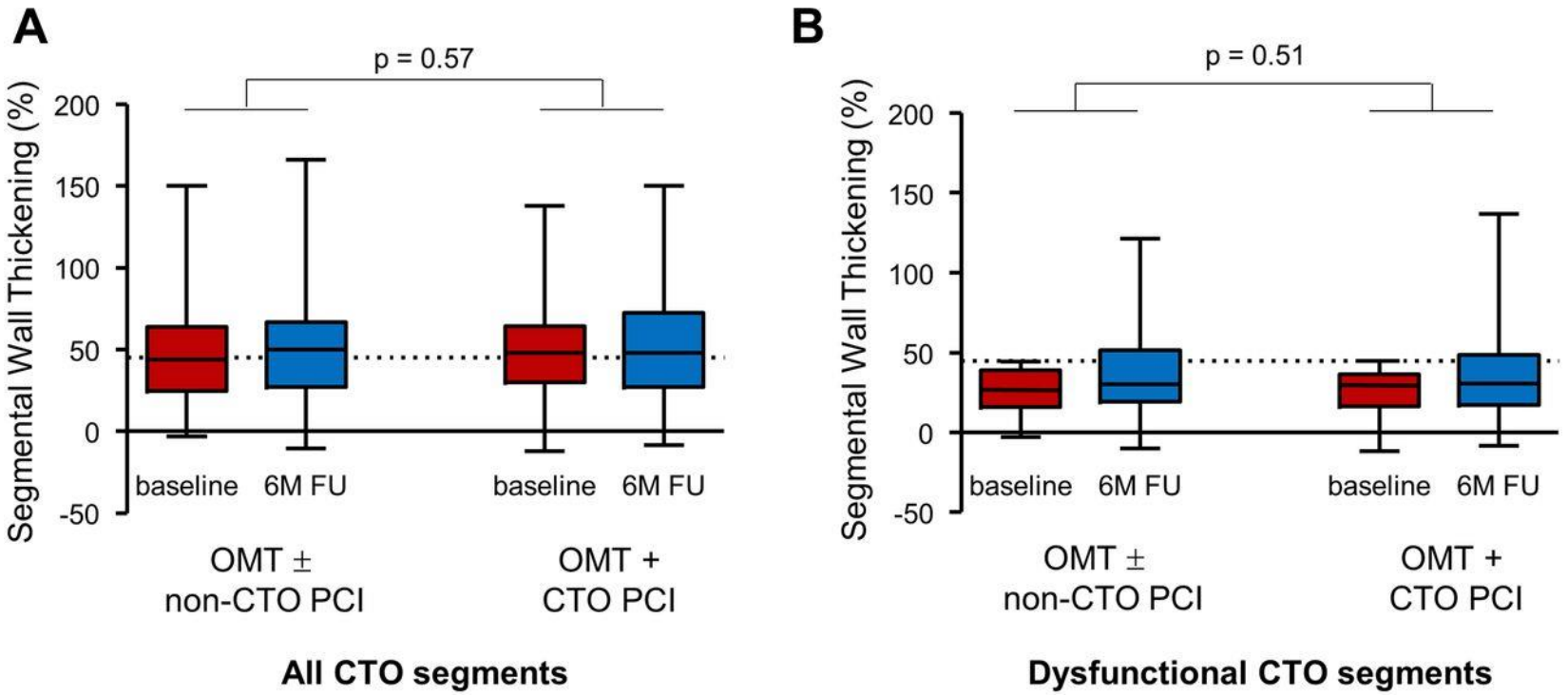
1. ***CABG***
2. *CTO PCI with Non-CTO PCI*
3. *No CTO PCI with Non-CTO PCI*

Treatment for MVD with CTO lesion



Preliminary Data from DECISION-CTO Registry (n=2,267)

No Difference in Segmental Wall Thickness, Reginal and Global LV function after CTO PCI

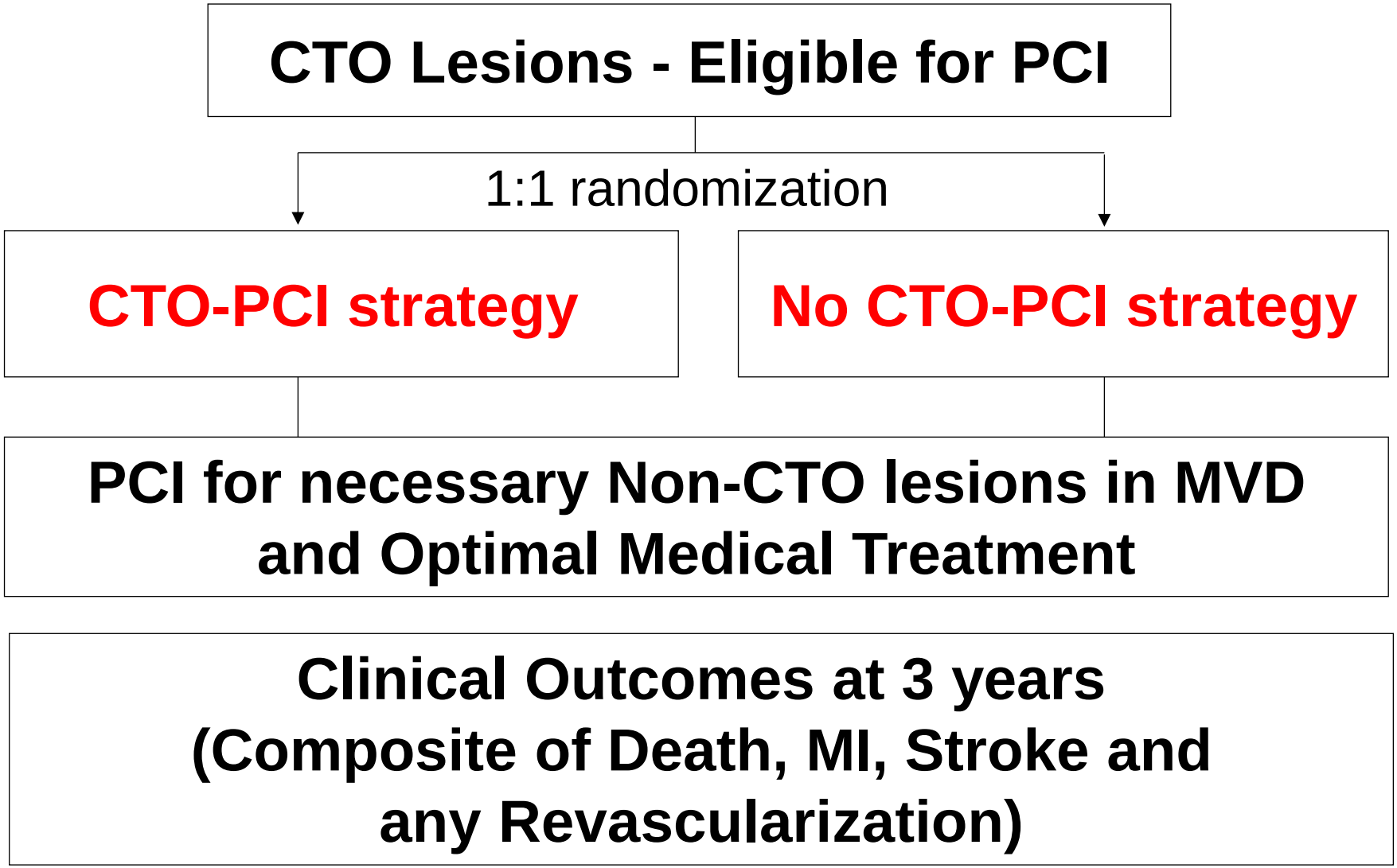


Kambis Mashayekhi et al. JCIN 2018;j.jcin.2018.05.041, A Randomized Trial to Assess Regional Left Ventricular Function After Stent Implantation in Chronic Total Occlusion. The REVASC Trial (n=205, MRI study)

DECISION CTO Study,

COURAGE Like Randomized Study for CTO Lesions.

DECISION-CTO



Baseline Characteristics

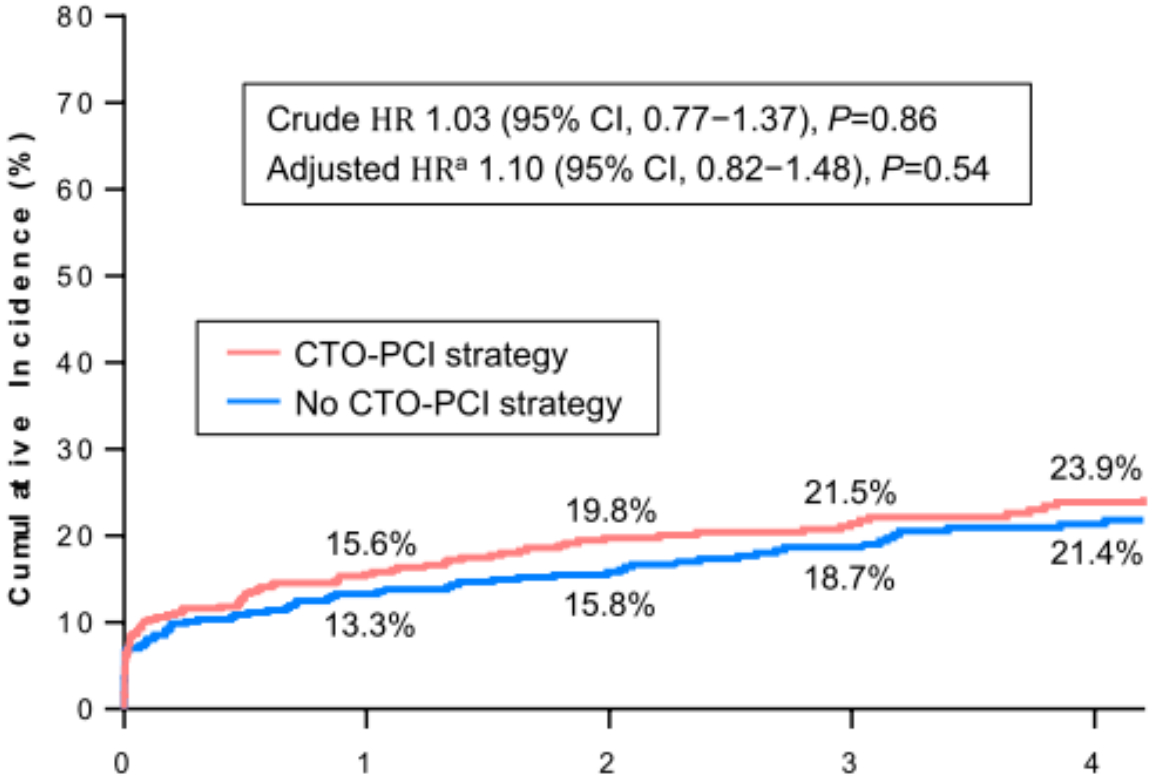
	OMT (N=398)	PCI (N=417)	P value
Age (years)	62.9±9.9	62.2±10.2	0.35
Male sex	315 (81.4%)	342 (83.2%)	0.50
BMI, kg/m²	25.4±3.3	25.6±3.6	0.66
Hypertension	235 (60.7%)	261 (63.5%)	0.50
Diabetes mellitus	133 (34.4%)	132 (32.1%)	
Hypercholesterolemia	215 (55.6%)	248 (60.3%)	0.17
Current smoker	102 (26.4%)	125 (30.4%)	0.20
Previous PCI	74 (19.1%)	62 (15.1%)	0.13
Previous MI	34 (8.8%)	45 (10.9%)	0.31
Previous CABG	5 (1.3%)	4 (1.0%)	0.75
Chronic renal failure	5 (1.3%)	6 (1.5%)	0.84
LVEF, %	57.2±9.4%	57.2±9.8%	0.95

Baseline Characteristics

	OMT (N=398)	PCI (N=417)	P value
Clinical presentation			0.58
Stable angina	290 (74.9%)	297 (72.3%)	
Unstable angina	75 (19.4%)	84 (20.4%)	
AMI	22 (5.7%)	30 (7.3%)	
Location of CTO			0.71
LAD	161 (41.6%)	183 (44.5%)	
LCX	42 (10.9%)	40 (10.2%)	
RCA	184 (47.5%)	186 (45.3%)	
Multi-vessel disease	286 (73.9%)	301 (73.3%)	0.76
SYNTAX score	21.0±9.5	21.2±9.1	0.79
J-CTO score	2.3±1.2	2.2±1.2	0.23
Number of total stents	2.0±1.4	2.4±1.3	<0.001
Total stent length, mm	53.6±39.4	71.2±40.5	<0.001

ITT Population

Primary End Point
(Death, MI, Stroke, Any Revascularization)

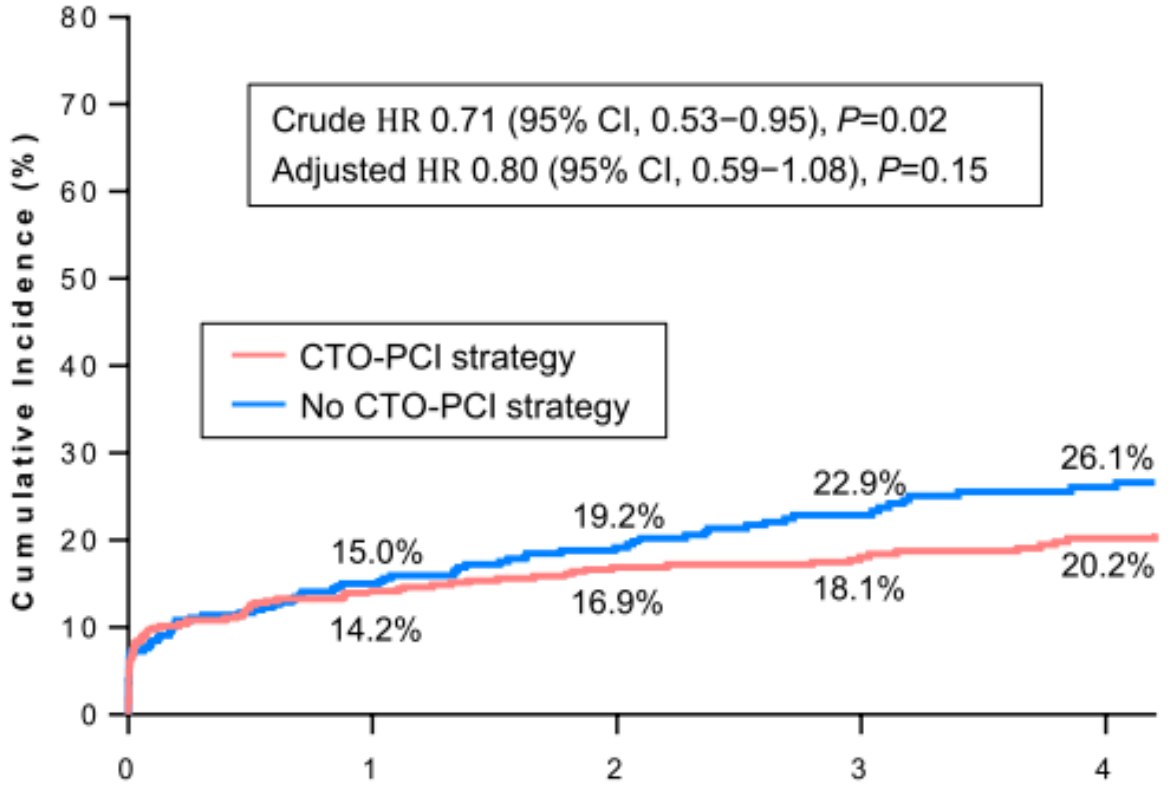


No. at Risk

CTO-PCI	417	330	269	222	161
No CTO-PCI	398	325	288	230	170

AT Population

Primary End Point
(Death, MI, Stroke, Any Revascularization)



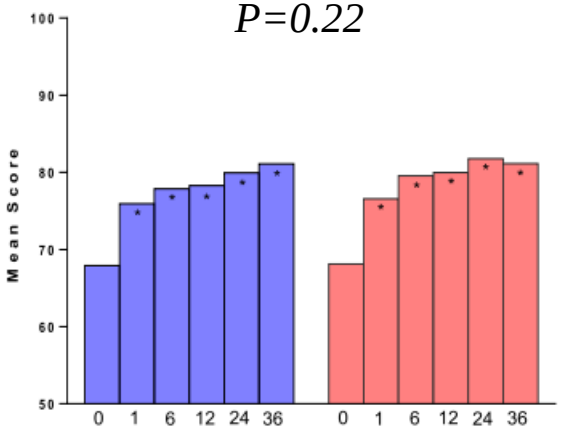
No. at Risk

CTO-PCI	462	375	318	268	197
No CTO-PCI	342	281	239	184	134

Quality of Life Measures Over Time

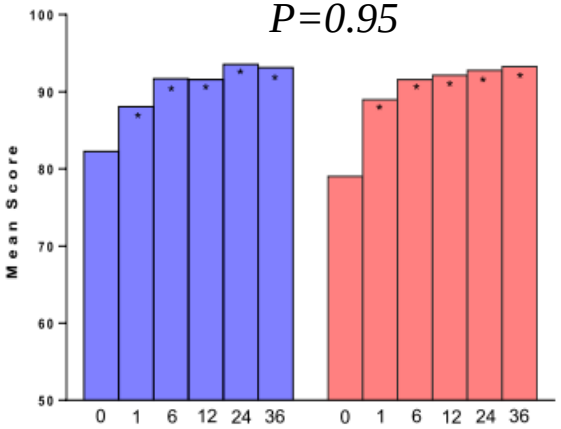
EQ-5D Visual Analogue Scale

P=0.22



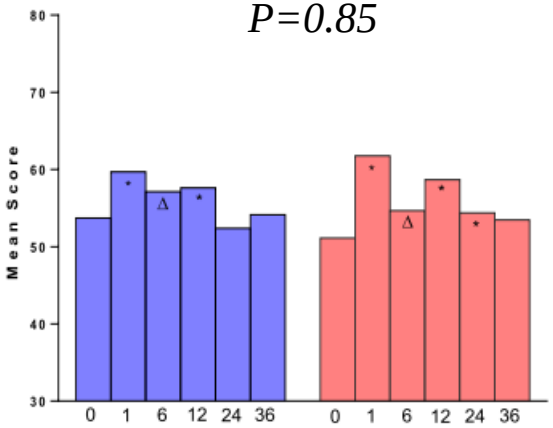
SAQ, Physical Limitation

P=0.95



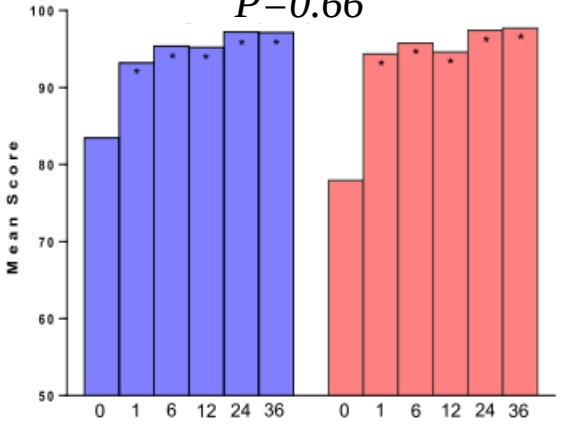
SAQ, Angina Stability

P=0.85



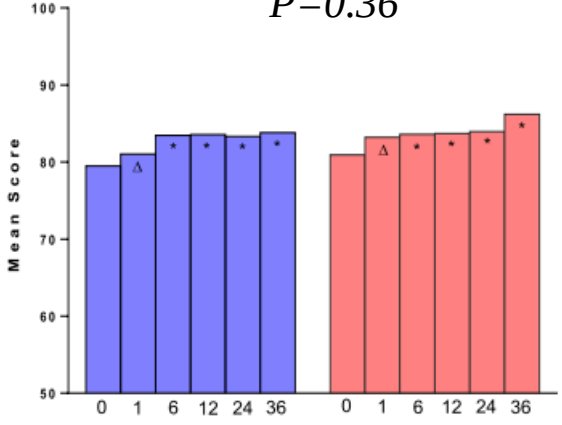
SAQ, Angina Frequency

P=0.66



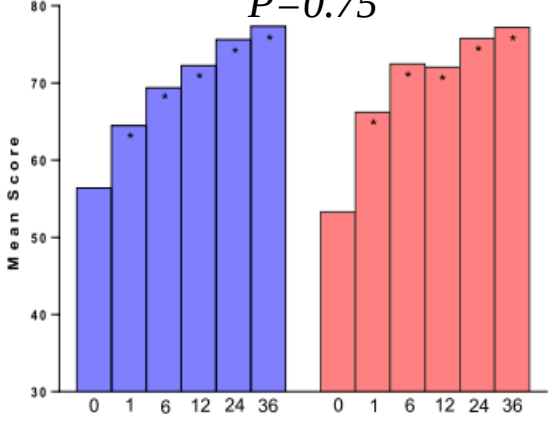
SAQ, Treatment Satisfaction

P=0.36



SAQ, Quality of Life

P=0.75

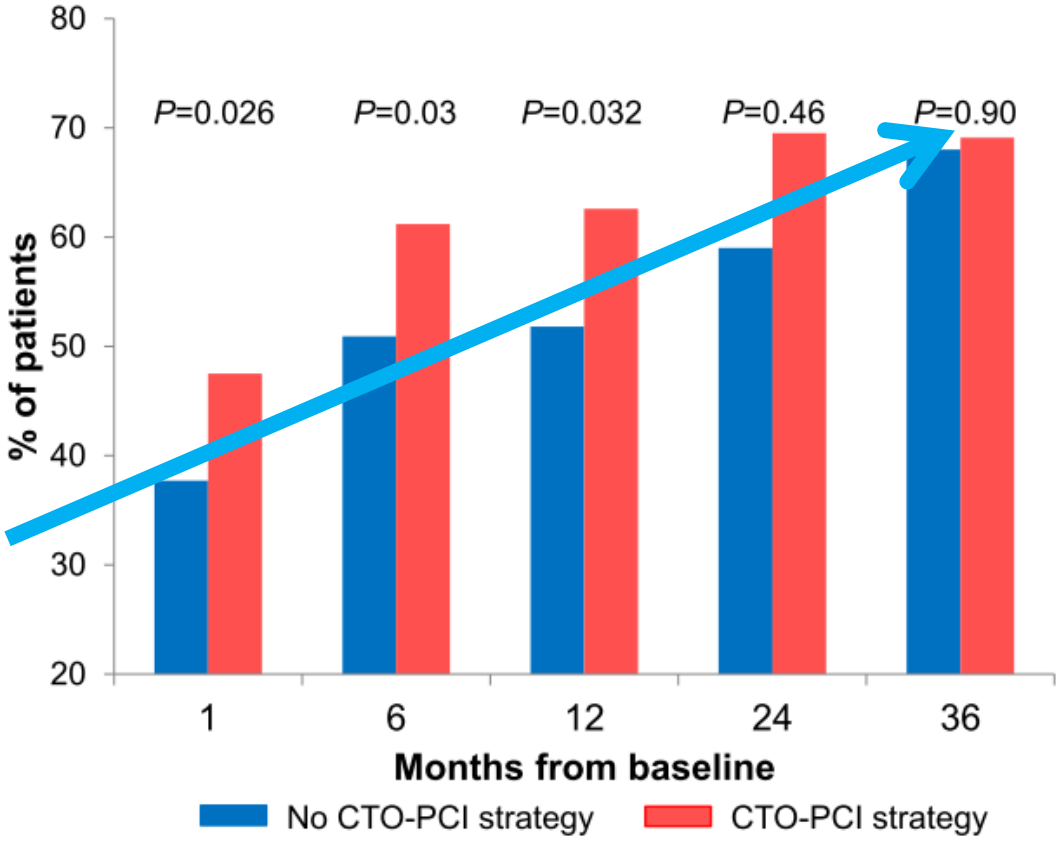


No CTO-PCI strategy CTO-PCI strategy

P values are for Treatment*Time

Clinically Meaningful Improvements

SAQ-Quality of Life



Practical Message from
DECISION CTO Study

1. ***Optimal Medical Treatment (OMT)*** *for Single Vessel CTO Is Mostly Safe and Effective.*
2. ***Non-CTO lesion PCI with OMT for Remaining CTO lesion (No CTO PCI)*** *Would be Effective Alternative for Patients with MVD with CTO lesion.*

Where Is the Benefit CTO PCI ?

Symptomatic

CTO PCI
Very High Cost, Very High Risk, Lack of Benefit to the Patient.

Letter To the Editor,

Mohammad Reza Movahed, MD,PhD, JACC Interv, 11.No 15, August 13, 2018:1536-44

Thank You !!

summitMD.com