

Appropriate Clinical Indication for CTO PCI

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Clinical indication for CTO PCI

Although interest in CTO PCI is growing with improving technical success rates, the current body of evidence is not sufficient to clearly determine the magnitude of benefits and to identify which patients are most likely to improve after recanalization.

Clinical indication for CTO PCI

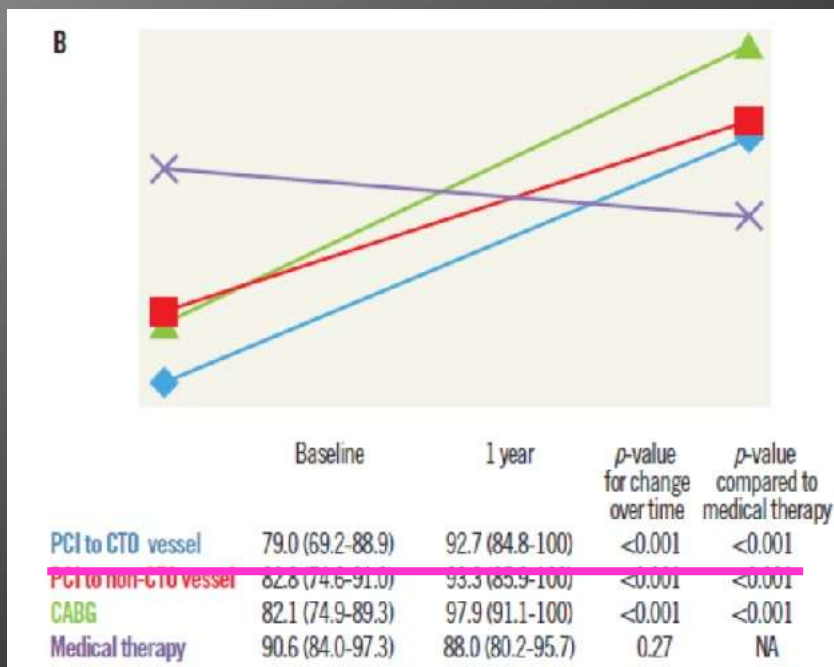
1. Presence of ischemia in territory of CTO vessel

Why do we open the CTO?

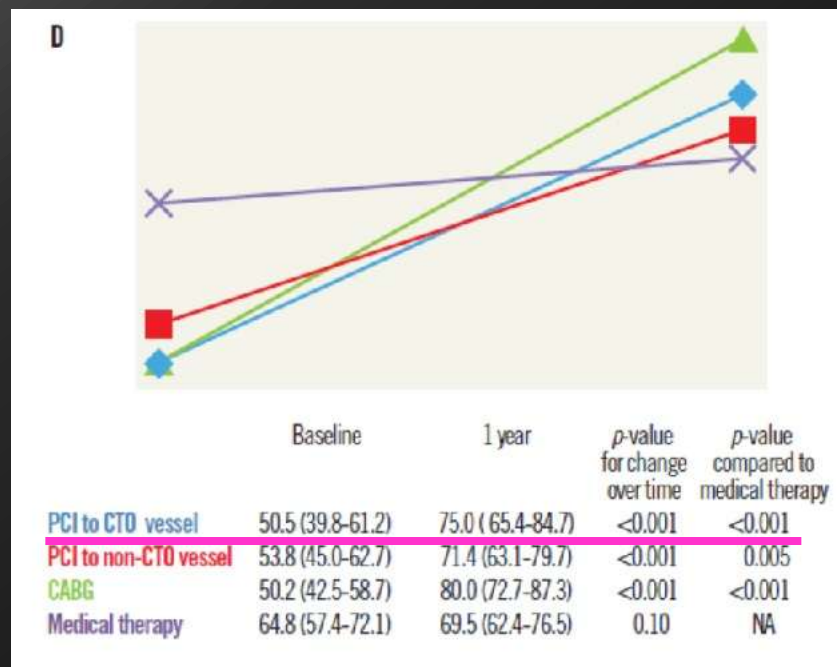
- For improvement of QOL
- For improvement of clinical prognosis

Relationship between initial treatment strategy and quality of life in patients with coronary chronic total occlusions

Wijeyesundera HC et al. EuroIntervention. 2014;9:1165-72.



Changes in angina frequency

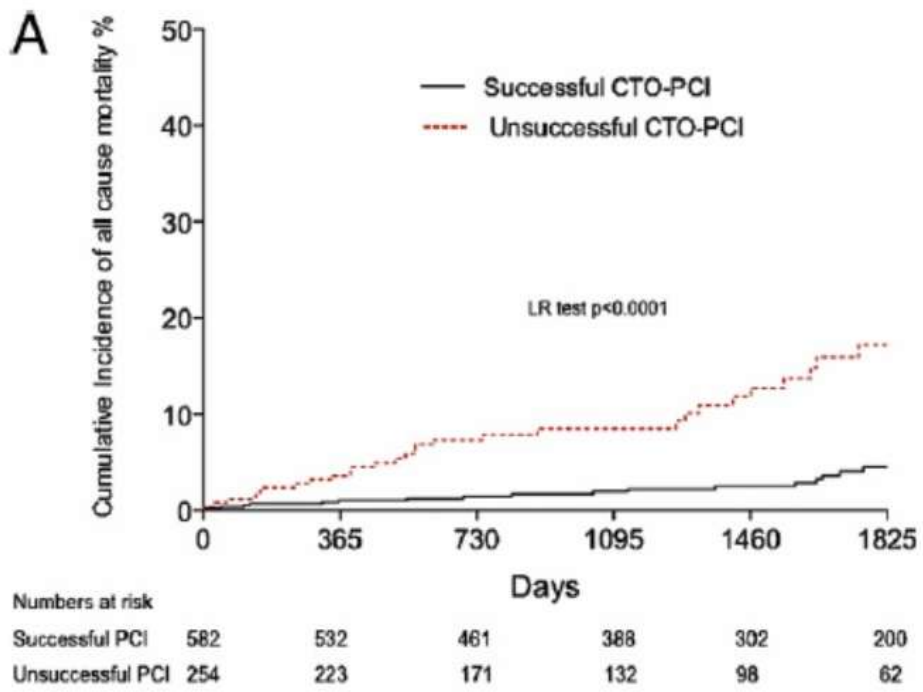


Changes in disease perception

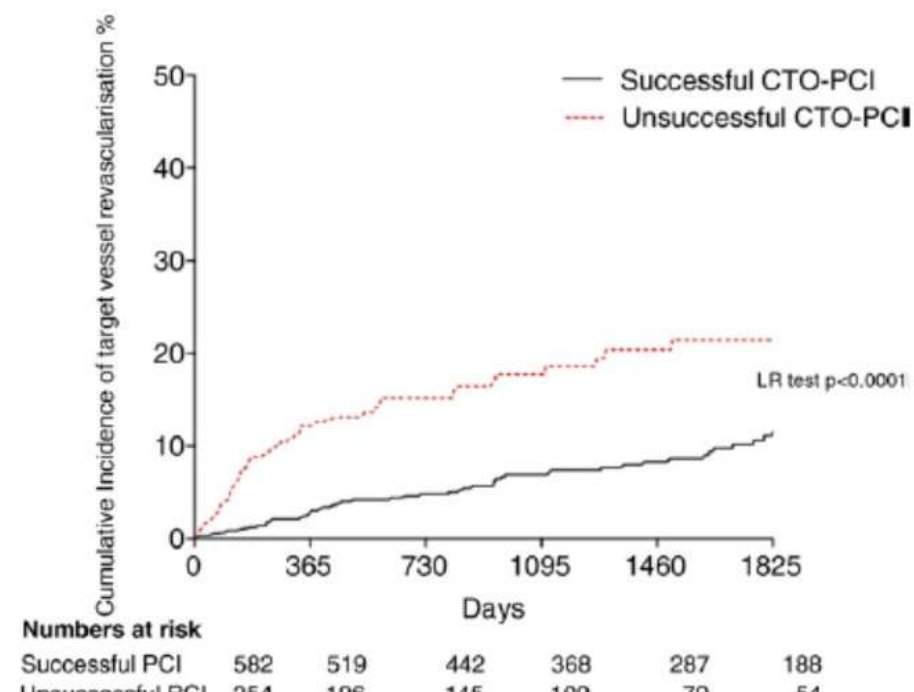
CTO territory revascularization was associated with QOL improvement

Successful Recanalization of Chronic Total Occlusion is Associated with improved Long-term Survival

Jones DA et al. JACC Cardiovasc Interv. 2012;5:380-8.



Incidence of mortality

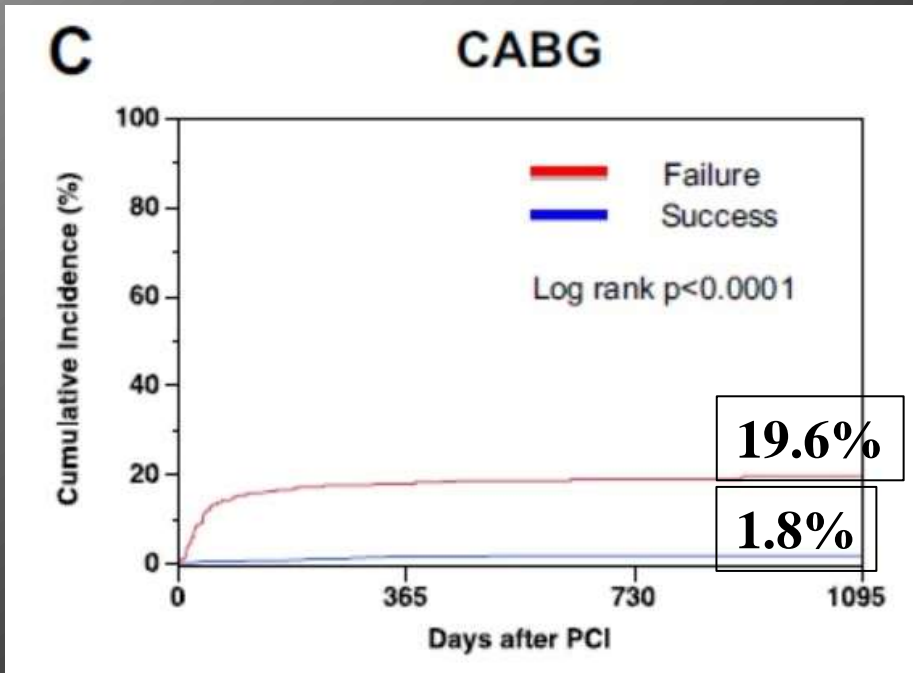


Incidence of TVR

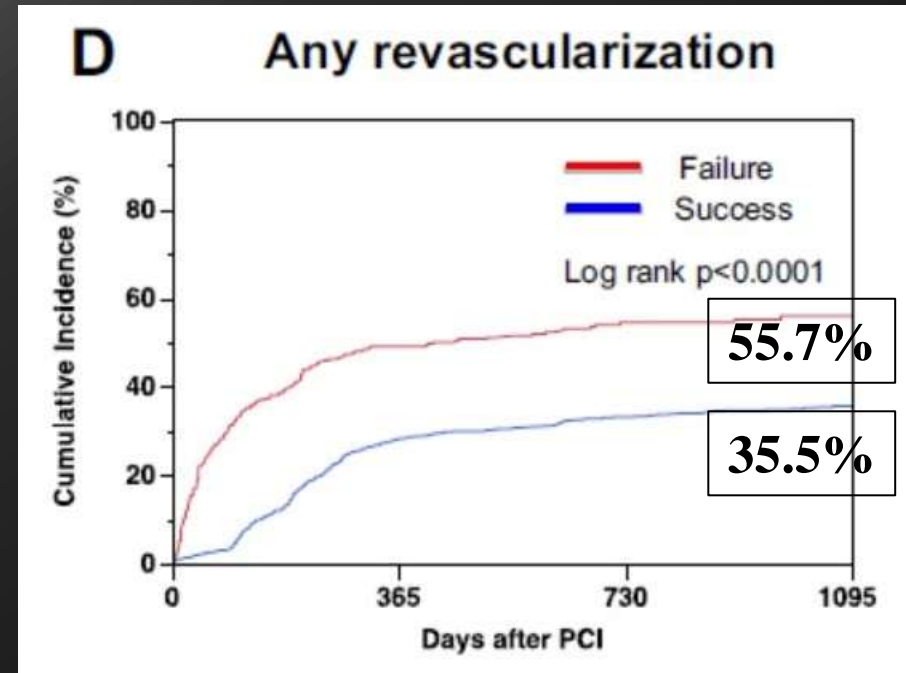
Successful CTO-PCI could reduce incidence of mortality and TVR

Long-term Outcomes after Percutaneous Coronary Intervention for Chronic Total Occlusion (from the CREDO-Kyoto Cohort-2)

Yamamoto E et al. Am J Cardiol 2013;112:767-774



Incidence of CABG



Incidence of any revascularization therapy

Successful CTO-PCI was associated with improvement of long-term clinical outcomes

Clinical indication for CTO PCI

1. Presence of ischemia in territory of CTO vessel

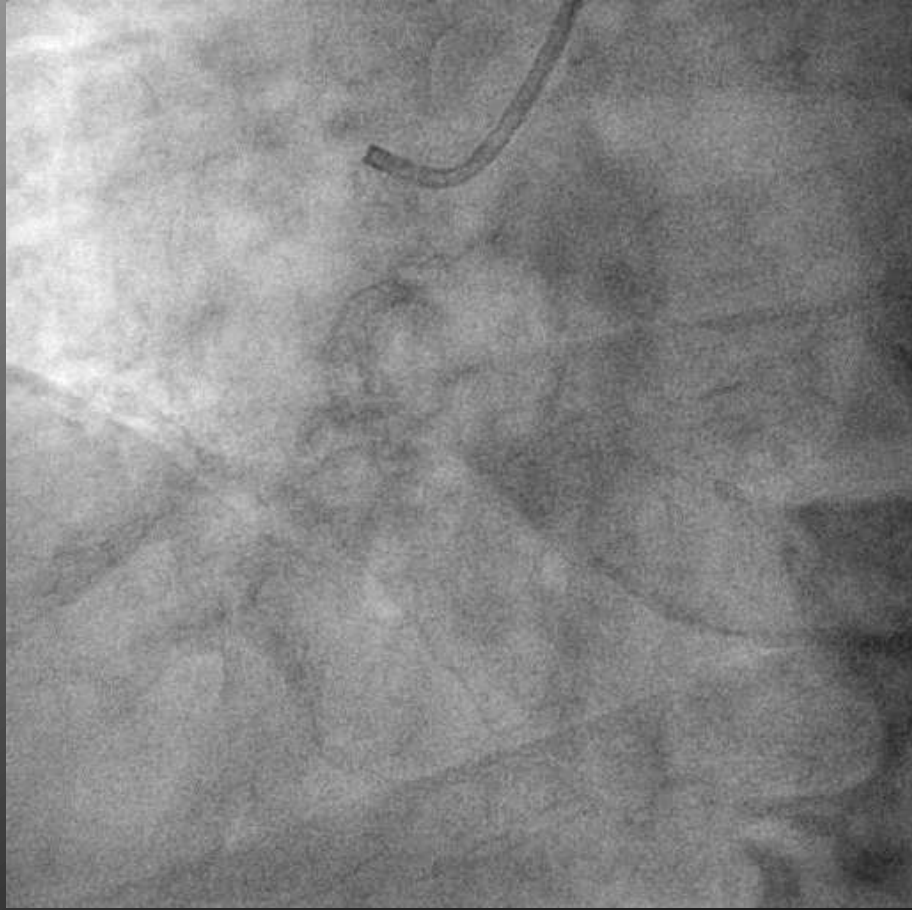
In patients with CTO lesion(s), donor artery should supply blood to the distal area in CTO vessel(s).



Plaque rupture in donor arteries may be associated with critical cardiovascular events.



CTO PCI attempt should not be obstructed by the presence or absence of ischemia in territory of CTO vessel(s).



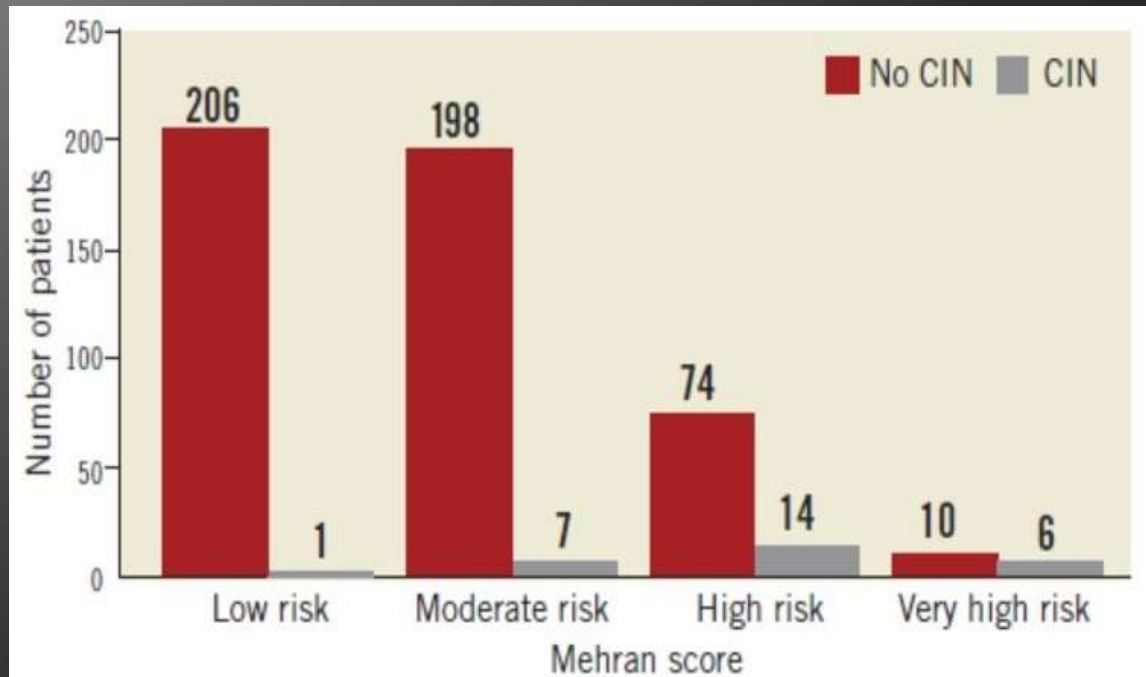
Clinical indication for CTO PCI

1. Presence of ischemia in territory of CTO vessel
2. Patients background
 - Patients renal function
 - = The risk of contrast-induced nephropathy

Predictors of Contrast-Induced Nephropathy in Chronic Total Occlusion Percutaneous Coronary Intervention

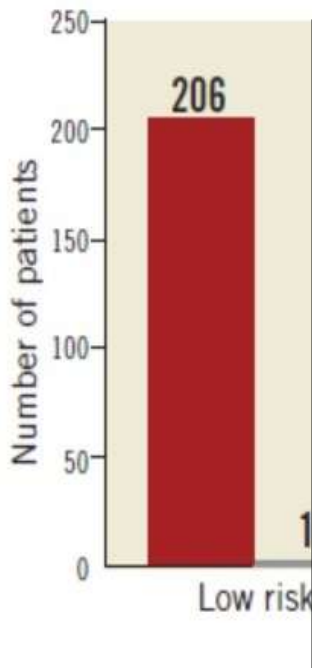
Lin YS et al. EuroIntervention. 2014;9:1173-1180.

Prevalence of CIN in different categories of Mehran score



Predictors of Contrast-Induced Nephropathy in Chronic Total Occlusion Percutaneous Coronary Intervention

Lin YS et al. EuroIntervention. 2014;9:1173-1180.



Prevalence category

Predictors of CIN in CTO PCI

Variables	OR	95% CI	p-value
Age >75	3.749	1.173-11.988	0.026
Severe tortuosity	6.621	1.090-40.227	0.040
Mehran score: high risk vs. low risk	27.022	2.787-262.028	0.004
Mehran score: very high risk vs. low risk	32.512	2.149-491.978	0.012

CI: confidence interval; CIN: contrast-induced nephropathy; CTO: chronic total occlusion; OR: odds ratio; PCI: percutaneous coronary intervention

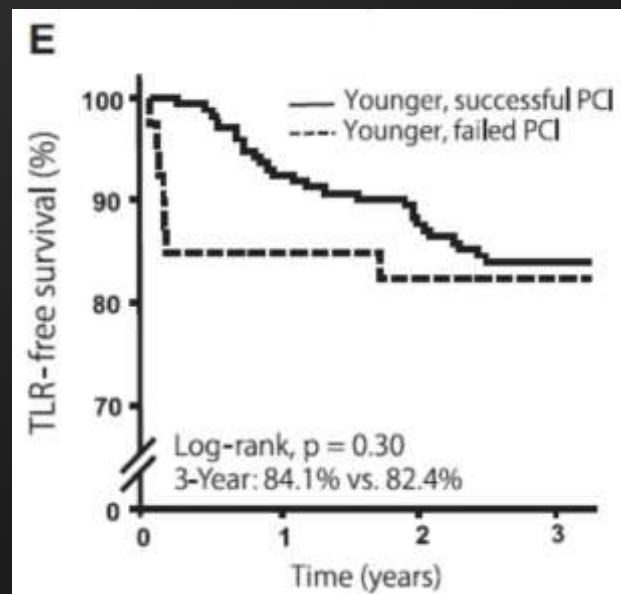
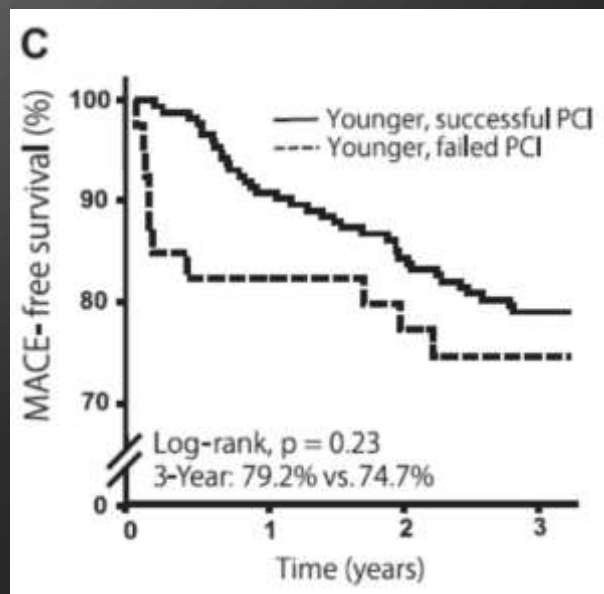
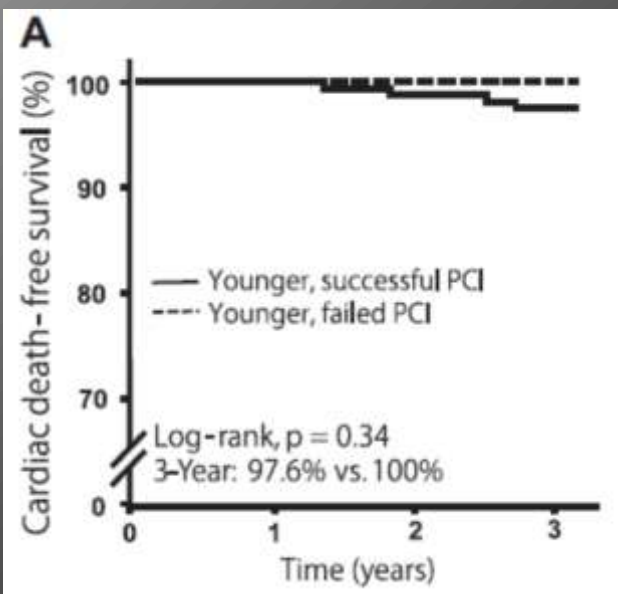
Patients renal function is definitely associated with CIN after CTO PCI

Clinical indication for CTO PCI

1. Presence of ischemia in territory of CTO vessel
2. Patients background
 - Patients renal function
 - = The risk of contrast-induced nephropathy
 - Patient age
 - = The risk or benefit of PCI for CTOs in older patients?

Comparison of Short- and Long-Term Outcomes of Percutaneous Coronary Intervention for Chronic Total Occlusion between Patients Aged ≥ 75 years and Those < 75 Years

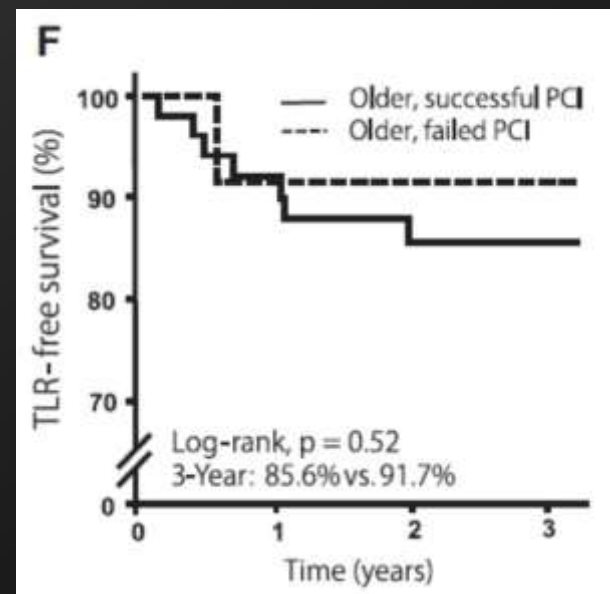
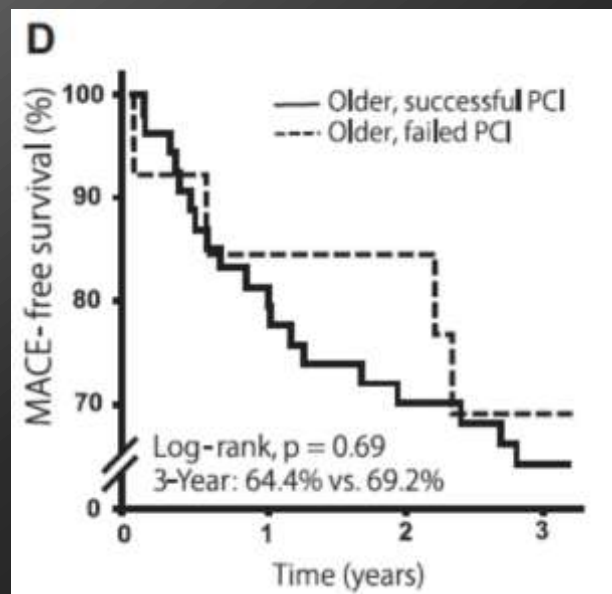
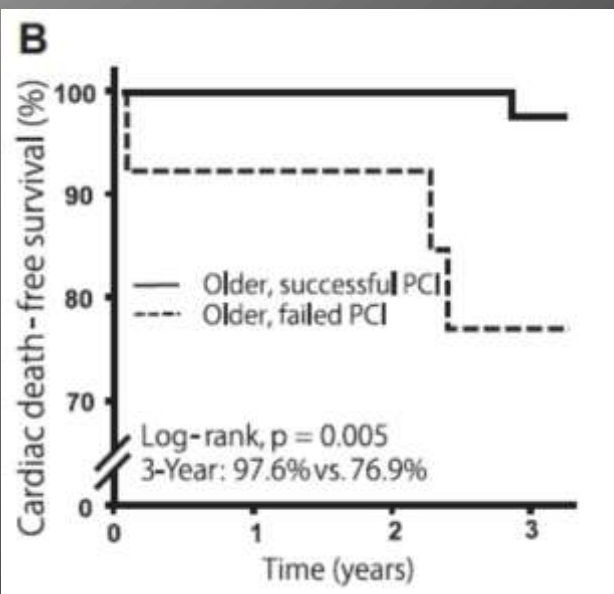
Tanaka Y et al. Am J Cardiol 2013;112:761-766.



In younger (< 75 years) patients, procedural results were not associated with long-term clinical outcomes.

Comparison of Short- and Long-Term Outcomes of Percutaneous Coronary Intervention for Chronic Total Occlusion between Patients Aged ≥ 75 years and Those < 75 Years

Tanaka Y et al. Am J Cardiol 2013;112:761-766.



CTO PCI should not be obstructed by age of patient

Clinical indication for CTO PCI

1. Presence of ischemia in territory of CTO vessel
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 - = The risk of contrast-induced nephropathy
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Clinical indication for CTO PCI

- 1. Presence of ischemia in territory of CTO vessel**
- 2. Patients background**
- 3. Number of CTO vessels**

Recanalization of isolated chronic total occlusions in patients with stable angina

Jaguszewski M et al. Int J Cardiol. 2013;167:1542-6.

Differences in symptom improvement and risk of MACE in 6- and 24-month follow up.

	CTO success	CTO failure	p Value
<i>Angina symptoms improvement</i>			
6 months observation, n (%)			
Improvement ^a	197 (79.8)	48 (34.5)	<0.01
No-improvement ^b	50 (20.2)	91 (65.5)	<0.01
24 months observation, n (%)			
Improvement ^a	177 (71.7)	29 (20.9)	<0.01
No-improvement ^b	70 (28.3)	110 (79.1)	<0.01
<i>Major adverse coronary events</i>			
6 months observation, n (%)			
Death	0	0	
MI	2 (0.8)	2 (1.4)	0.56
TVR, TLR	27 (10.9)	13 (9.4)	0.63
CABG	1 (0.4)	5 (3.6)	<0.05
MACE	28 (11.3)	14 (10.0)	0.70
24 months observation, n (%)			
Death	5 (2.0)	2 (1.4)	0.68
MI	5 (2.0)	5 (3.6)	0.35
TVR, TLR	42 (17.0)	25 (18.0)	0.81
CABG	3 (1.2)	12 (8.6)	<0.01
MACE	46 (18.6)	27 (19.4)	0.84

Single CTO lesion should be opened!

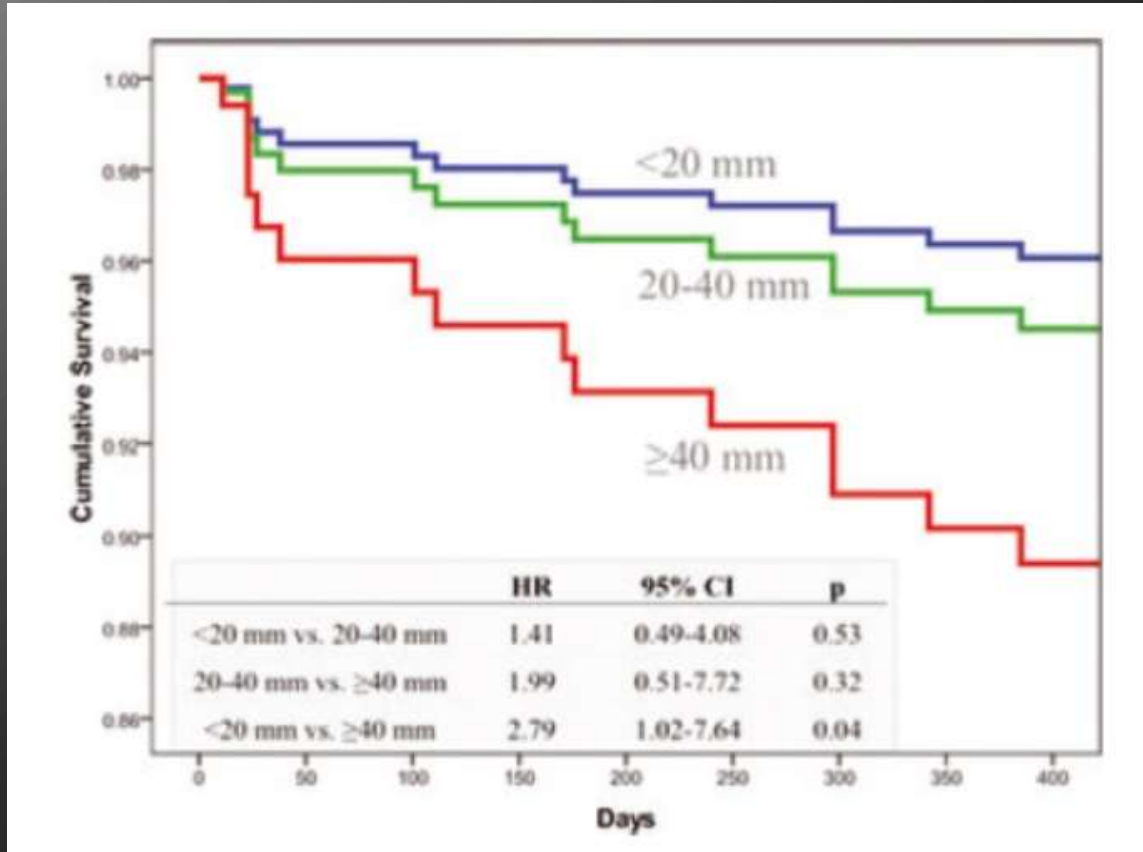
Clinical indication for CTO PCI

1. Presence of ischemia in territory of CTO vessel
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3. Number of CTO vessels

**Can we perform PCI for patients with
two CTO vessels?**

Influence of Chronic Total Occlusion on Coronary Artery Bypass Graft Surgical Outcomes

Banerjee S et al. J Card Surg. 2012;27:662-7.



Length of CTO was associated with 1 year survival

Initial success rate of percutaneous coronary intervention for chronic total occlusion in a native coronary artery is decreased in patients who underwent previous coronary artery bypass graft surgery.

Teramoto T et al. JACC Cardiovasc Interv. 2014;7:39-46.

Table 3. Lesion and Procedural Characteristics of pCABG and nCABG Groups

Variables	pCABG (206 PCIs)	nCABG (1,431 PCIs)	p Value
Target vessel			0.0003
LAD	45 (22)	488 (34)	
RCA	93 (45)	616 (43)	
LCX	64 (31)	323 (22)	
LMT	4 (2)	4 (0.3)	
Calcification			<0.0001
None	47 (23)	480 (34)	
Mild	49 (24)	433 (30)	
Moderate	63 (30)	329 (23)	
Severe	47 (23)	176 (13)	
Tortuosity			0.18
None	164 (80)	1,211 (85)	
Moderate	29 (14)	157 (11)	
Severe	13 (6)	63 (4)	
Major branch at CTO	28 (14)	230 (16)	0.36
In-stent occlusion	20 (10)	178 (12)	0.26
Stent deployment	116 (56)	939 (66)	0.009
Initial success rate of PCI	146 (71)	1,184 (83)	<0.0001

Table 4. Adopted Guidewire Strategies in pCABG and nCABG Groups

Variables (%)	pCABG (173 PCIs)	nCABG (1,121 PCIs)	p Value
Guidewiring strategy			
Parallel guidewire technique	49 (28)	335 (30)	0.68
Success	21 (43)	182 (54)	0.13
IVUS guided	24 (14)	121 (11)	0.23
Success	12 (50)	75 (62)	0.27
Overall retrograde attempt (including CART)	82 (47)	300 (37)	0.001
Success	41 (50)	174 (58)	0.19
CART technique	38 (22)	127 (11)	<0.0001
Success	27 (71)	114 (89)	0.004

Values are n (%).

IVUS = intravascular ultrasound; other abbreviations as in Tables 1 and 2.

Summary

- **Presence/absence of ischemia is not problem for CTO PCI.**
- **We should consider about renal function of the patients**

More than two CTOs

- **Risk of procedure**
- **If one CTO can be treated by antegrade approach, we have a chance to treat another CTO.**
- **In case with diffuse jeopardized collateral in donor artery, CABG is better to reduce complication during procedure.**