

Controversy in PCI

When to perform CTO intervention

Just do it!

Cardiovascular Care Center, Iwaki Kyoritsu General Hospital

Yoshito Yamamoto, MD.

2018 © AICT Congress 2018. All rights reserved. - Any reproduction even in part is prohibited.

2018 © AICT Congress 2018. All rights reserved. - Any reproduction even in part is prohibited.



Disclosure Statement of Financial Interest

I, (Yoshito Yamamoto)

DO NOT have a financial interest/arrangement or affiliation with one or more organizations that could be perceived as a real or apparent conflict of interest in the context of the subject of this presentation.

2018 © AICT Congress 2018. All rights reserved - Any reproduction even in part is prohibited.

2018 © AICT Congress 2018. All rights reserved - Any reproduction even in part is prohibited.

Evidence for CTO-PCI

Journal of the American College of Cardiology
© 2011 by the American College of Cardiology Foundation and the American Heart Association, Inc.
Published by Elsevier Inc.

Vol. 58, No. 24, 2011
ISSN 0735-1097/1316.00
doi:10.1016/j.jacc.2011.08.007

PRACTICE GUIDELINE

2011 ACCF/AHA/SCAI Guideline for Percutaneous Coronary Intervention

A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines and the Society for Cardiovascular Angiography and Interventions

Writing Committee Members*

Glenn N. Levine, MD, FACC, FAHA, *Chair*†
Eric R. Bates, MD, FACC, FAHA,
*Vice Chair**†
James C. Blankenship, MD, FACC, FSCAI,

Richard A. Lange, MD, FACC, FAHA§
Laura Mauri, MD, MSc, FACC, FSCAI*†
Roxana Mehran, MD, FACC, FAHA, FSCAI*†
Issam D. Moussa, MD, FACC, FAHA, FSCAI†

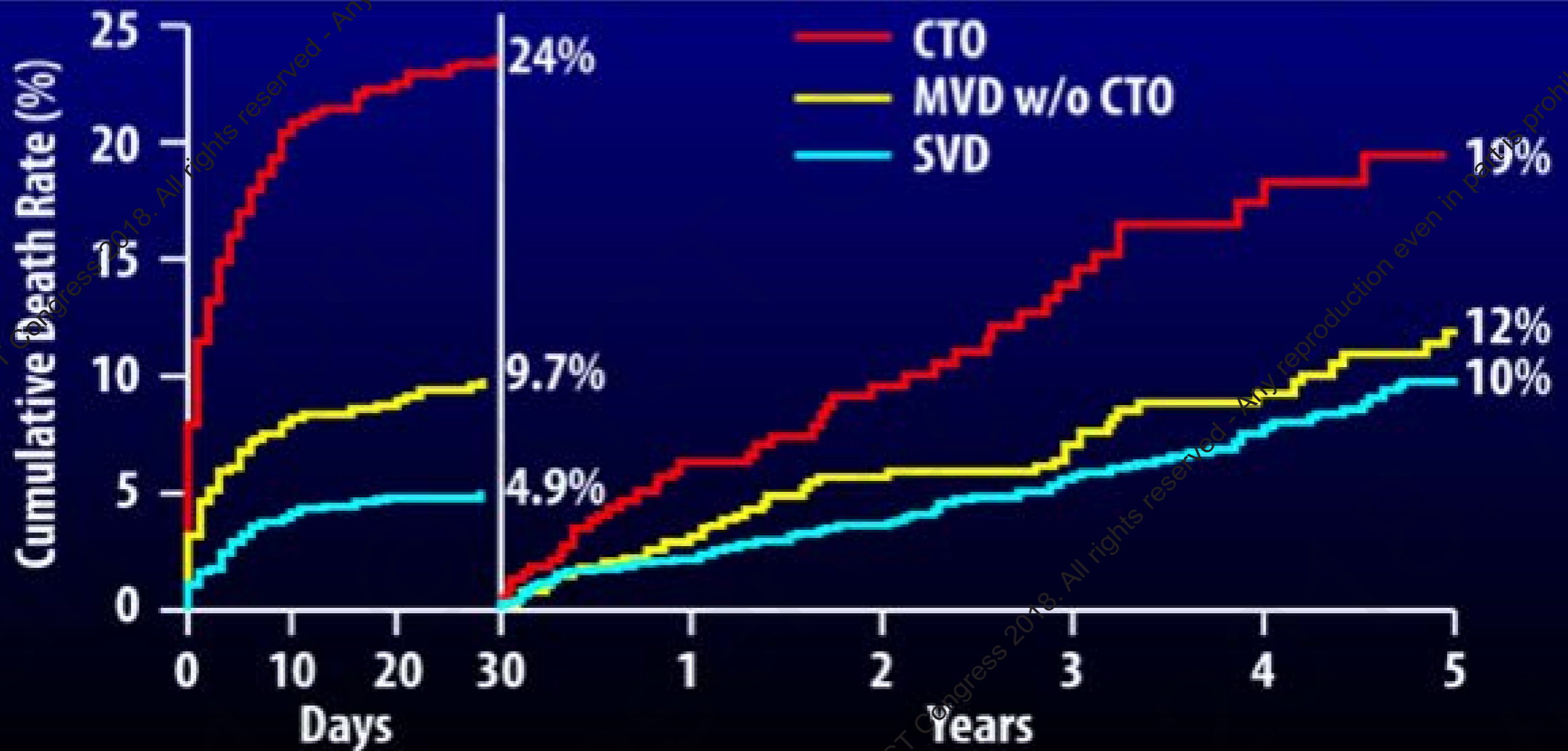
PCI of a CTO in patients with appropriate clinical indications and suitable anatomy is reasonable when performed by operators with appropriate expertise. (Level of Evidence: B)

Steven M. Hollenberg, MD, FACC*†
Umesh N. Khot, MD, FACC*†

Guidelines Liaison: ACCF/AHA Task Force on Performance Measures Liaison

Evidence for CTO-PCI

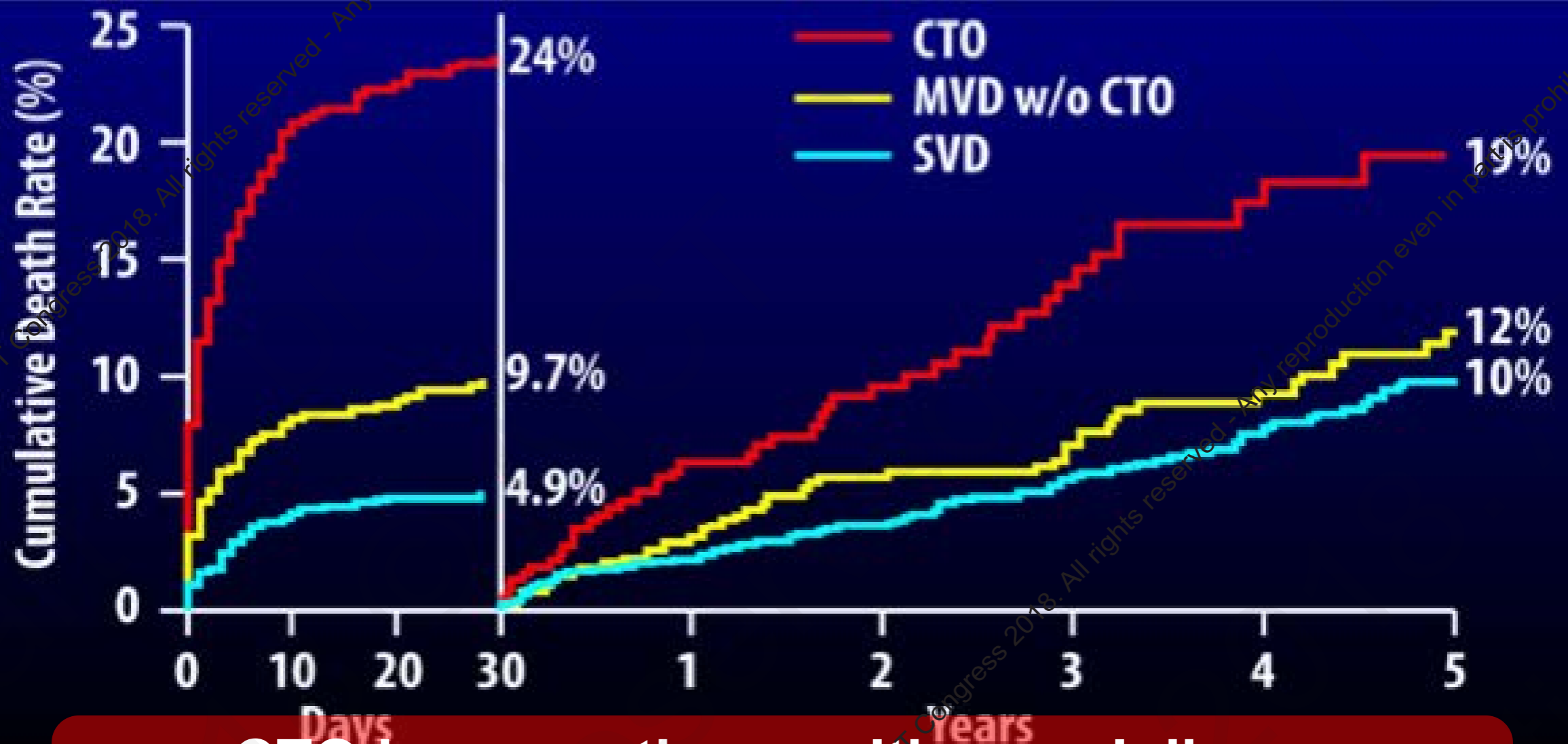
Survival at 5 years in STEMI



Classen et al, JACC: Cardiovasc Int., 2010

Evidence for CTO-PCI

Survival at 5 years in STEMI

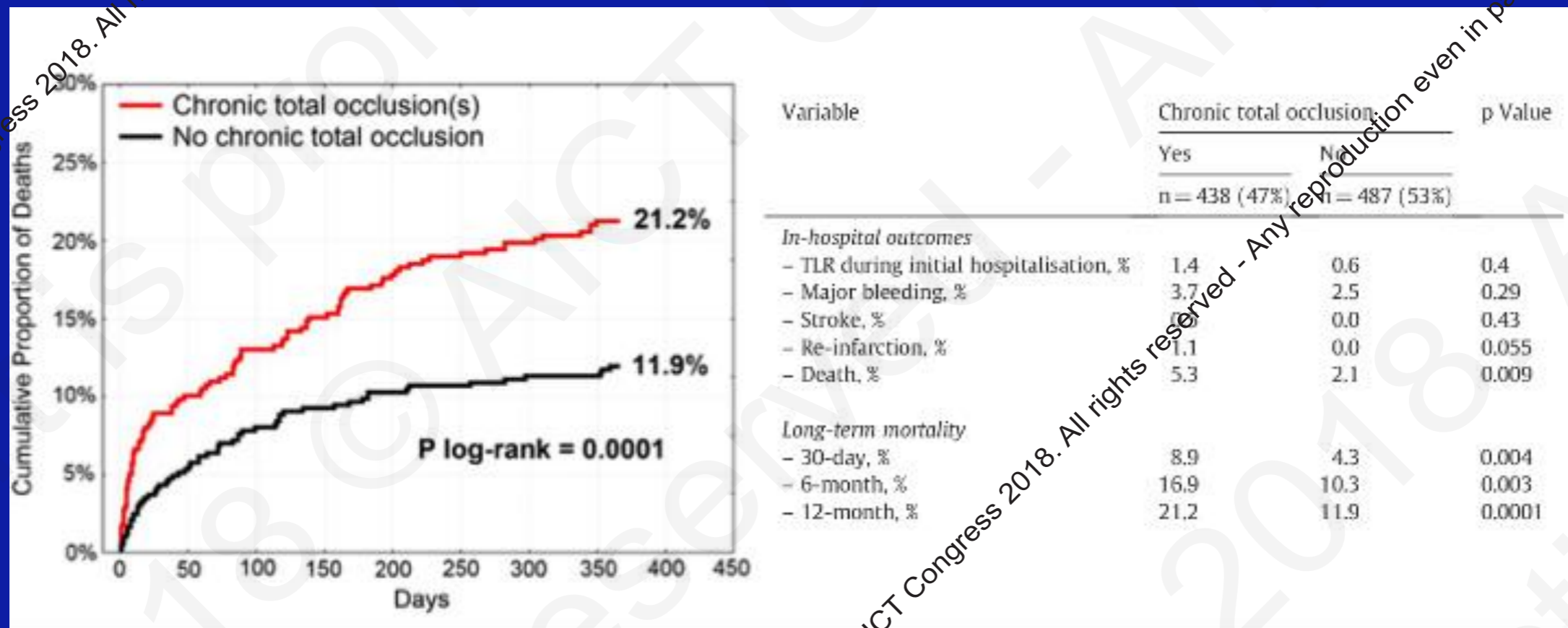


CTO is worse than multi-vessel disease

Classen et al, JACC: Cardiovasc Int., 2010

Evidence for CTO-PCI

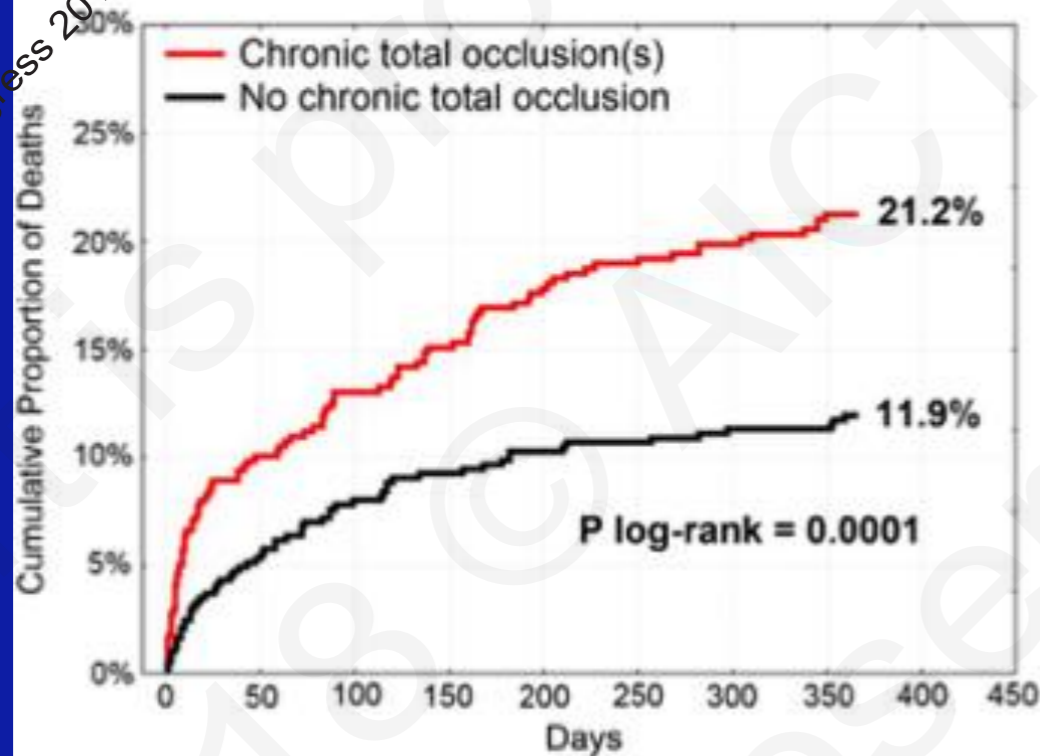
Impact of CTO artery on 12-month mortality in patients with non STEMI treated by PCI (From the PL-ACS Registry)



Evidence for CTO-PCI

Impact of CTO artery on 12-month mortality in patients with non STEMI treated by PCI (From the PL-ACS Registry)

Residual CTO increase mortality



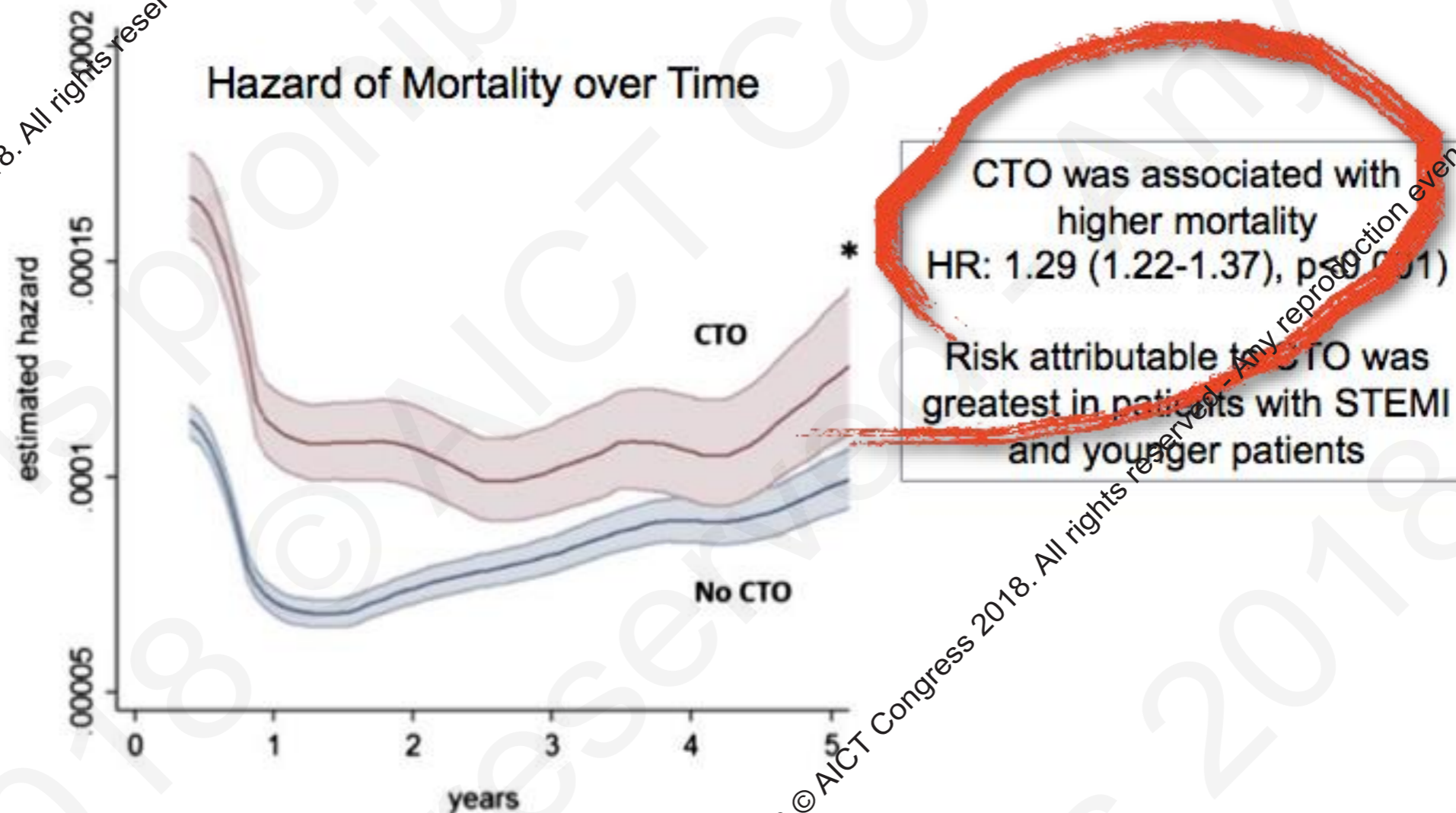
Variable	Chronic total occlusion		p Value
	Yes n = 438 (47%)	No n = 487 (53%)	
<i>In-hospital outcomes</i>			
- TLR during initial hospitalisation, %	1.4	0.6	0.4
- Major bleeding, %	3.7	2.5	0.29
- Stroke, %	0.0	0.0	0.43
- Re-infarction, %	1.1	0.0	0.055
- Death, %	5.3	2.1	0.009
<i>Long-term mortality</i>			
- 30-day, %	8.9	4.3	0.004
- 6-month, %	16.9	10.3	0.003
- 12-month, %	21.2	11.9	0.0001

Why we need CTO-PCI ?

CTO should not be left ...

SCAAR: Prognostic Importance of CTO

14,441 patients with CTO and 75,431 patients without CTO from 2005-2012

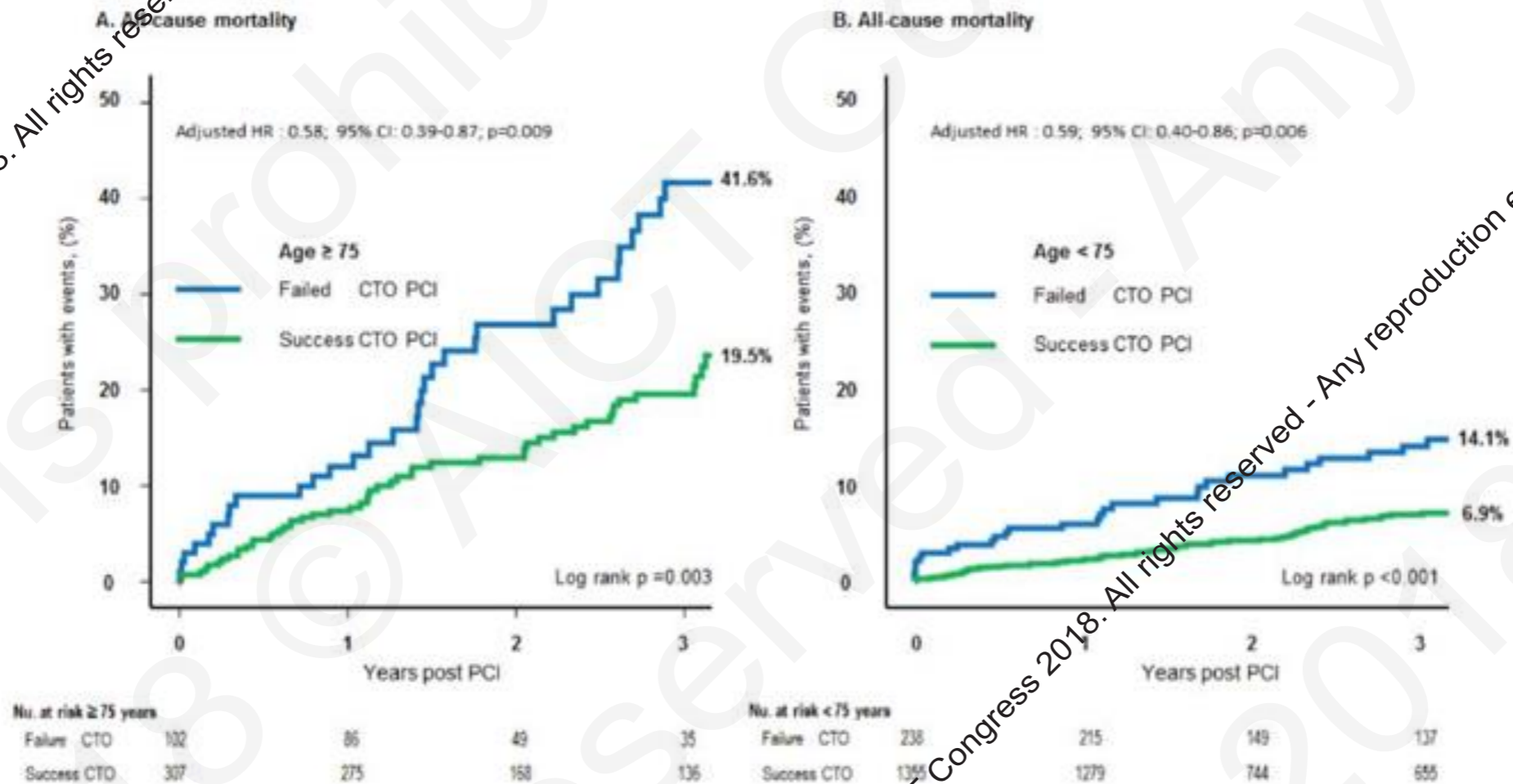


Why we need CTO-PCI ?

successful CTO-PCI is required, in any age ...

Prognosis Related to CTO PCI in Elderly

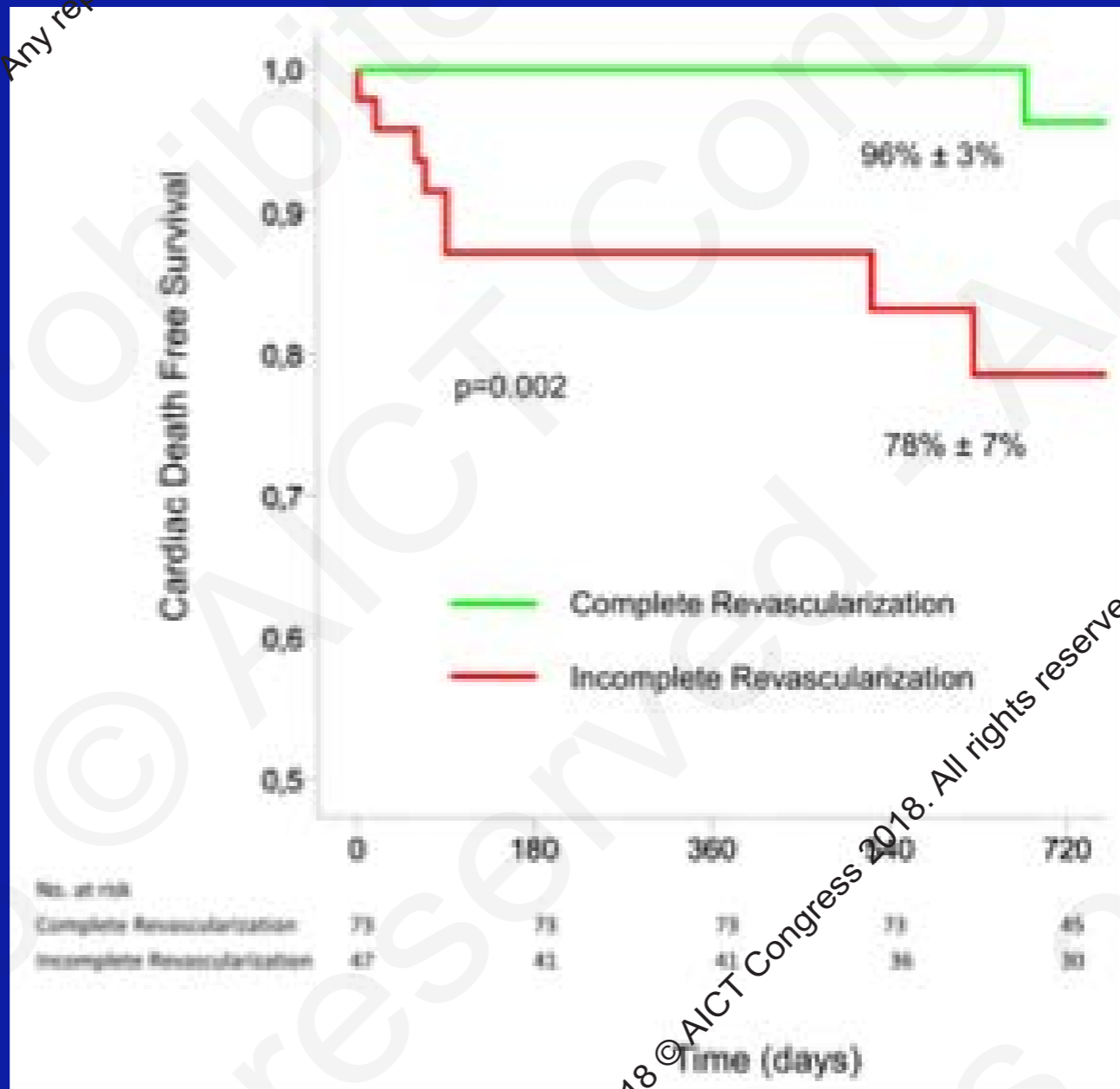
2002 pts with CTO PCI, stratified by age (409 pts with age >75 yrs)



Similar survival advantage with successful vs. failed PCI irrespective of age

Evidence for CTO-PCI

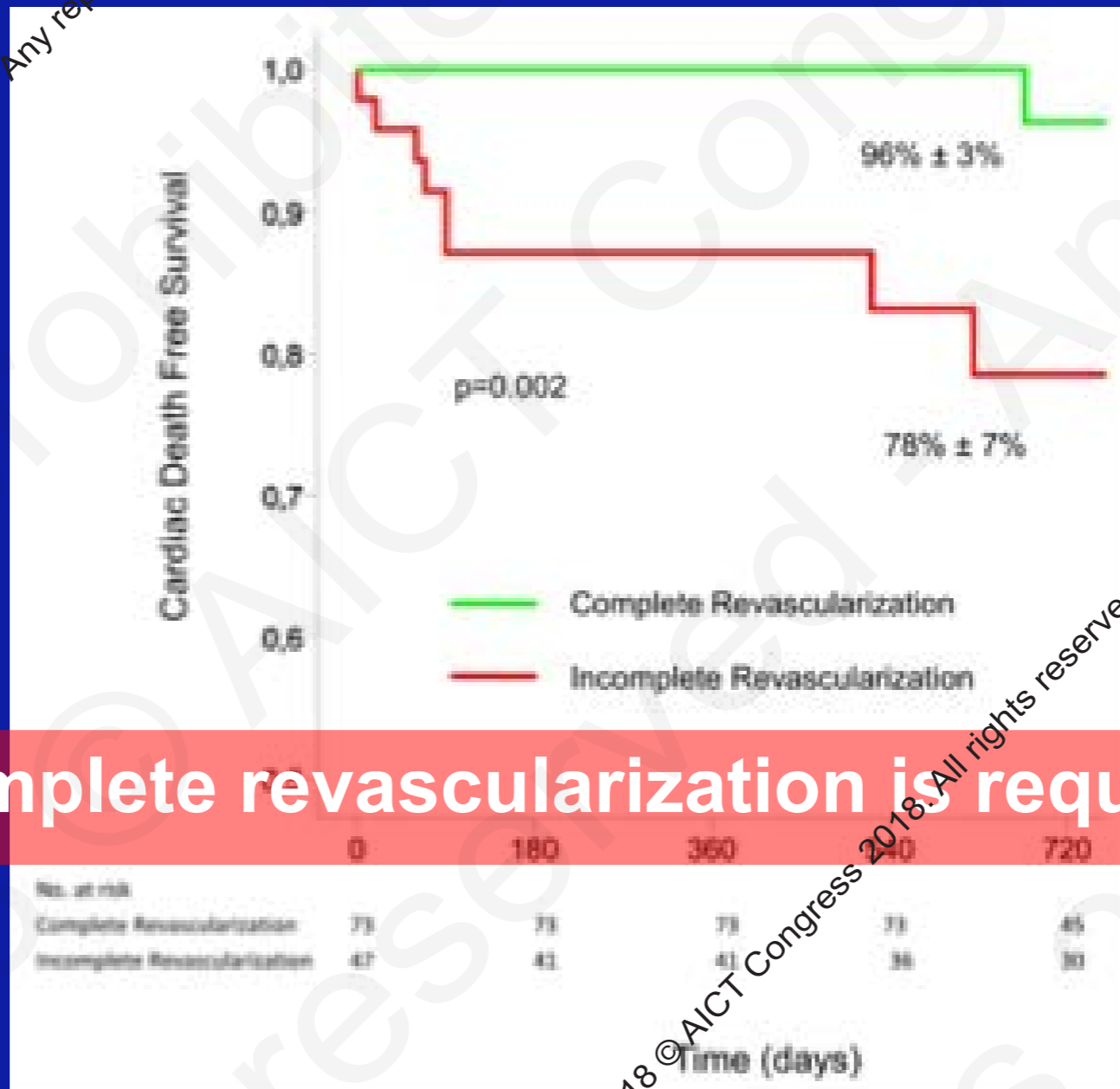
PCI for Multiple Chronic Total Occlusions



Danzi et al, Am J Cardiol 2013;112:1849-1853)

Evidence for CTO-PCI

PCI for Multiple Chronic Total Occlusions



Complete revascularization is required

Why we need CTO-PCI ?

DECISION-CTO

Patients with PCI-eligible CTO Lesions

1:1 randomization

PCI strategy

MT strategy

PCI for non-CTO lesions
+ PCI for CTO lesions

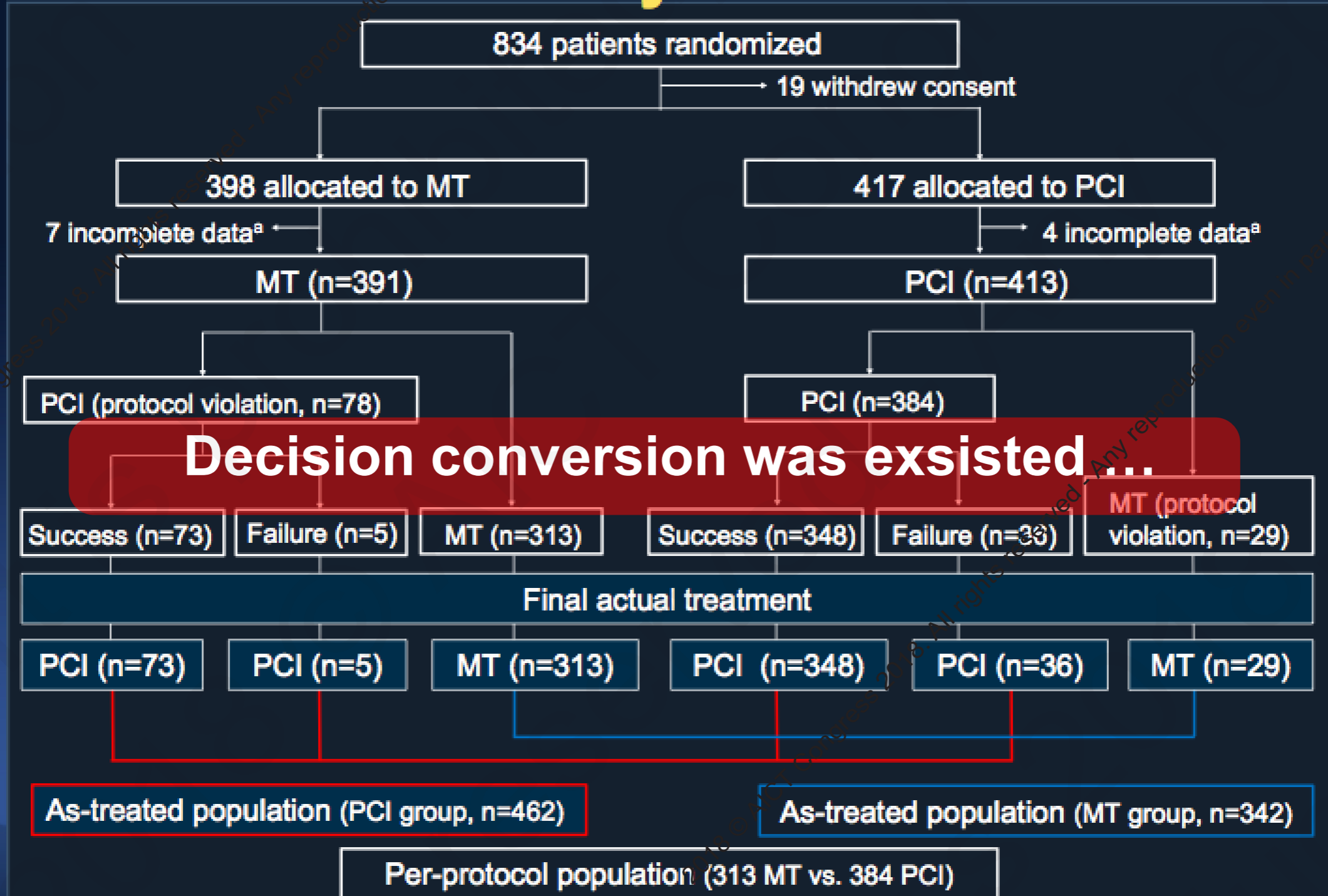
PCI for non-CTO lesions
+ MT for CTO lesions

Guideline Directed Medical Treatment

Clinical Outcomes at 3 years
(Composite of Death, MI, Stroke and
any Revascularization)

Why we need CTO-PCI ?

Study Flow



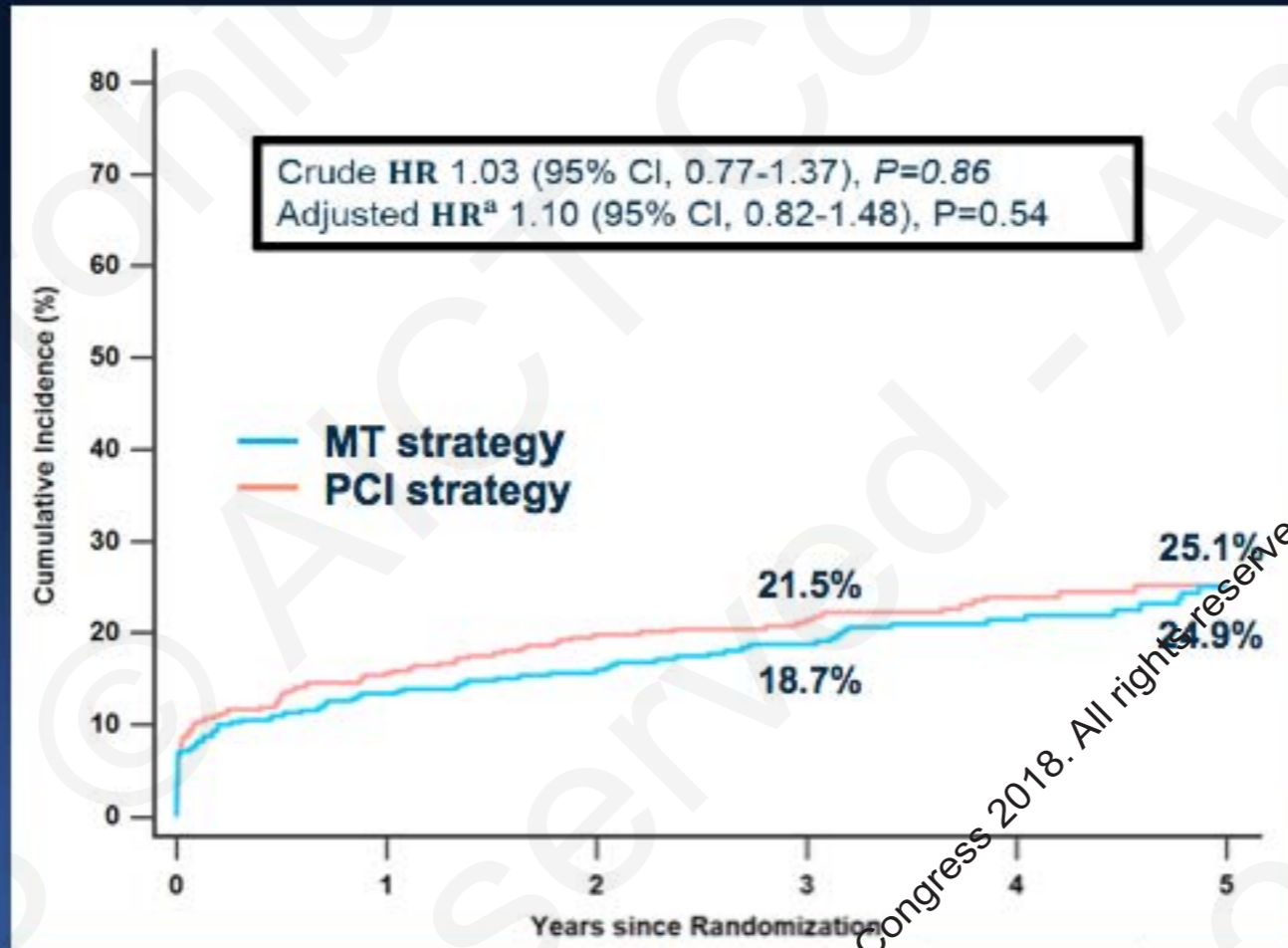
2018 © AICT Con... Any reproduction even in part is prohibited.

Any reproduction even in part is prohibited.

Why we need CTO-PCI ?

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

ITT Population



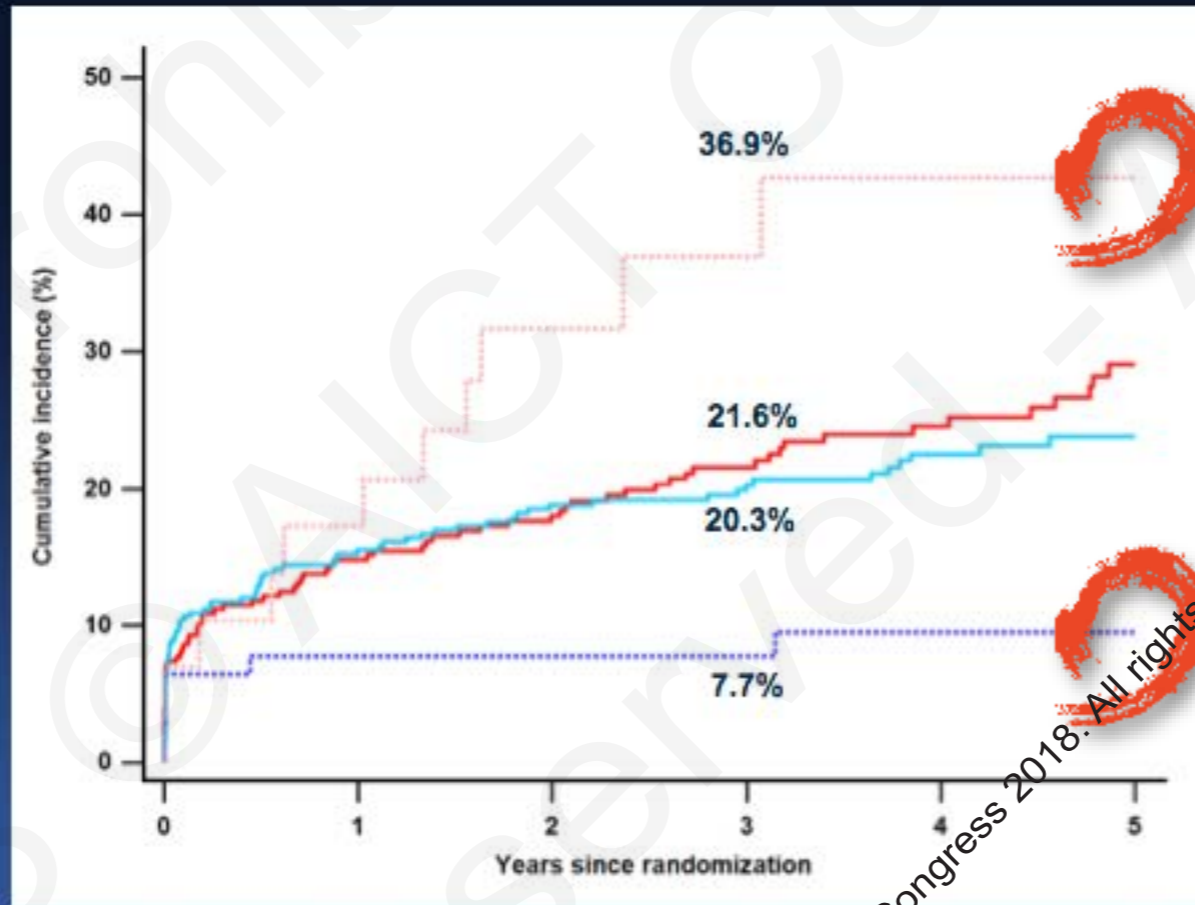
Medical therapy	398	324	287	273	169	107
PCI	417	330	268	221	159	104

^aAdjusted for age, BMI, hypercholesterolemia, previous stroke, renal dysfunction, atrial fibrillation, clinical presentation, location of CTO, number of diseased vessels, and stratifying covariates.



Why we need CTO-PCI ?

Primary endpoint analyses Stratified by the assigned and actual strategy



PCI to MT strategy

MT to MT strategy

PCI to PCI strategy

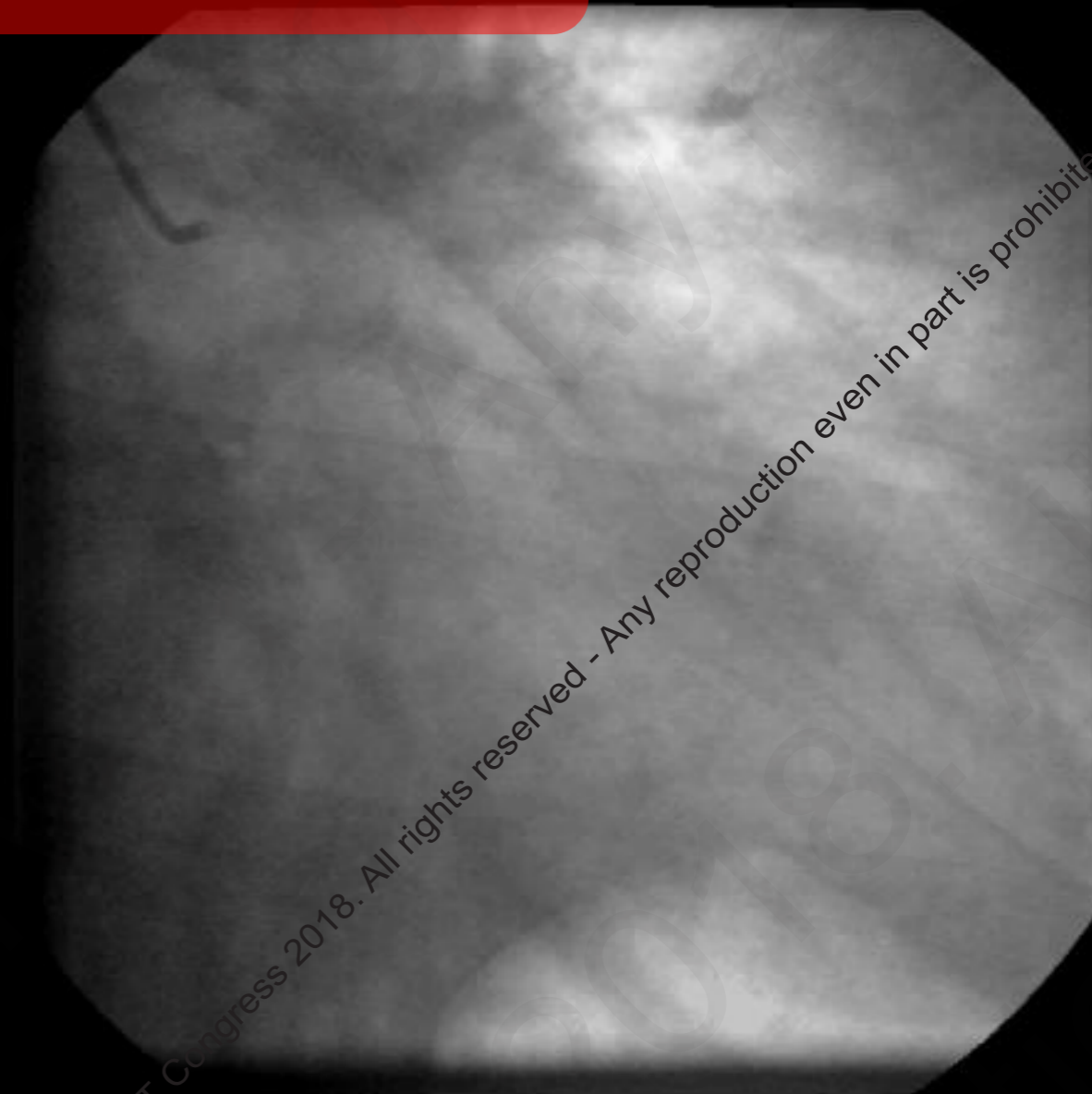
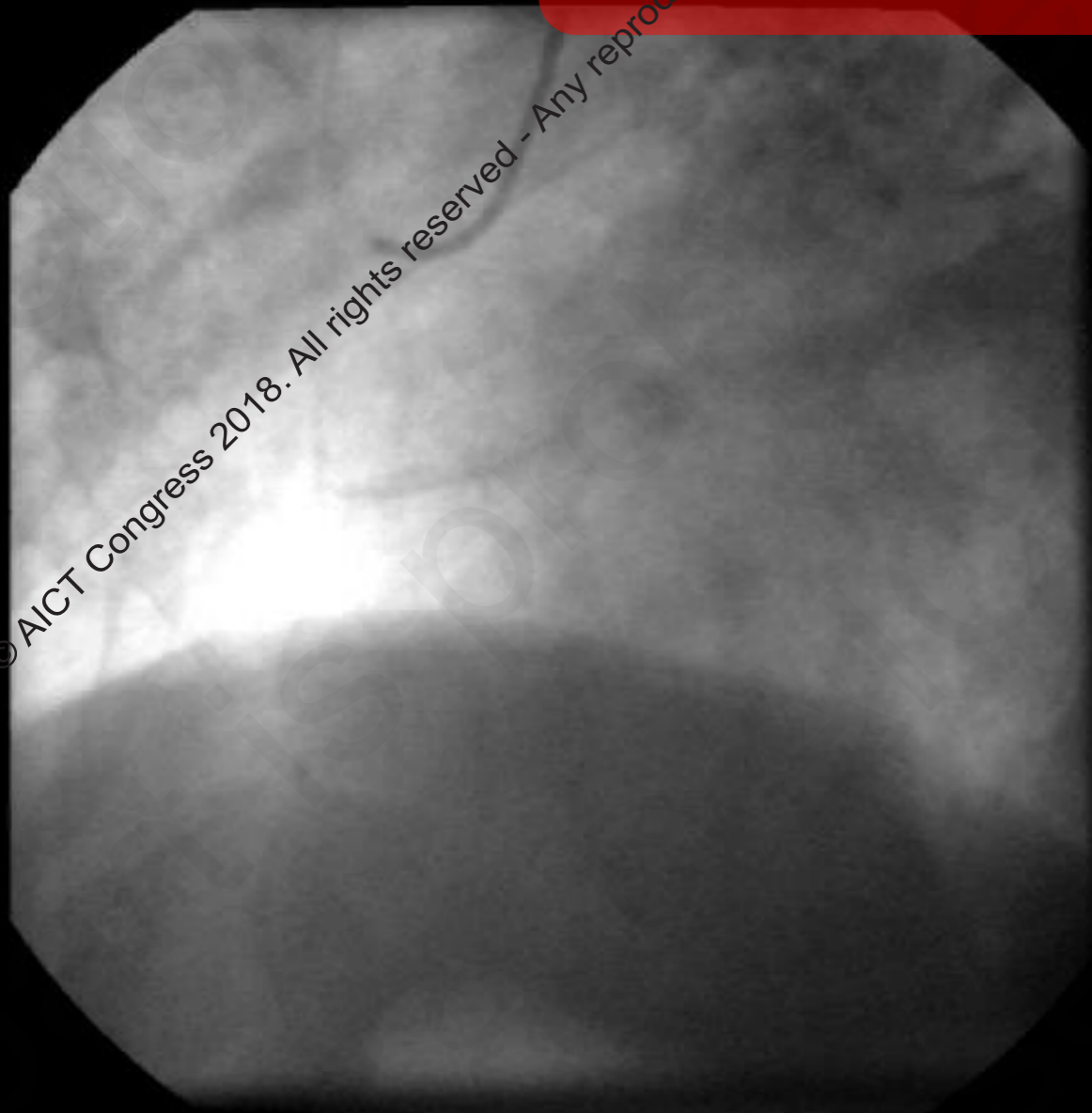
MT to PCI strategy

PCI to PCI	384	306	254	210	152	98
PCI to MT	29	25	16	13	10	8
MT to PCI	78	70	65	59	46	30
MT to MT	313	257	224	172	125	78

Multiple CTO + ACS

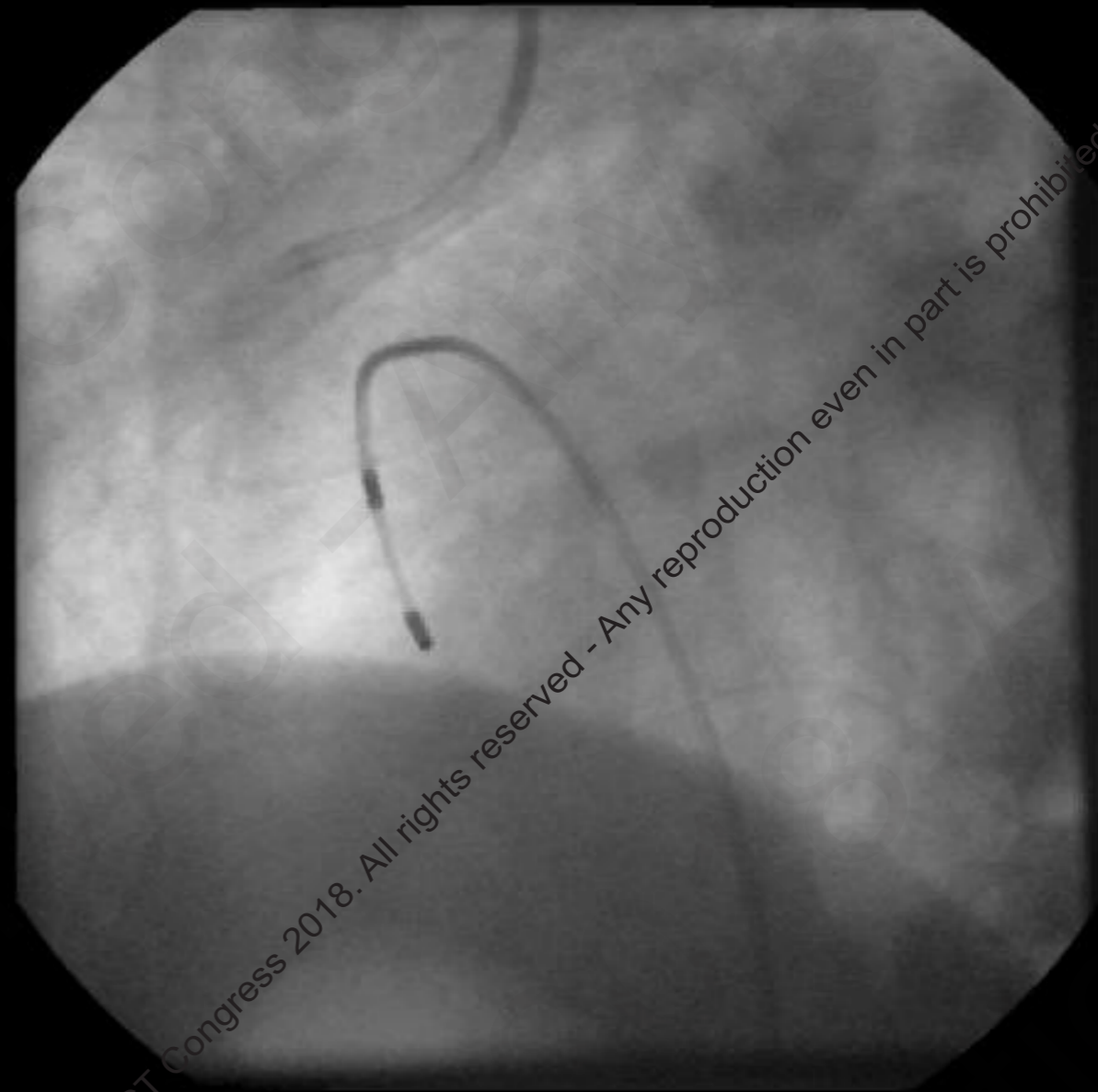
→ Cardiogenic shock

Emergency Angio



64 y.o, Male

PCI to RCA



2018 © AICT Congress 2018. All rights reserved - Any reproduction even in part is prohibited.

2018 © AICT Congress 2018. All rights reserved - Any reproduction even in part is prohibited.

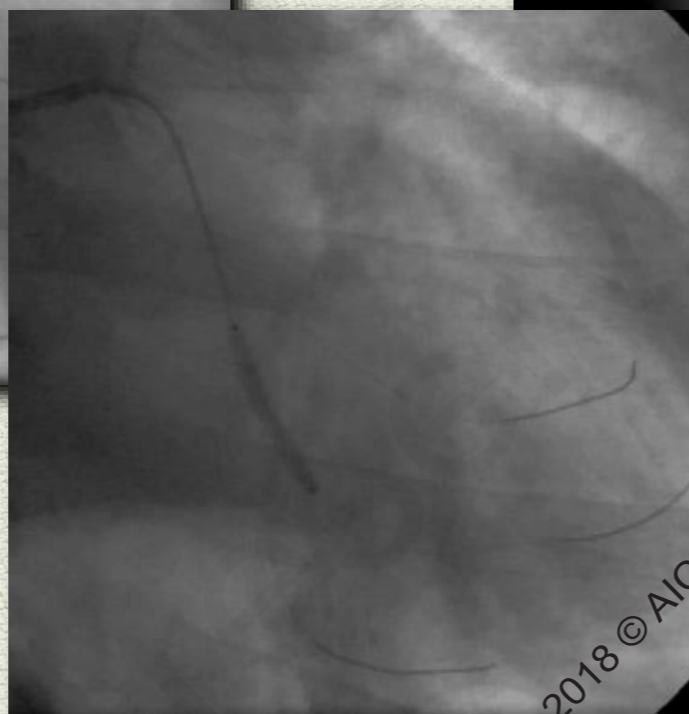
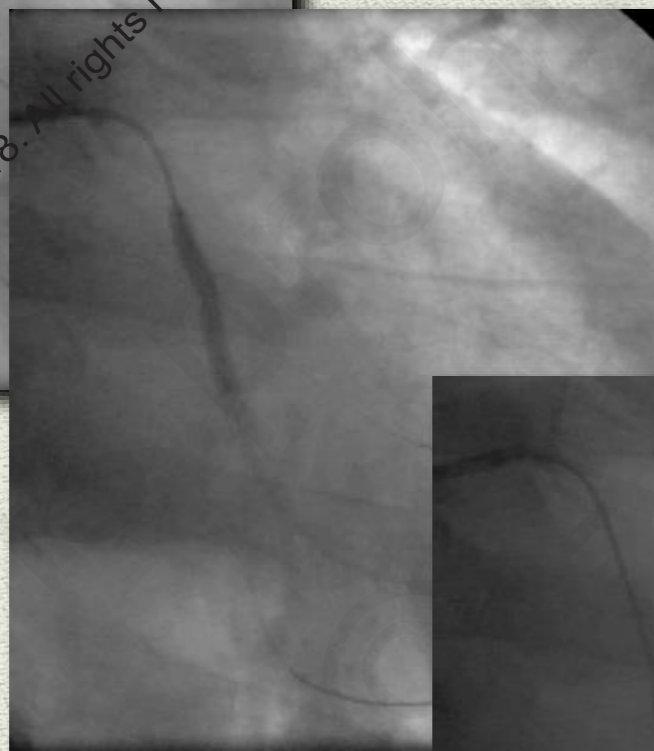
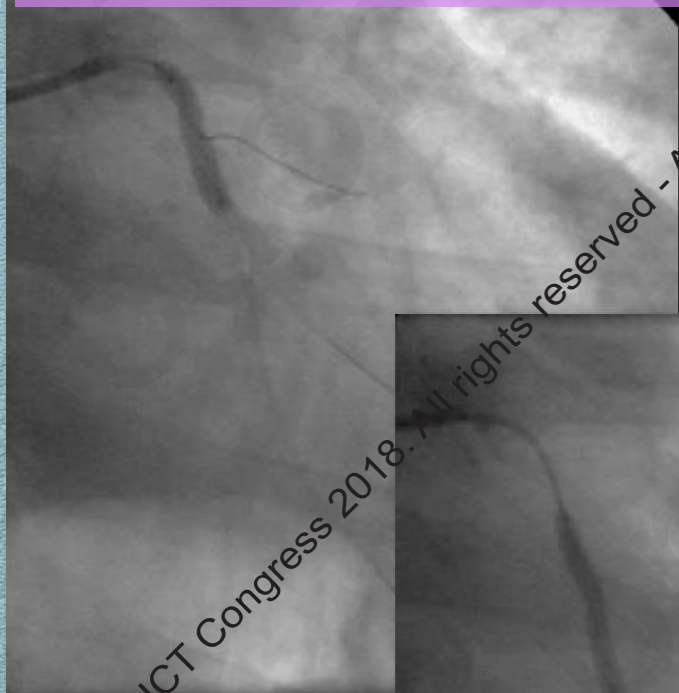
Final Angio



Also need intubation ...

LCX

Antegrade Parallel wire technique with IVUS was required

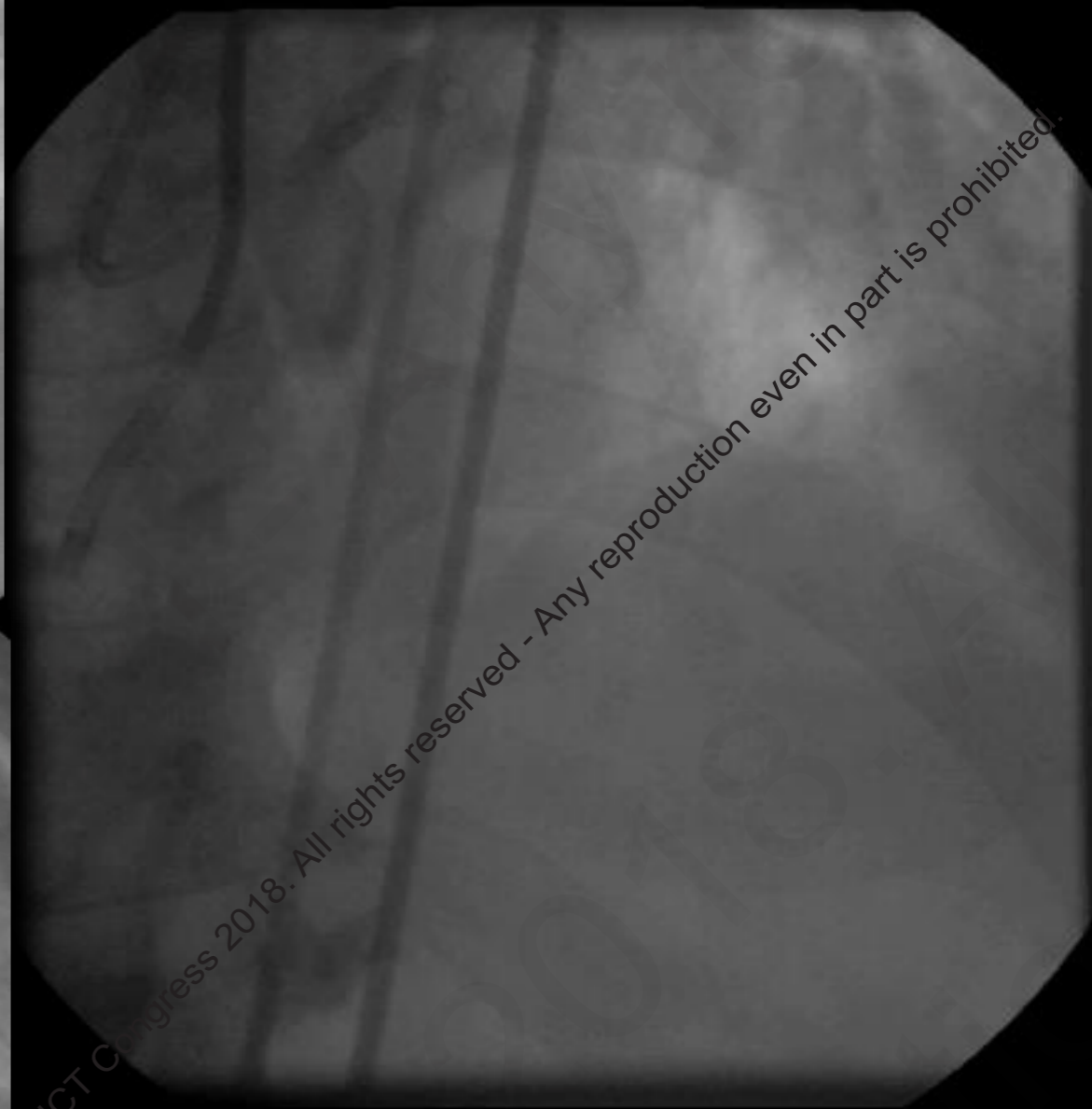
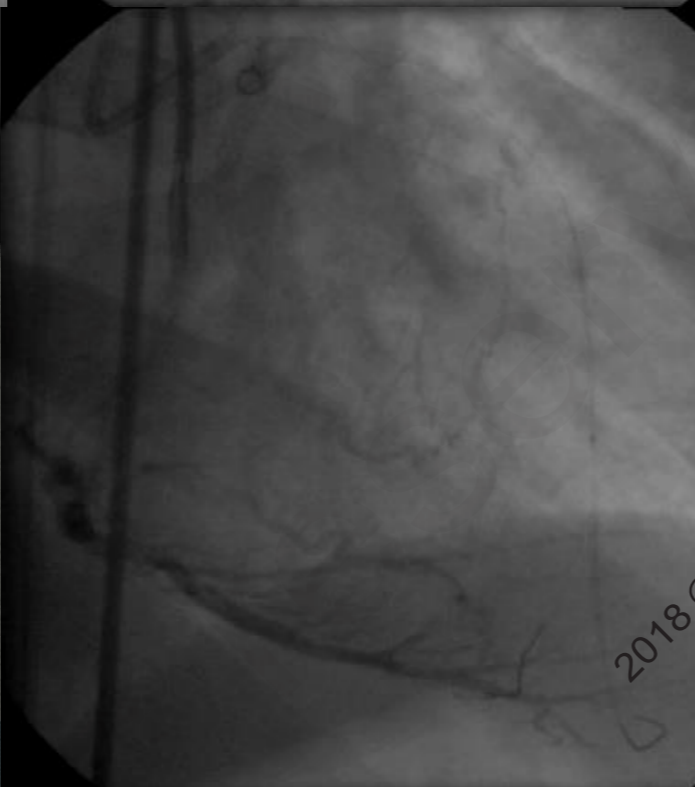
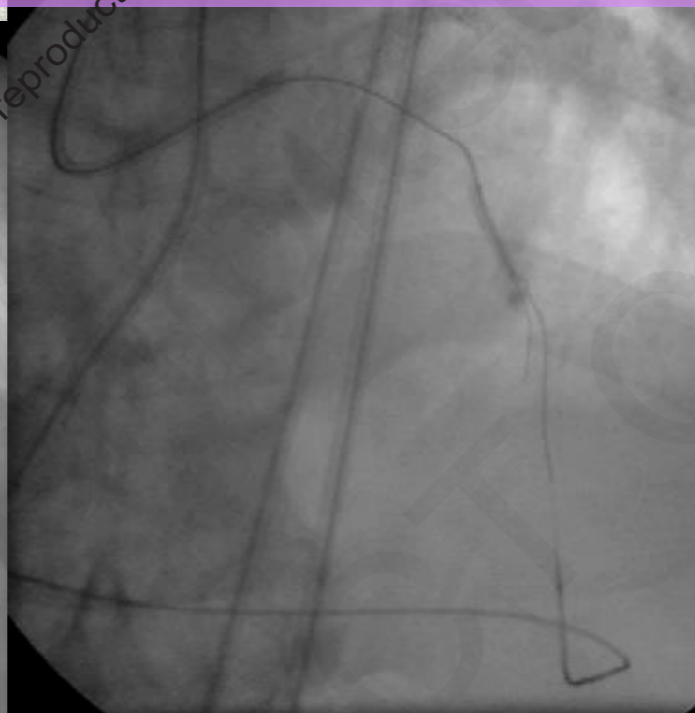


2018 © AICT Congress 2018. All rights reserved - Any reproduction even in part is prohibited.

2018 © AICT Congress 2018. All rights reserved - Any reproduction even in part is prohibited.

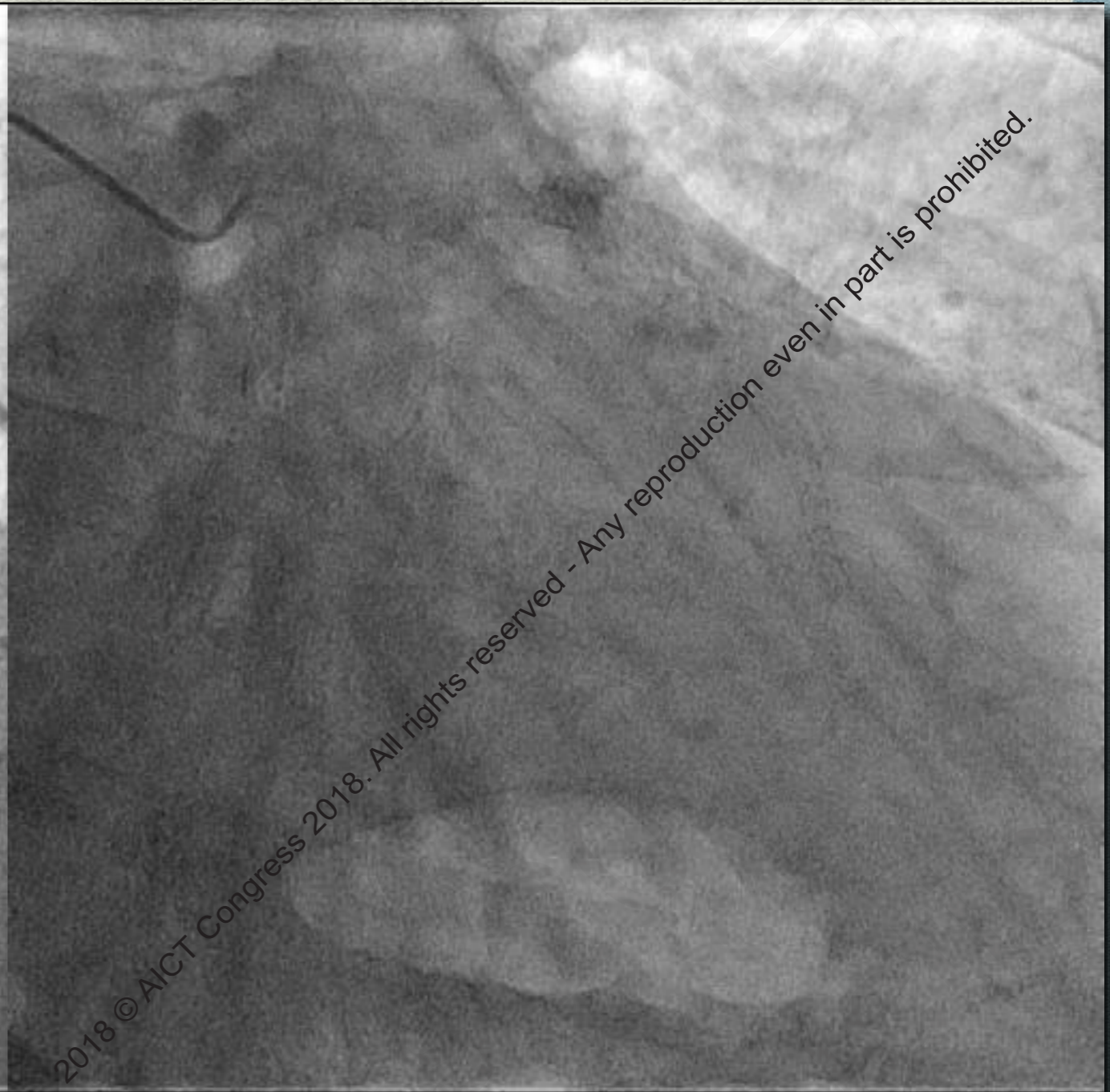
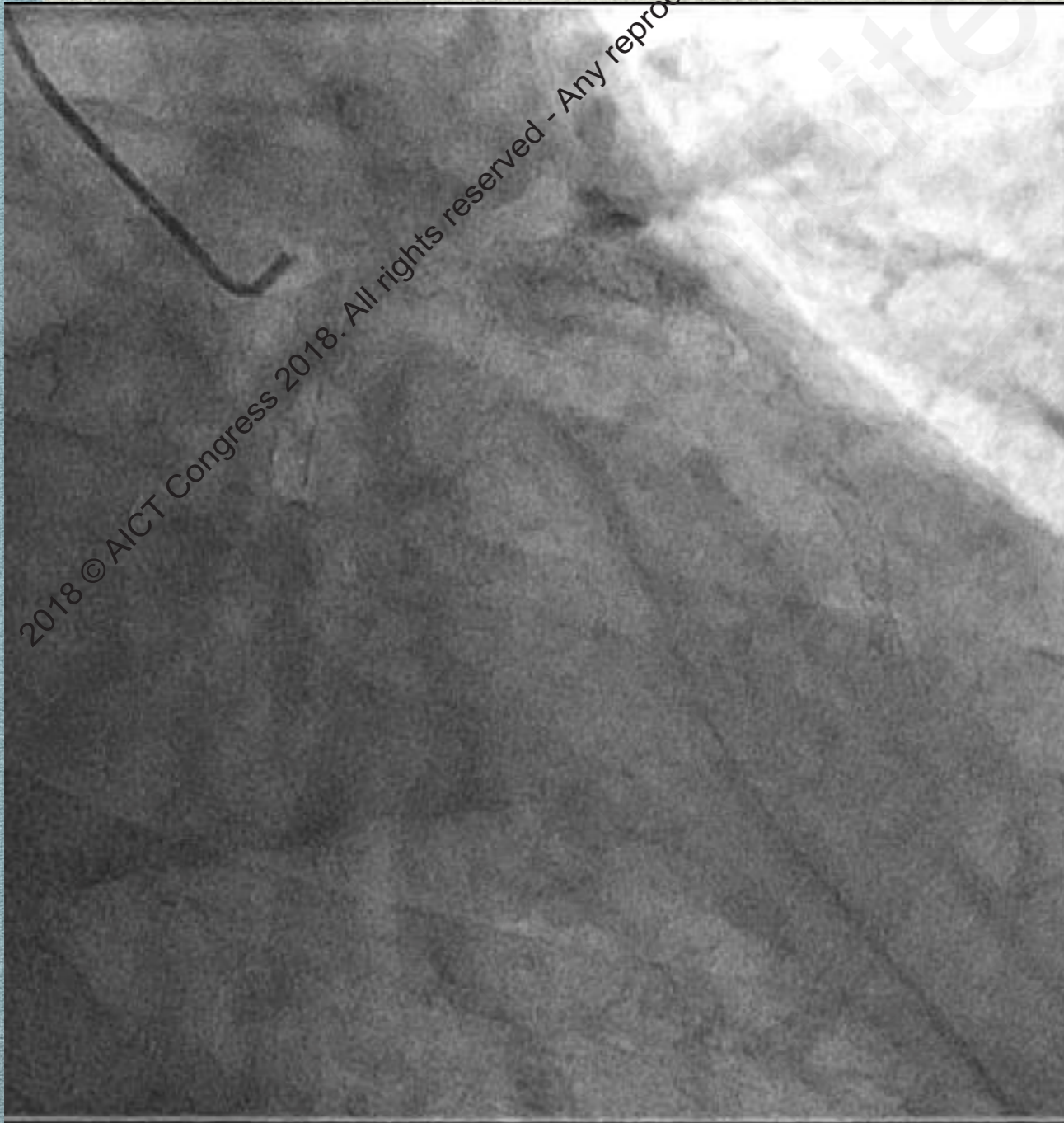
LAD

Retrograde approach was required



Need Maintenance PCI ...

During 8 years, need maintenance PCI for 3 vessels ...



After Maintenance PCI ...

2 more years later ...

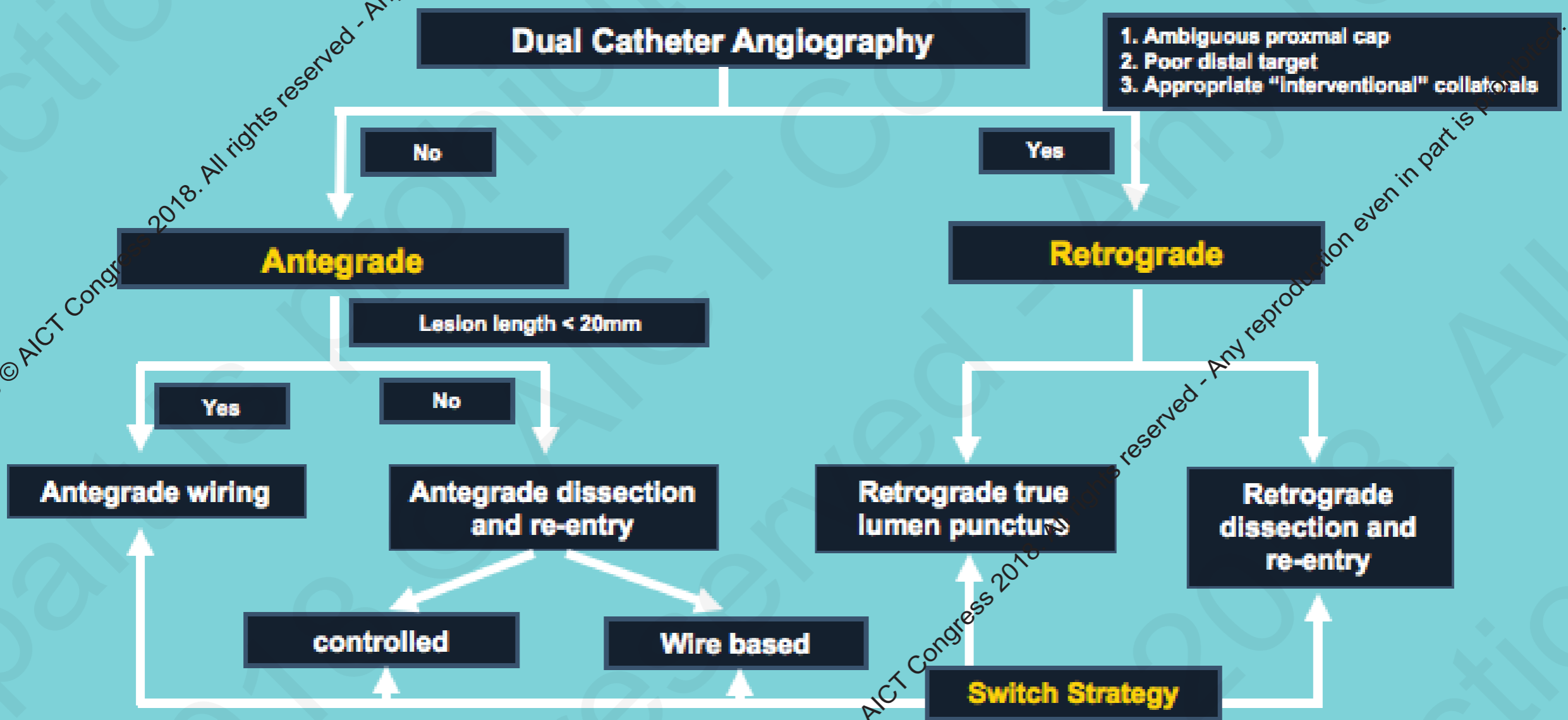
Still, he survives more than 10 years ...

2018 © AICT Congress 2018. All rights reserved - Any reproduction even in part is prohibited.

2018 © AICT Congress 2018. All rights reserved - Any reproduction even in part is prohibited.

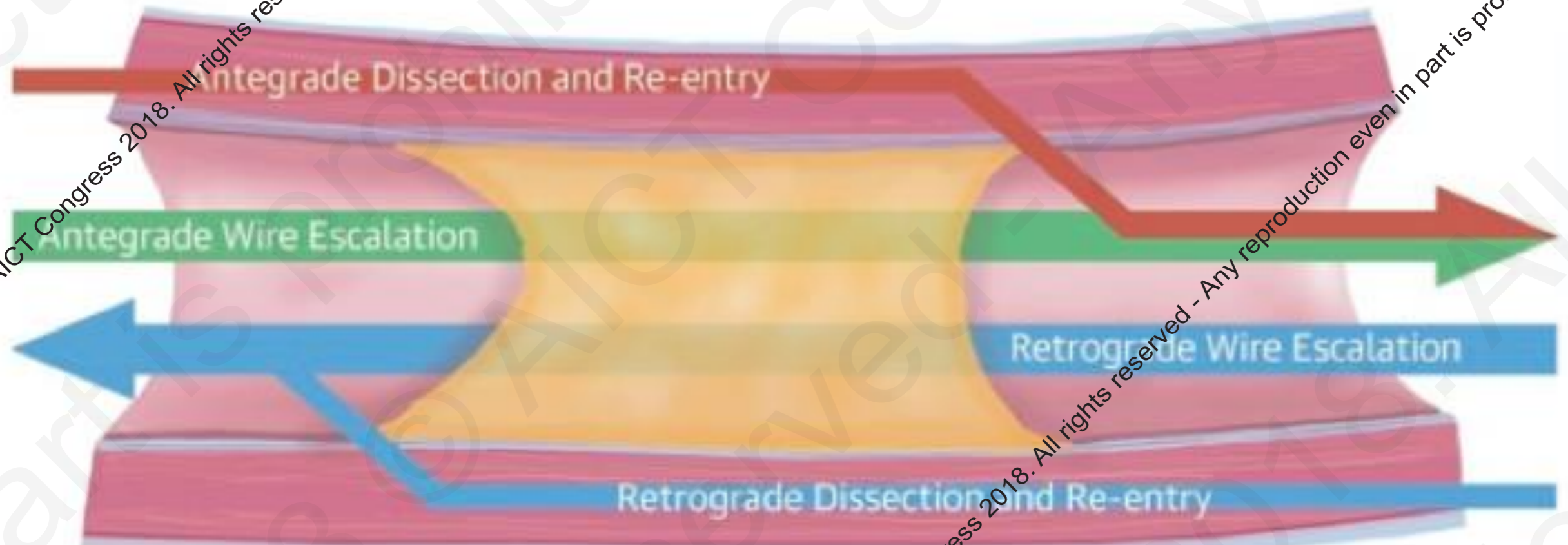
When to perform CTO-PCI ?

We need algorithm for crossing CTOs



When to perform CTO-PCI ?

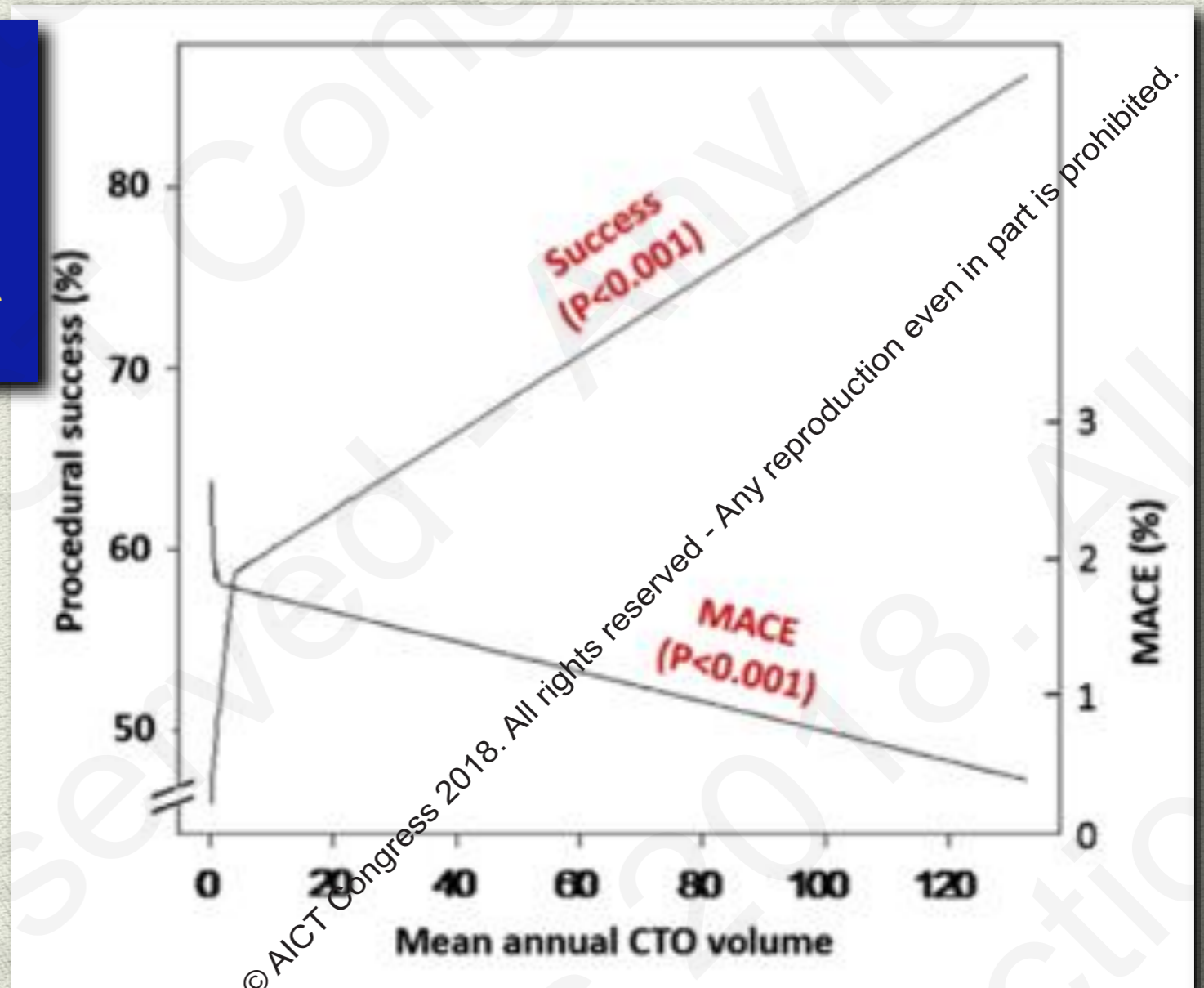
Hybrid Strategies can simplify strategy of CTO-PCI



Evidence for CTO-PCI

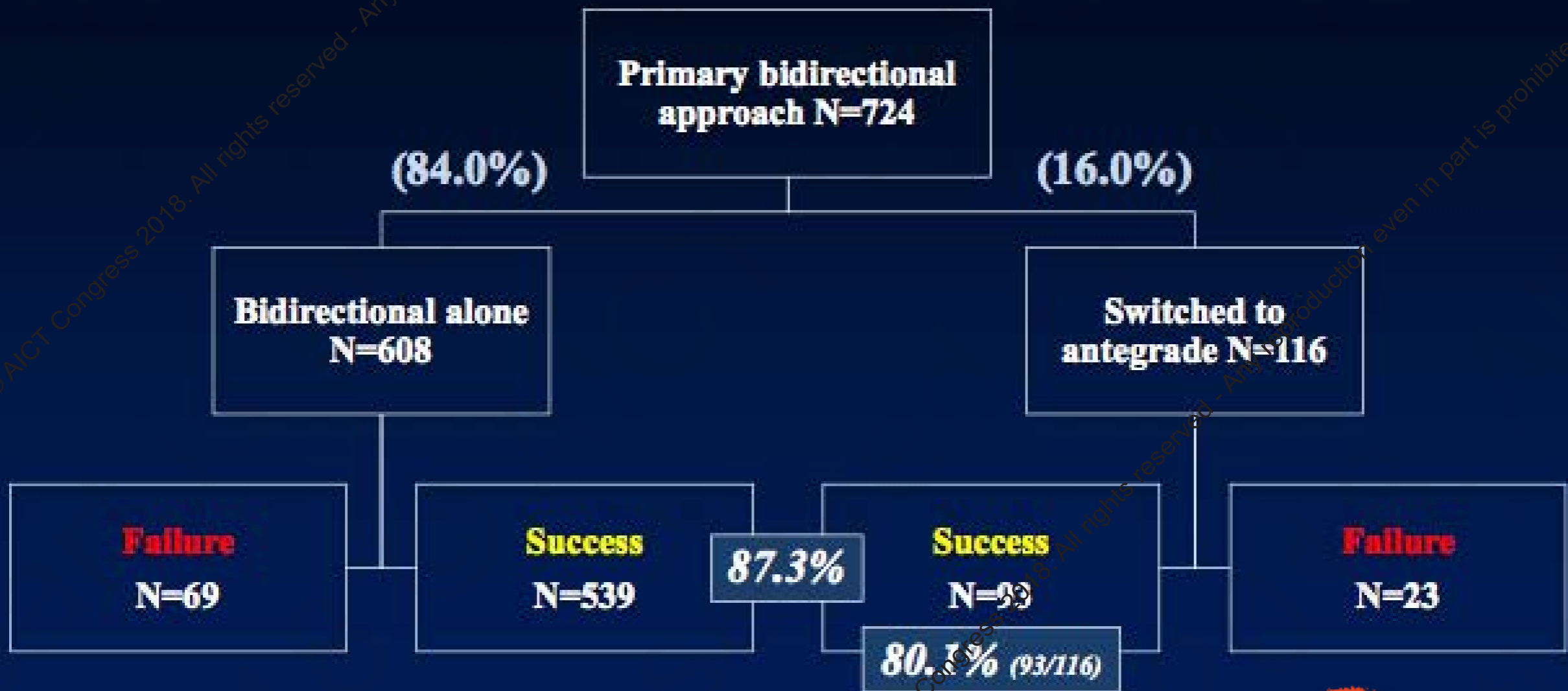
CTO operator should be well experienced

Operator CTO-PCI volume associated with procedural success and complications



Evidence for CTO-PCI

Primary Bidirectional with extremely difficult cases ...



When to perform CTO-PCI ?

Over-all Procedure Success



	2012 (1553)	2013 (1676)	2014 (1045)	2015 (737)	2016 (465)	2017 (476)
Over all	88.4% (1372)	88.4% (1482)	88.2% (922)	88.9% (655)	90.5% (421)	88.7% (422)

	2012	2013	2014	2015(737)	2016 (465)	2017 (476)
Ante alone group	90.8% (965/1063)	92.4% (1051/1138)	90.7% (693/764)	91.3% (474/519)	93.9% (307/327)	92.3% (313/339)
Retro group	83.1% (407/490)	80.1% (431/538)	81.5% (229/281)	83.0% (181/218)	82.6% (114/138)	75.9% (104/137)

2018 © AICT Congress 2018. All rights reserved - Any reproduction even in part is prohibited.

2018 © AICT Congress 2018. All rights reserved - Any reproduction even in part is prohibited.

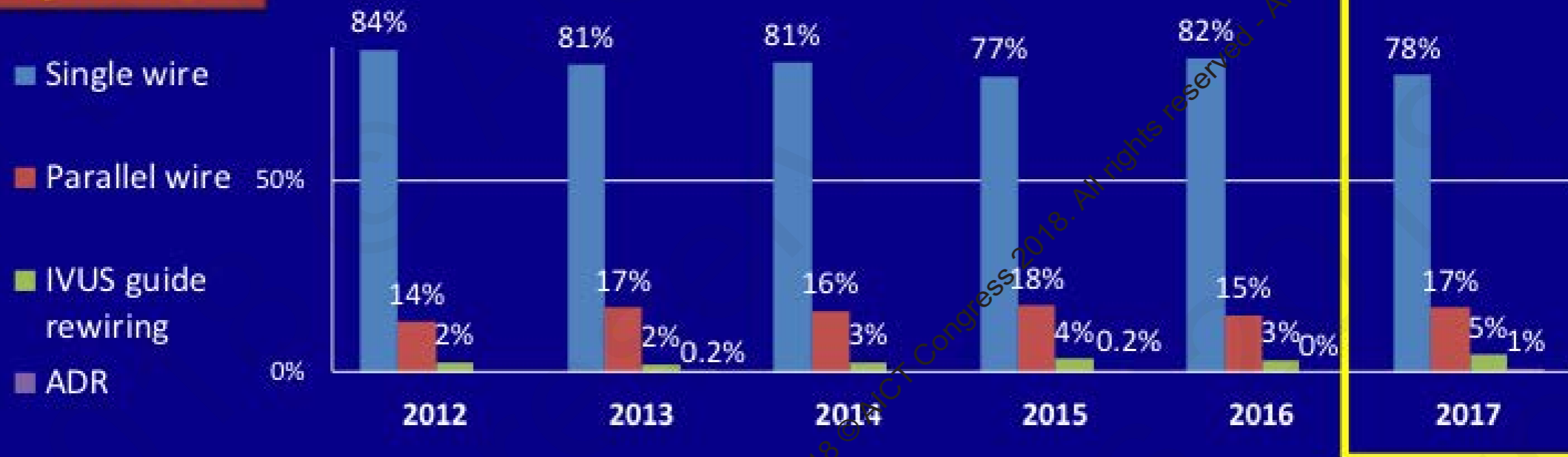
When to perform CTO-PCI ?

Antegrade-alone CTO Crossing



	2012 (1063)	2013 (1138)	2014 (764)	2015 (519)	2016 (327)	2017(339)
Guidewire success	91.8% (976)	93.5% (1064)	92.2% (704)	91.9% (477)	95.4% (312)	94.7% (321)

Crossing technique



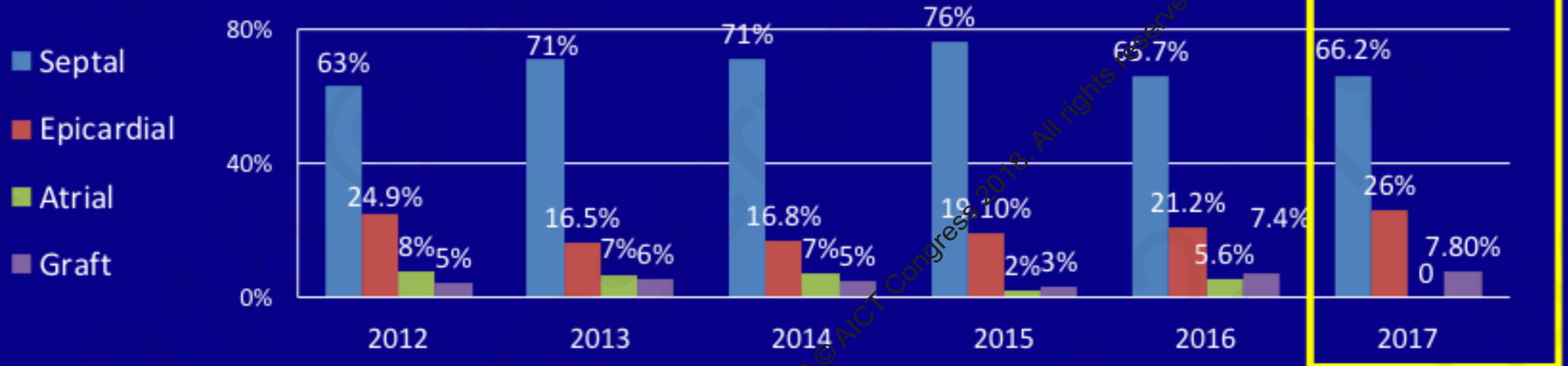
When to perform CTO-PCI ?

Collateral Channel Crossing



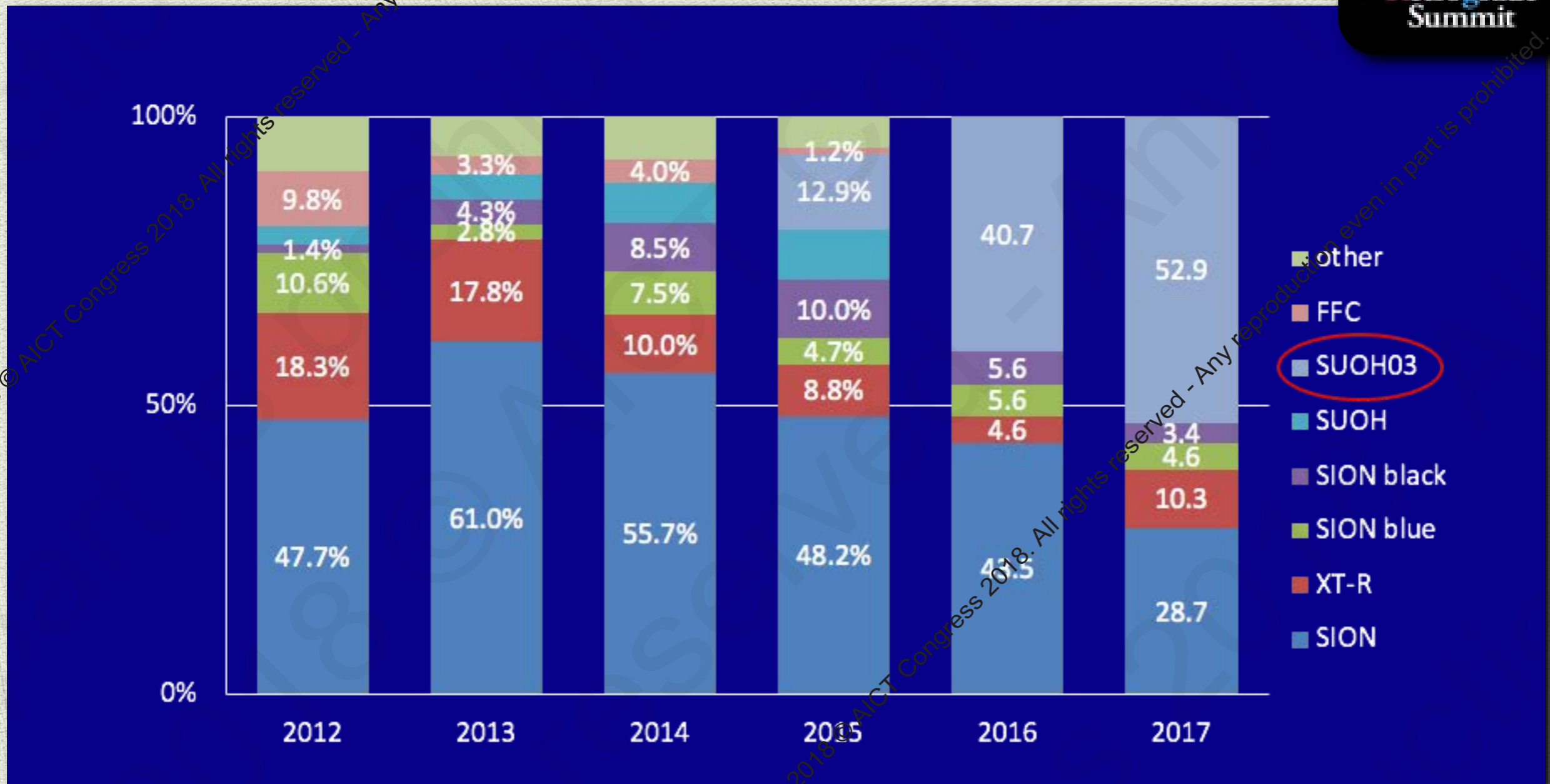
	2012 (490)	2013 (538)	2014 (281)	2015 (218)	2016 (138)	2017 (137)
Guidewire cross success	77.6% (380)	76.4% (411)	76.5% (215)	78.9% (172)	78.7% (108)	74.5% (102)

Successful collateral route



When to perform CTO-PCI ?

Successful GW for Collateral Channel

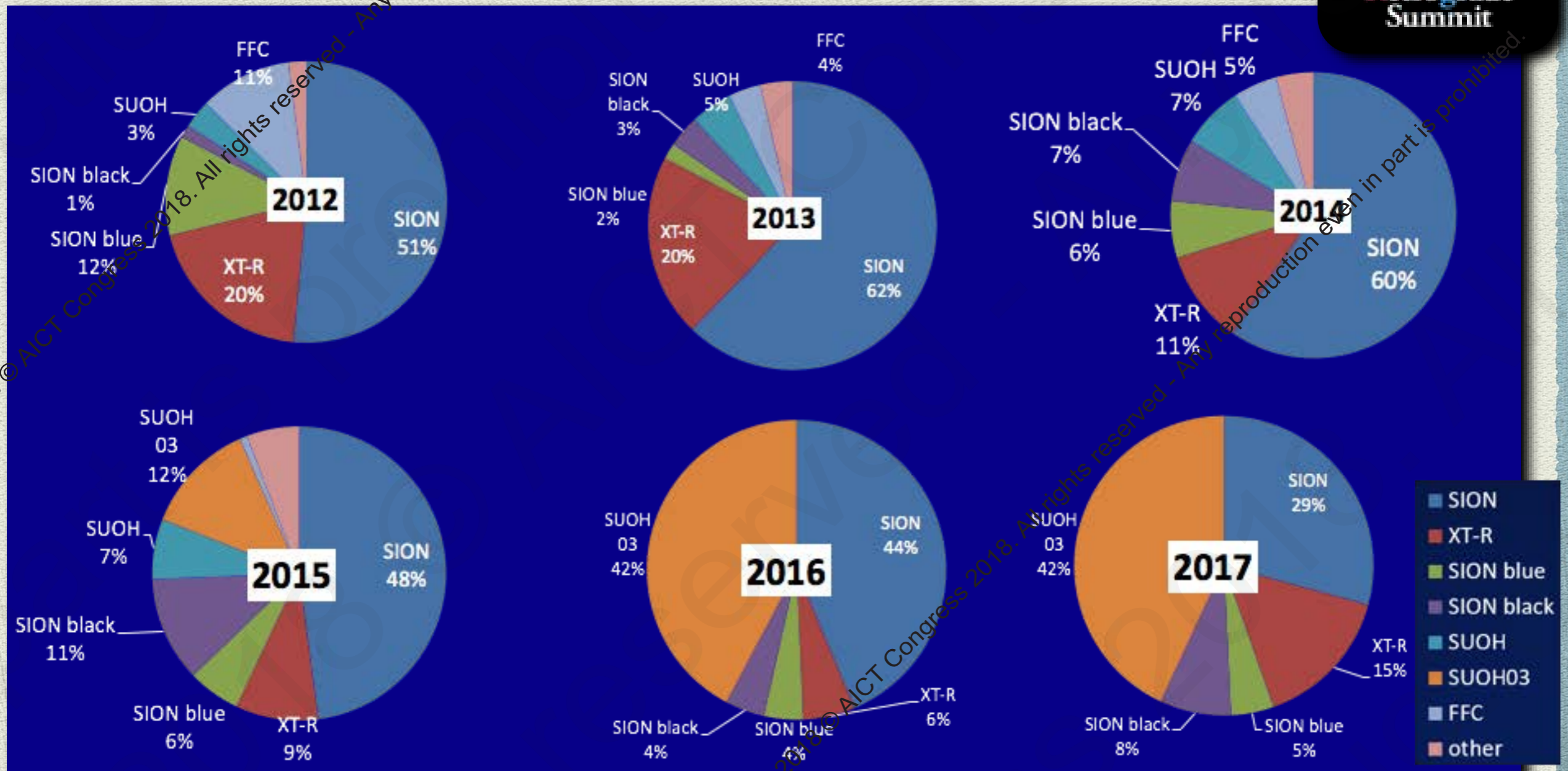


When to perform CTO-PCI ?

Successful GW for Septal Channel

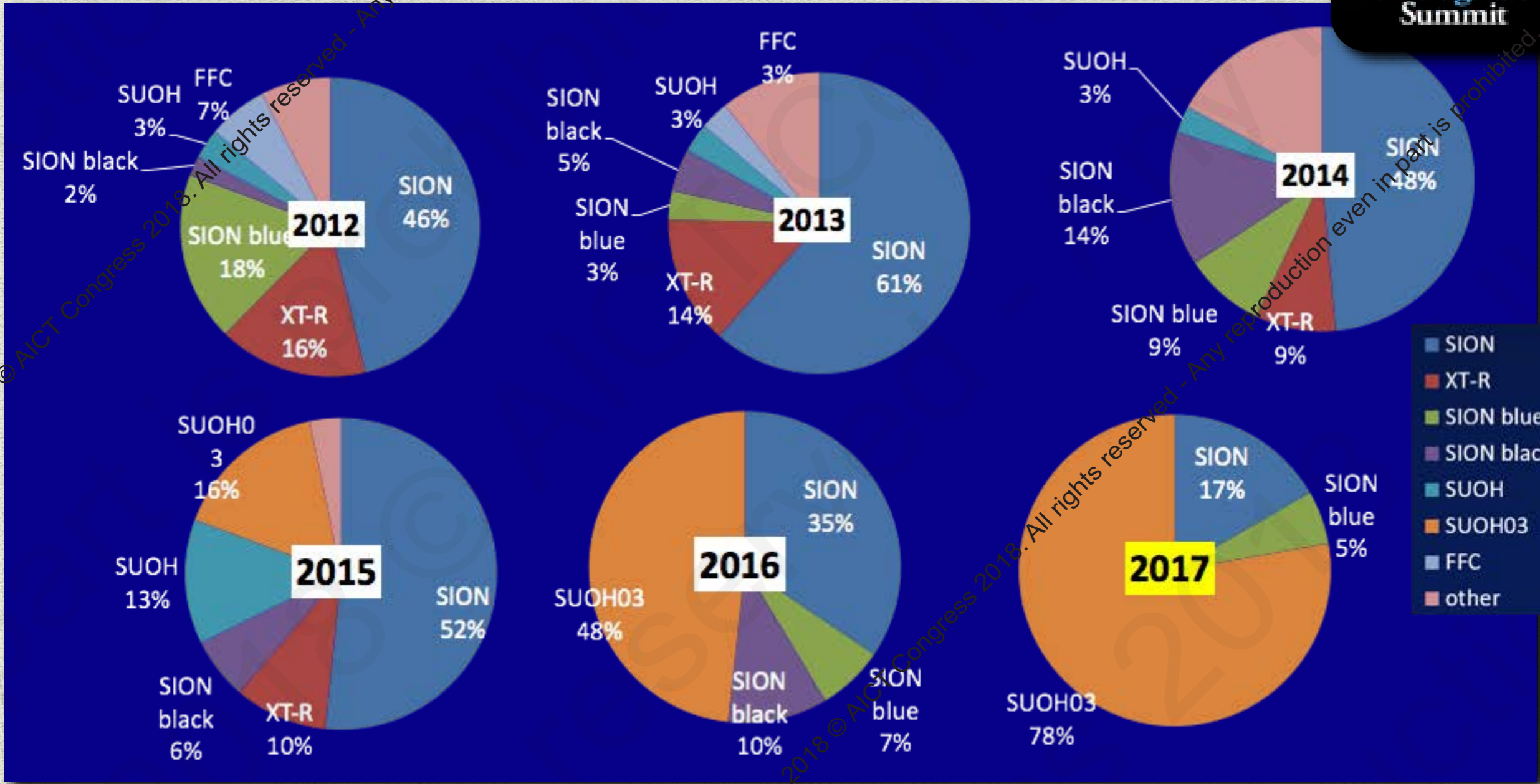


Retrograde Summit



When to perform CTO-PCI ?

Successful GW for Epicdial Channel



When to perform CTO-PCI ?

Overall Complications



In-hospital MACCE	1.7% (8)
Death	0.7% (3)
<i>PCI related death</i>	0.2%(1)
Stroke	0 % (0)
MI	1.1% (5)
<i>Non-Q MI</i>	0.9%(4)
Emergent CABG	0.4% (2)
Other complication	
Coronary perforation	3.0% (14)
<i>Tamponade</i>	0.4% (2)
Contrast induced-nephropathy	9.0% (42)
Stent thrombosis	0.4% (2)
Access site complication requiring treatment	1.7% (8)

2018 ESC/EACTS Guidelines on myocardial revascularization

Recommendations	Class ^a	Level ^b
Stent implantation in the main vessel only, followed by provisional balloon angioplasty with or without stenting of the side branch, is recommended for PCI of bifurcation lesions. ^{654–658}	I	A
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}	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

2018 © AICT Congress 2018. All rights reserved. Any reproduction even in part is prohibited.

2018 © AICT Congress 2018. All rights reserved. Any reproduction even in part is prohibited.

2018 ESC/EACTS Guidelines on myocardial revascularization

Recommendations	Class ^a	Level ^b
Stent implantation in the main vessel only, followed by provisional balloon angioplasty with or without stenting of the side branch, is recommended for PCI of bifurcation lesions. ^{654–658}	I	A
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}	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

2018 © AICT Congress 2018. All rights reserved. Any reproduction even in part is prohibited.

2018 © AICT Congress 2018. All rights reserved. Any reproduction even in part is prohibited.

When to perform CTO-PCI ?

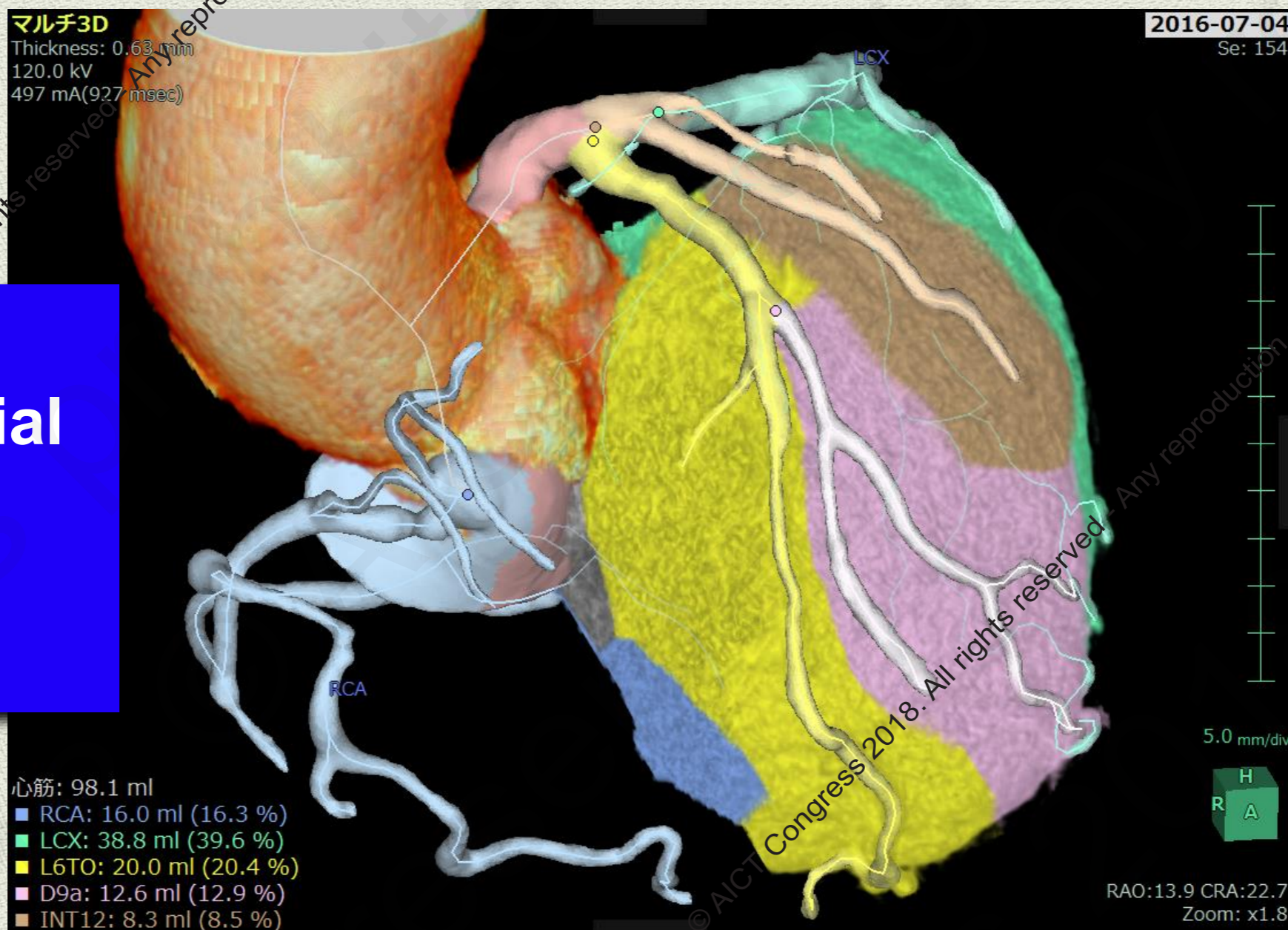
LAD-CTO Case from Dr. Sumitsuji



Courtesy by Dr. Sumitsuji

When to perform CTO-PCI ?

CT-MMAR Result - estimate coronary territory

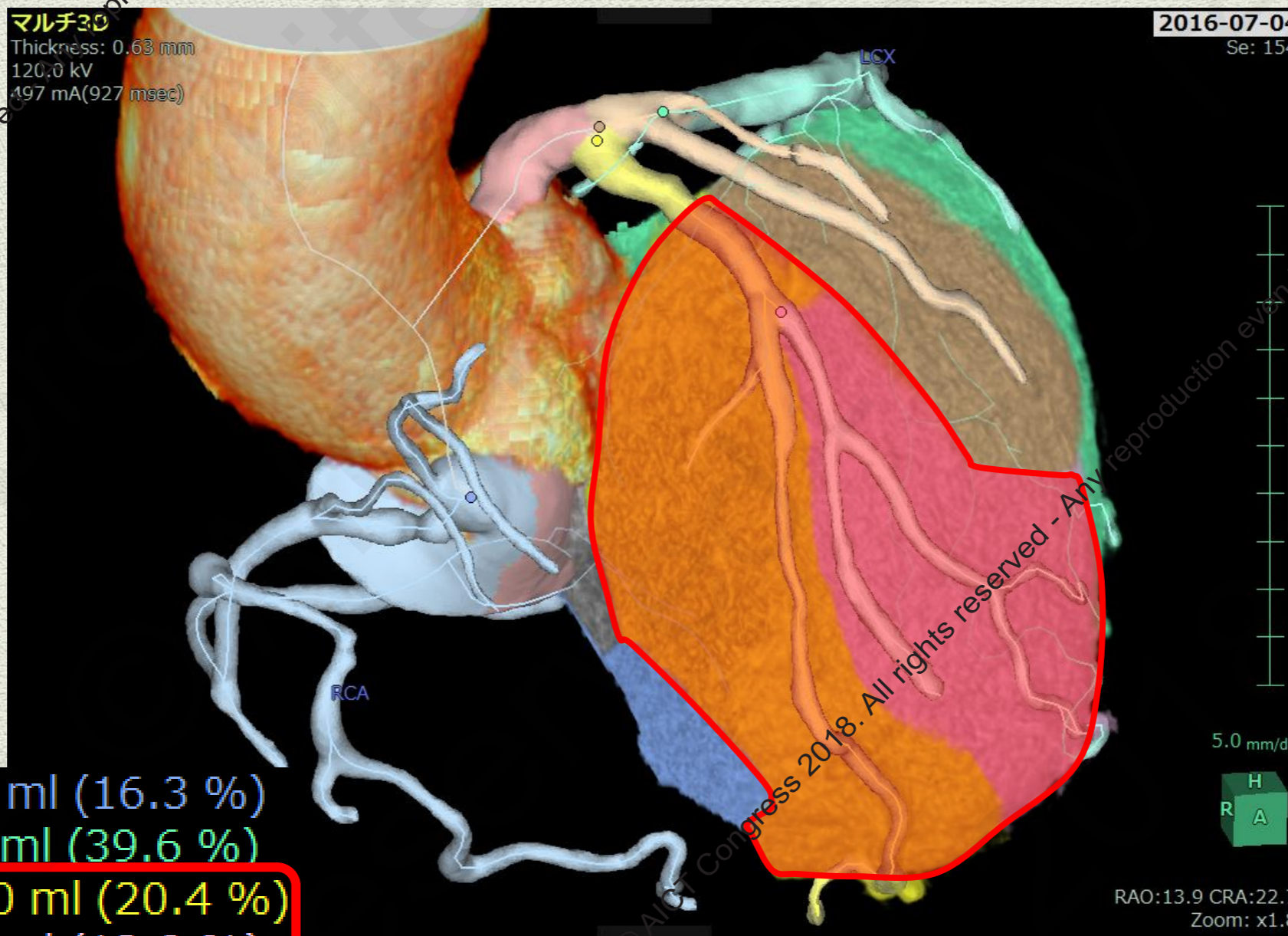


**MMAR:
Myocardial
Mass
At
Risk**

Courtesy by Dr. Sumitsuji

When to perform CTO-PCI ?

LAD-CTO : 33.3% of LV myocardium

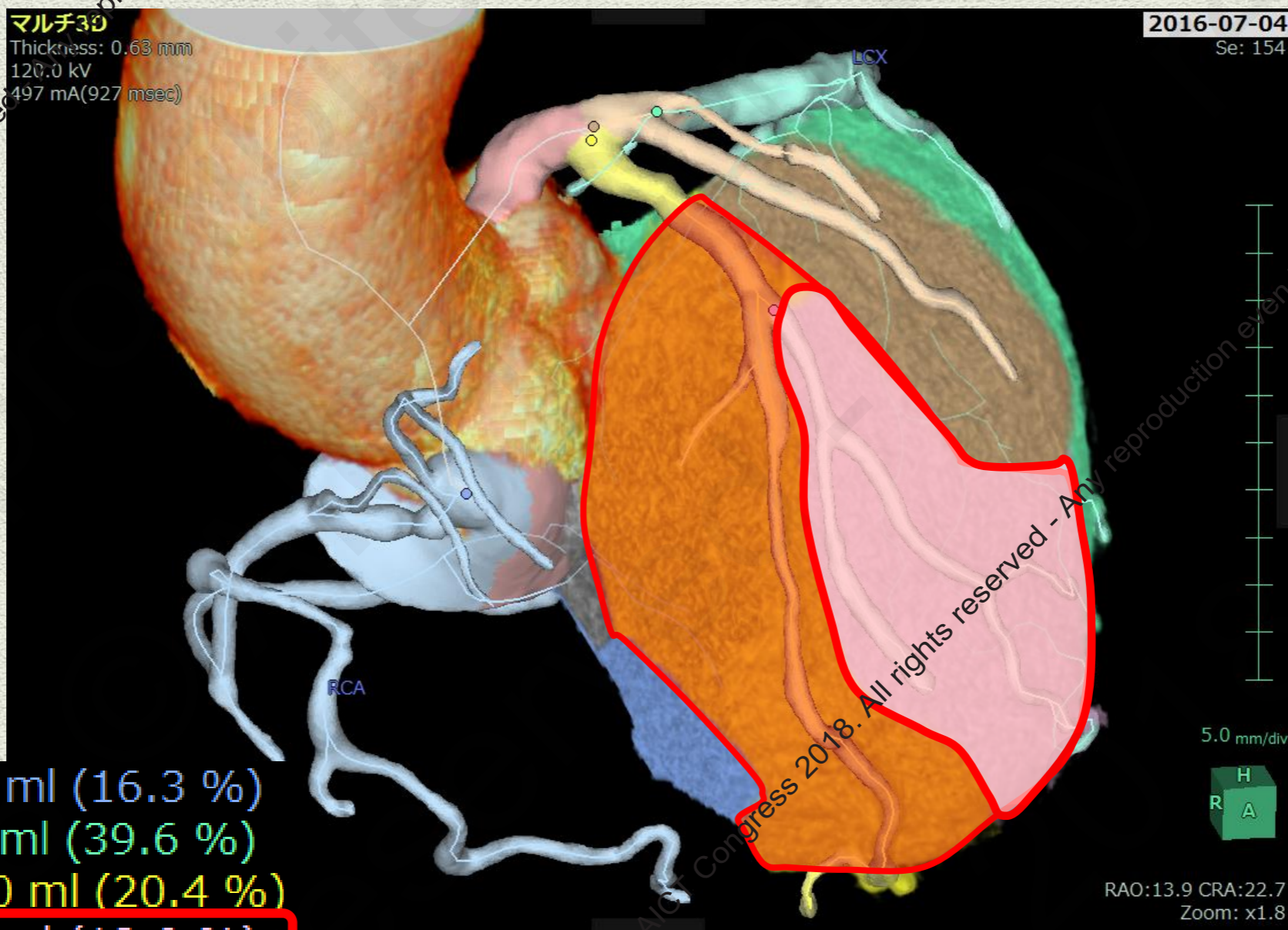


- RCA: 16.0 ml (16.3 %)
- LCX: 38.8 ml (39.6 %)
- L6TO: 20.0 ml (20.4 %)
- D9a: 12.6 ml (12.9 %)
- INT12: 8.3 ml (8.5 %)

Courtesy by Dr. Sumitsuji

When to perform CTO-PCI ?

D9-CTO : 38.7% of CTO myocardium

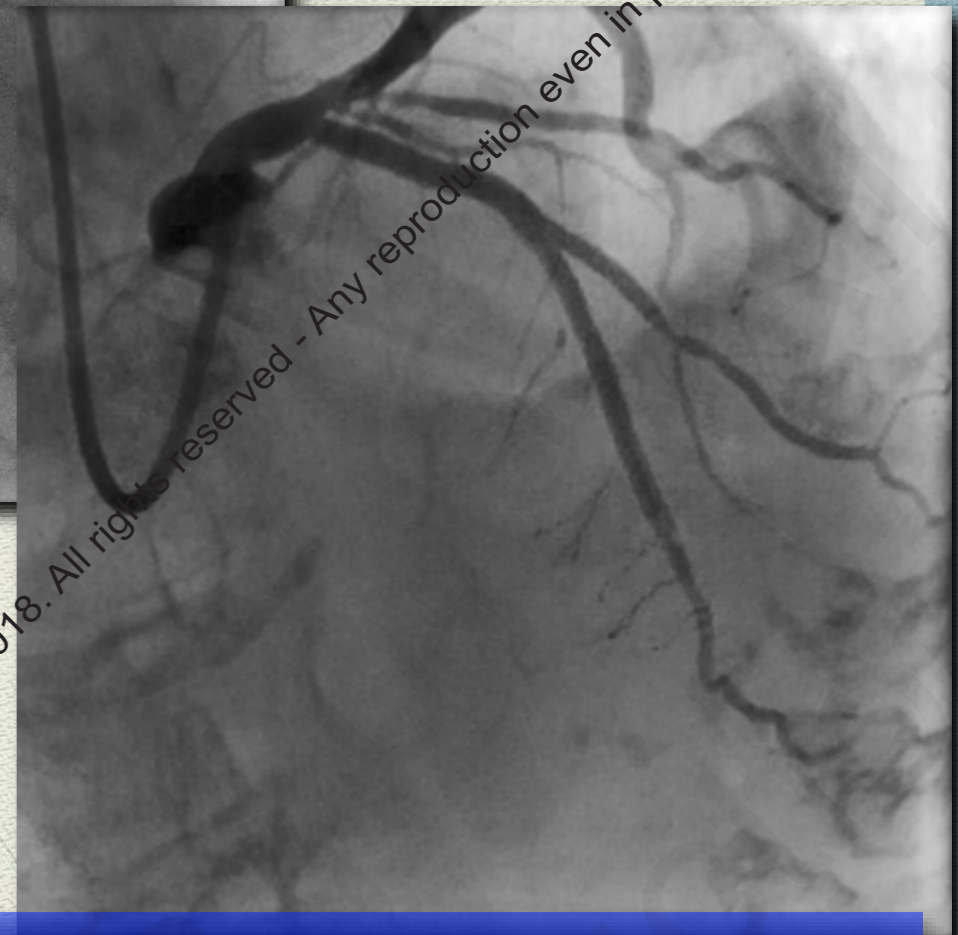
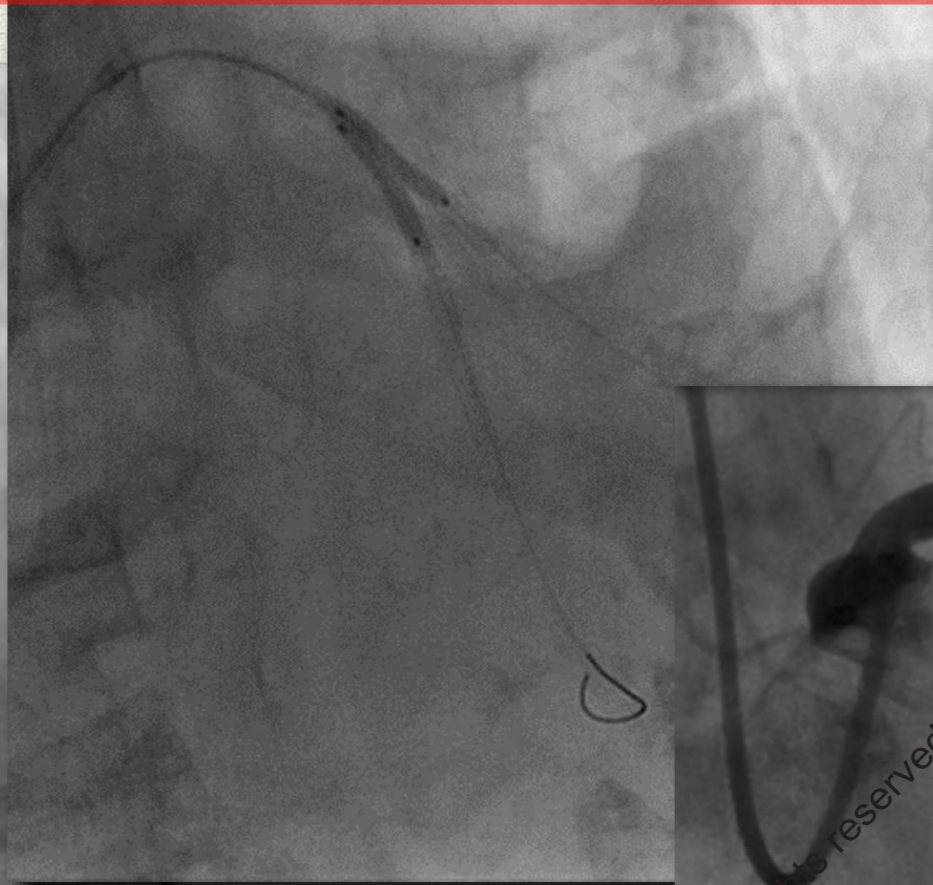


- RCA: 16.0 ml (16.3 %)
- LCX: 38.8 ml (39.6 %)
- L6TO: 20.0 ml (20.4 %)
- D9a: 12.6 ml (12.9 %)
- INT12: 8.3 ml (8.5 %)

Courtesy by Dr. Sumitsuji

When to perform CTO-PCI ?

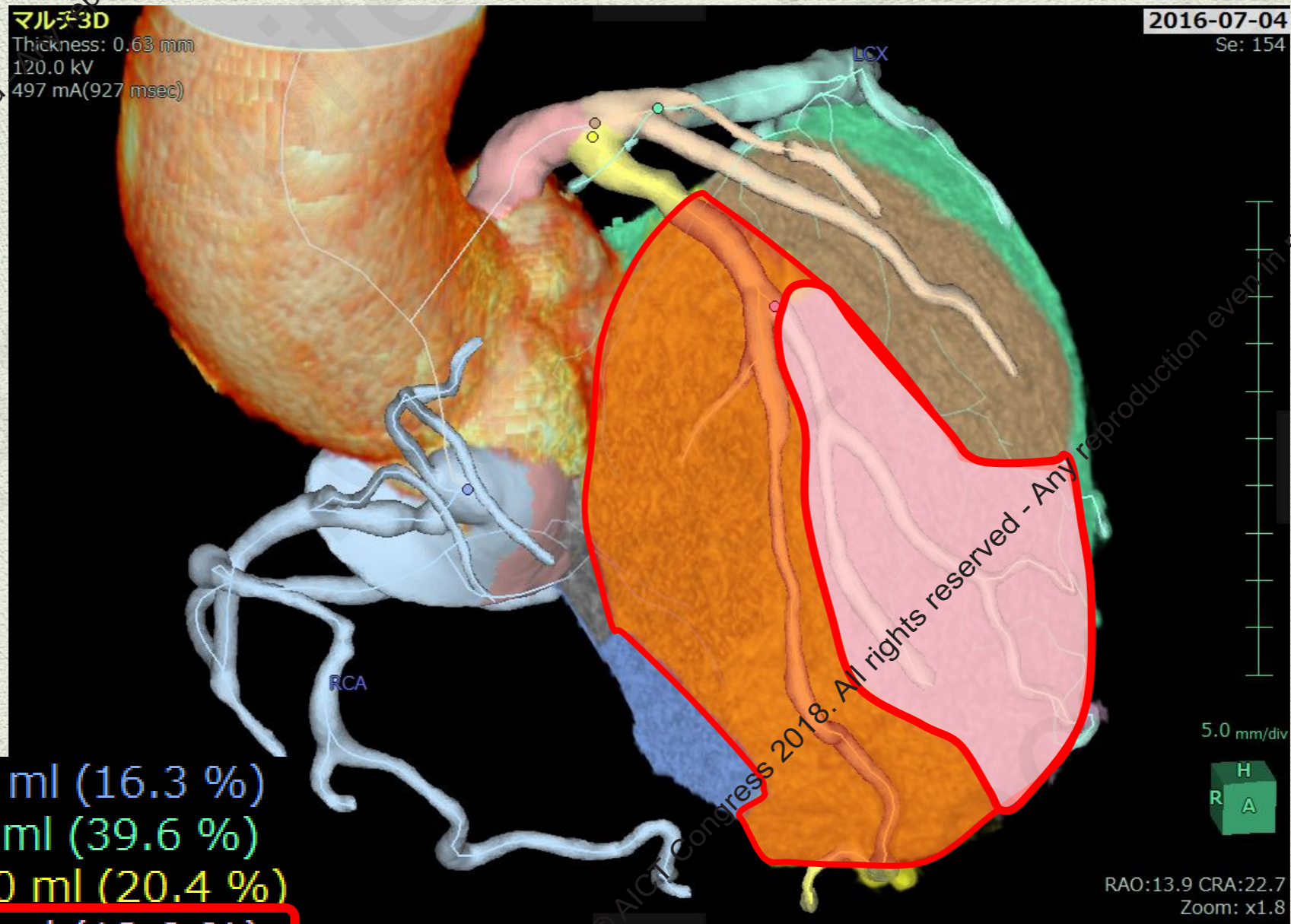
LAD-CTO PCI with 2 stent



Courtesy by Dr. Sumitsuji

When to perform CTO-PCI ?

D9-CTO : 38.7% of CTO myocardium



- RCA: 16.0 ml (16.3 %)
- LCX: 38.8 ml (39.6 %)
- L6TO: 20.0 ml (20.4 %)
- D9a: 12.6 ml (12.9 %)
- INT12: 8.3 ml (8.5 %)

Courtesy by Dr. Sumitsuji

When to perform CTO-PCI ?

Final Angio



Courtesy by Dr. Sumitsuji

2018 © AICT Congress 2018. All rights reserved - Any reproduction even in part is prohibited.

2018 © AICT Congress 2018. All rights reserved - Any reproduction even in part is prohibited.

Conclusion

- CTO-PCI should be performed, because ...
 - ☑ mortality rate is higher in CTO than multi-vessel disease, after STEMI-PCI.
 - ☑ residual CTO worsens mortality rate after non-STEMI PCI.
- But, CTO-PCI should be performed, if ...
 - ☑ operator is well experienced.
 - ☑ complete revascularization is achieved in success.
- Hybrid algorithm may simplify and improve CTO strategy.
- CT-MMAR may estimate CTO territory for revascularization.



Thank you for your attention!



2018 © AICT Congress 2018. All rights reserved. Any reproduction even in part is prohibited.

rights reserved. Any reproduction even in part is prohibited.

14th

AICT

ASIAN INTERVENTIONAL CARDIOVASCULAR THERAPEUTICS
THE OFFICIAL CONGRESS OF APSIC

7 - 9th September 2018

Hong Kong

Convention and Exhibition Centre (HKCEC)

2018 © AICT Congress 2018. All rights reserved - Any reproduction even in part is prohibited.

2018 © AICT Congress 2018. All rights reserved - Any reproduction even in part is prohibited.

2018 © AICT Congress 2018. All rights reserved - Any reproduction even in part is prohibited.

2018 © AICT Congress 2018. All rights reserved - Any reproduction even in part is prohibited.

2018 © AICT Congress 2018. All rights reserved - Any reproduction even in part is prohibited.

2018 © AICT Congress 2018. All rights reserved - Any reproduction even in part is prohibited.

2018 © AICT Congress 2018. All rights reserved - Any reproduction even in part is prohibited.

2018 © AICT Congress 2018. All rights reserved - Any reproduction even in part is prohibited.