MHIF FEATURED STUDY:

Rhapsody

OPEN AND ENROLLING:
Please Refer Patients!

CONDITION:	PI:	RESEARCH CONTACT:	SPONSOR:
Pericarditis	David Lin, MD	Christine Majeski Christine.Majeski@allina.com | 612-863-3546	Kiniksa Pharmaceuticals

DESCRIPTION:

First multinational, phase 3, double-blinded, placebo-controlled, randomized withdrawal, study assessing the efficacy of rilonacept, an interleukin 1 alpha and beta receptor decoy, in the treatment of recurrent pericarditis.

CRITERIA LIST/ QUALIFICATIONS:

Inclusion

Diagnosis of recurrent pericarditis

Exclusion

- Pericarditis secondary to specific prohibited etiologies, including tuberculosis (TB); neoplastic, purulent, or radiation etiologies
- Post-thoracic blunt trauma (e.g., motor vehicle accident)
- Myocarditis
- Systemic autoimmune diseases with exception of Still's disease, pregnancy, hx HIV, prednisone > 60 mg/day, positive Hep B or C, serious infection

MHIF was first in the world to enroll in this trial and has 4 subjects enrolled out of the 9 in the world.
Pericarditis patients are experiencing significant benefits and most often have no chest pain after starting this medication.

HOPE DISCOVERED HERE

Minneapolis Heart Institute Foundation
Creating a world without heart and vascular disease

Minneapolis Heart Institute Grand Rounds
Monday, April 15, 2019

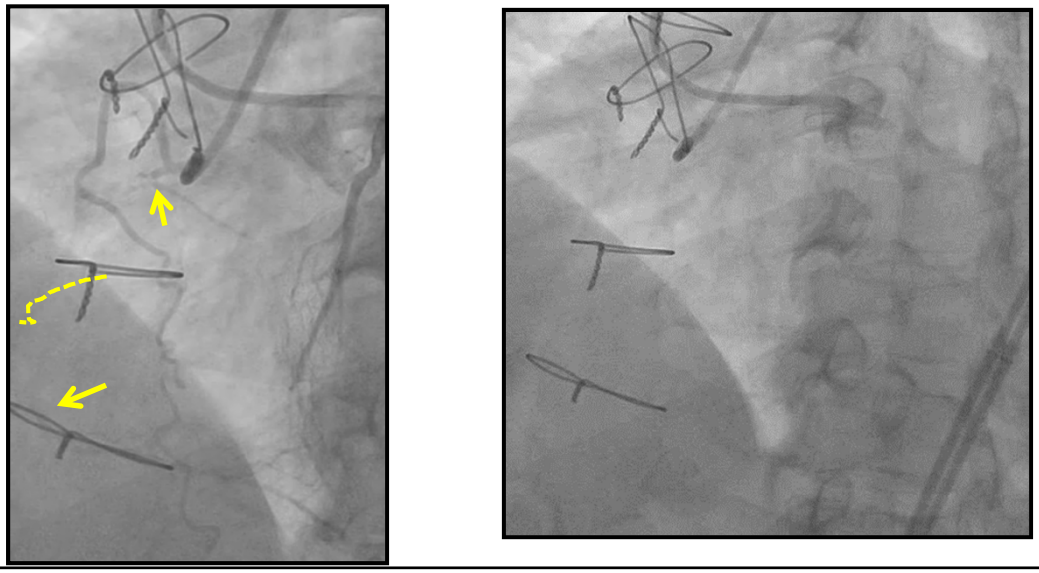
Update in CTO PCI

Emmanouil S. Brilakis, MD, PhD

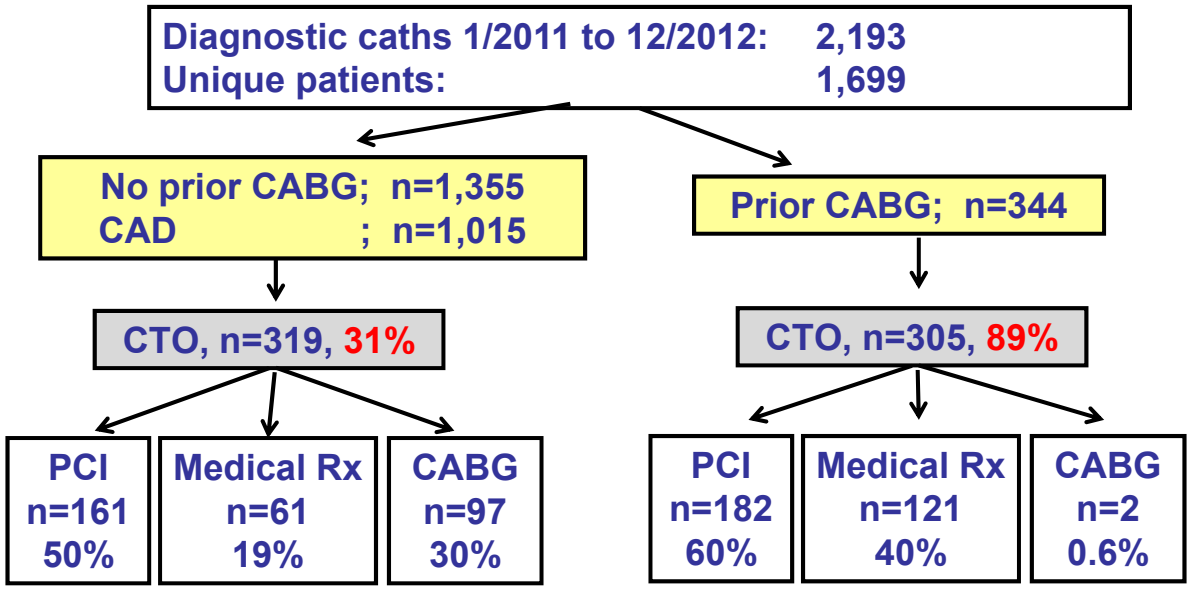
Disclosures

- **Consulting/speaker honoraria: Abbott Vascular, American Heart Association (associate editor Circulation), Boston Scientific, Cardiovascular Innovations Foundation (Board of Directors), CSI, Elsevier, GE Healthcare, InraRedx, Medtronic**
- **Research support: Regeneron, Siemens**
- **Shareholder: MHI Ventures.**
- **Board of Trustees: Society of Cardiovascular Angiography and Interventions**

CTO: occlusion in the coronary artery with TIMI 0 flow of ≥3 months duration



Dallas VAMC: CTO prevalence and revascularization



Jeroudi O et al. Catheter Cardiovasc Interv 2014;84:637-43.

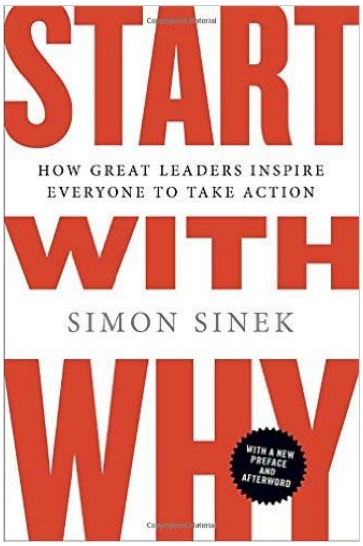
CTO Corner

Insights into the expanding field of chronic total occlusion interventions.

THE WHY AND HOW OF CTO INTERVENTIONS

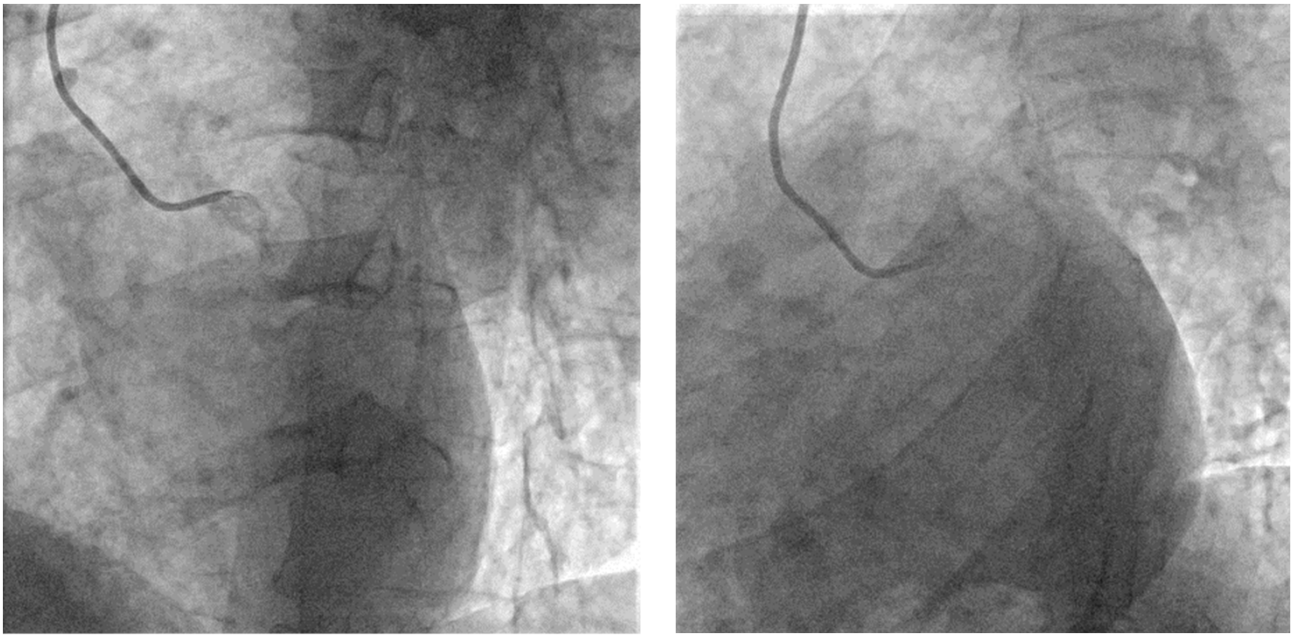
by Emmanouil S. Brilakis, MD, PhD

38 Cardiology today Intervention | January/February 2012

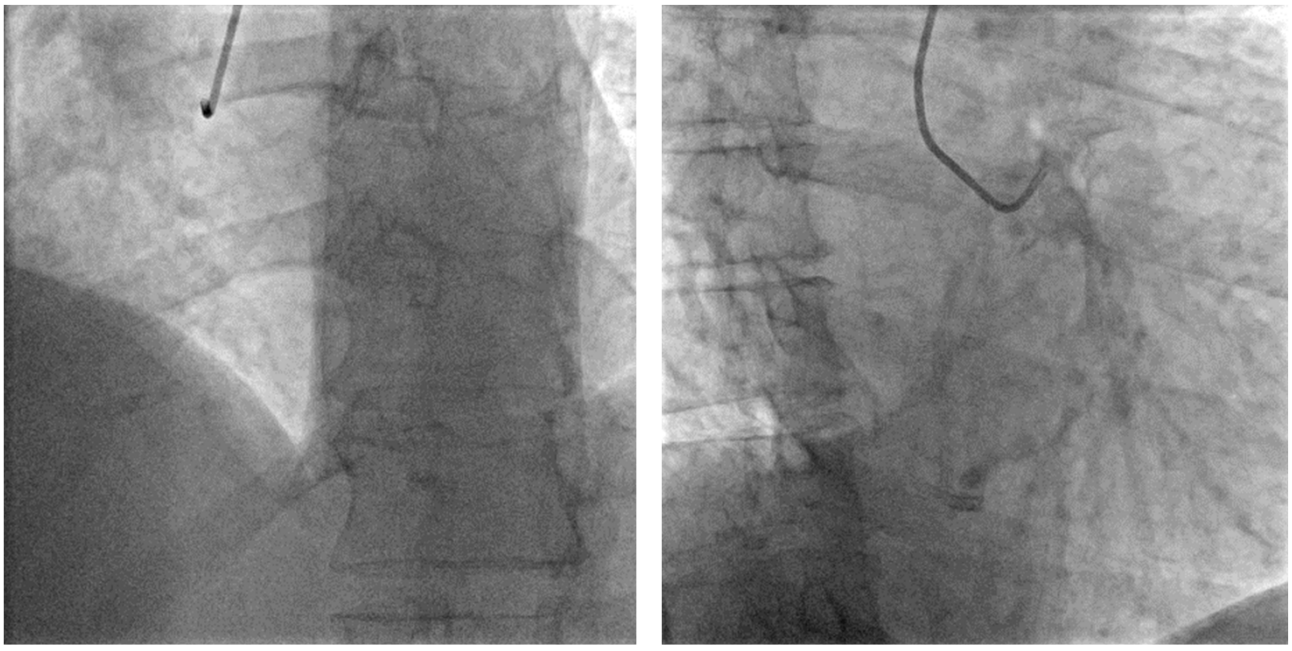


Case 1

55-year-old diabetic. EF=26% Referred for Circ CTO PCI



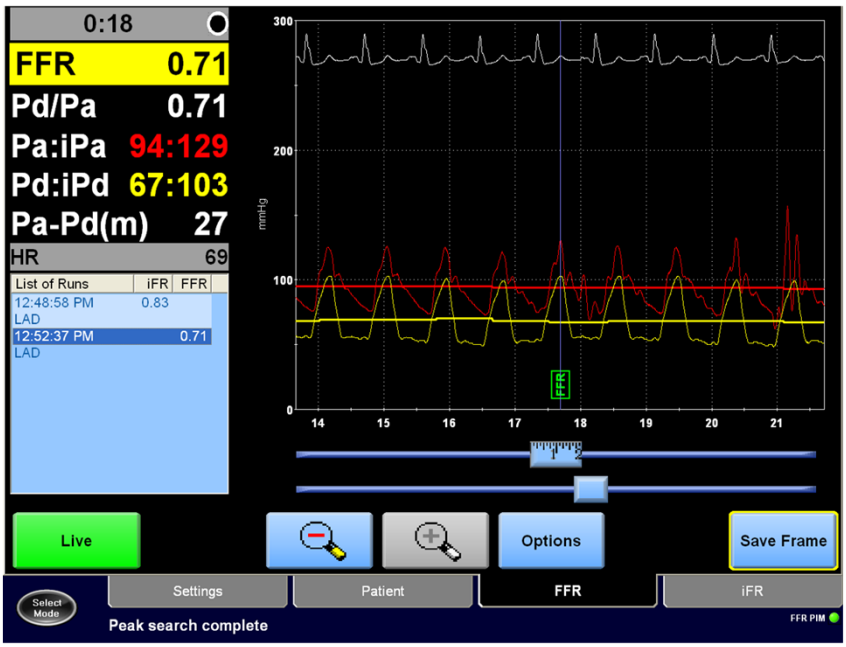
Referred for circ CTO PCI

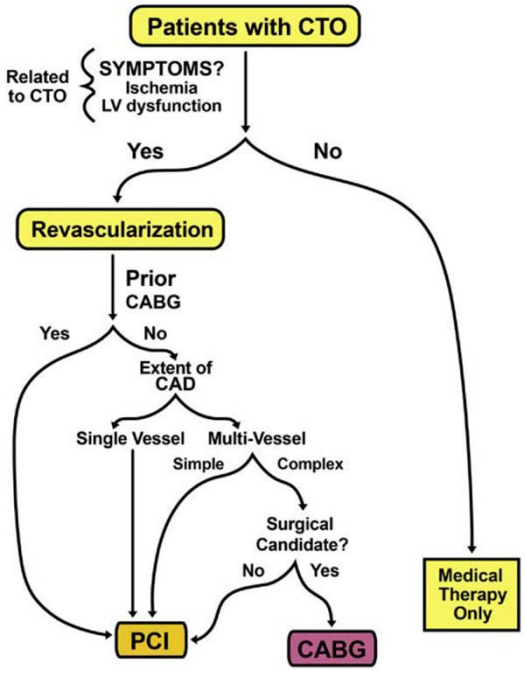


iFR


0:06
iFR®
0.83
List of Runs
iFR
FFR
12:48:58 PM
0.83
LAD
mmHg
300
200
100
0
1
2
3
4
5
Live
Options
Save Frame
Select Mode
Settings
Patient
FFR
iFR
iFR measurement complete
FFR PIM

FFR


0:18
FFR 0.71
Pd/Pa 0.71
Pa:iPa 94:129
Pd:iPd 67:103
Pa-Pd(m) 27
HR 69
List of Runs
iFR
FFR
12:48:58 PM
0.83
LAD
12:52:37 PM
0.71
LAD
mmHg
300
200
100
0
14
15
16
17
18
19
20
21
FFR
Live
Options
Save Frame
Select Mode
Settings
Patient
FFR
iFR
Peak search complete
FFR PIM



Brilakis ES. Manual of coronary CTO interventions 2nd edition. Elsevier 2017

Case 2

When should CTO PCI be done?

JACC: CARDIOVASCULAR INTERVENTIONS VOL. 11, NO. 7, 2018

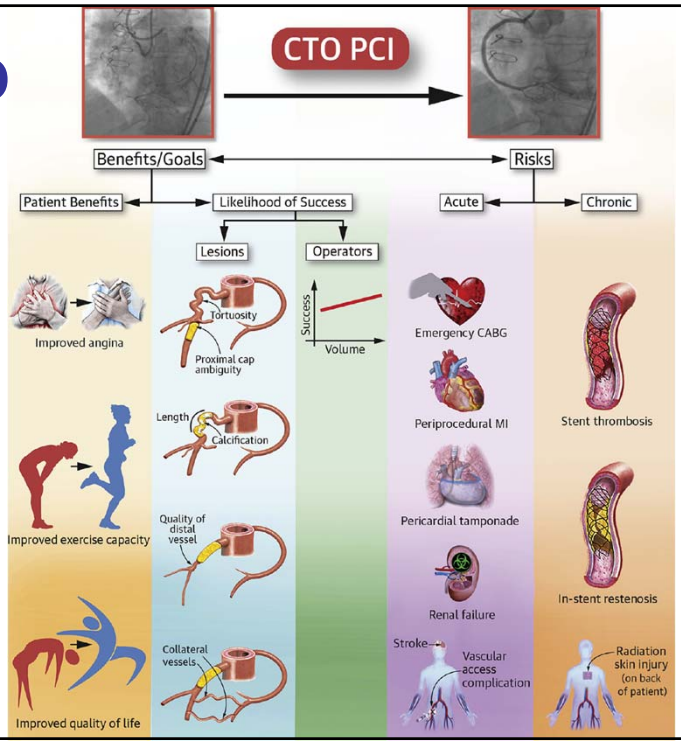
STATE-OF-THE-ART REVIEW

Update in the Percutaneous Management of Coronary Chronic Total Occlusions

Peter Tajti, MD,[a,b] M. Nicholas Burke, MD,[a] Dimitri Karmpaliotis, MD, PhD,[c] Khaldoon Alaswad, MD,[d] Gerald S. Werner, MD,[e] Lorenzo Azzalini, MD, PhD, MSc,[f] Mauro Carlino, MD,[f] Mitul Patel, MD,[g] Kambis Mashayekhi, MD,[h] Mohaned Egred, MD,[i] Oleg Krestyaninov, MD,[j] Dmitrii Khelimskii, MD,[j] William J. Nicholson, MD,[k] Imre Ungi, MD, PhD,[l] Alfredo R. Galassi, MD,[f] Subhash Banerjee, MD,[m] Emmanouil S. Brilakis, MD, PhD[a,m]

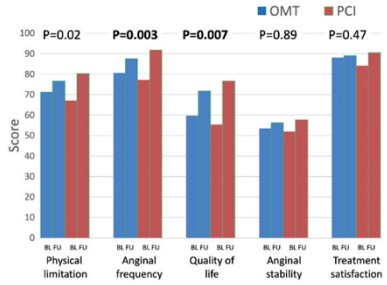
ABSTRACT

Percutaneous coronary intervention (PCI) for chronic total occlusions (CTOs) has been rapidly evolving during recent years. With improvement in equipment and techniques, high success rates can be achieved at experienced centers, although overall success rates remain low. Prospective, randomized-controlled data regarding optimal use and indications for CTO PCI remain limited. CTO PCI should be performed when the anticipated benefit exceeds the potential risk. New high-quality studies of the clinical outcomes and techniques of CTO PCI are needed, as is the expansion of expert centers and operators that can achieve excellent clinical outcomes in this challenging patient and lesion subgroup. In the current review the authors summarize the latest publications in CTO PCI and provide an overview of the current state of the field. (J Am Coll Cardiol Intv 2018;11:615–25) © 2018 the American College of Cardiology Foundation. Published by Elsevier. All rights reserved.



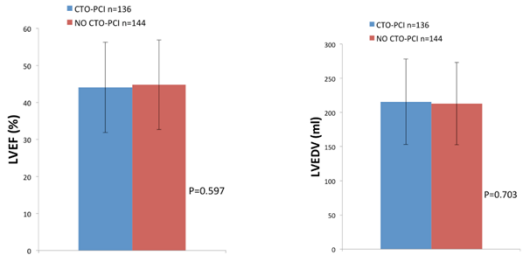
EuroCTO

euroPCR Primary endpoint: SAQ health status (ITT)



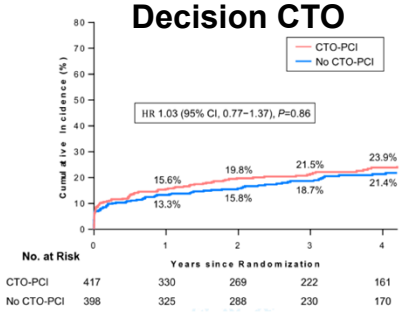
Werner et al. Eur Heart J 2018

EXPLORE trial results

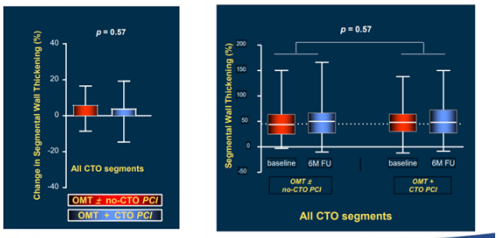


Henriques et al. J Am Coll Cardiol. 2016

Decision CTO



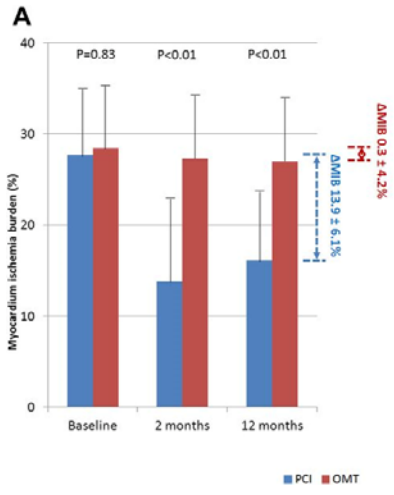
Revasc trial Primary endpoint:



tct2017 Mashayekhi et al. JACC Intv 2018 Cardiovascular Research Foundation

Impactor CTO

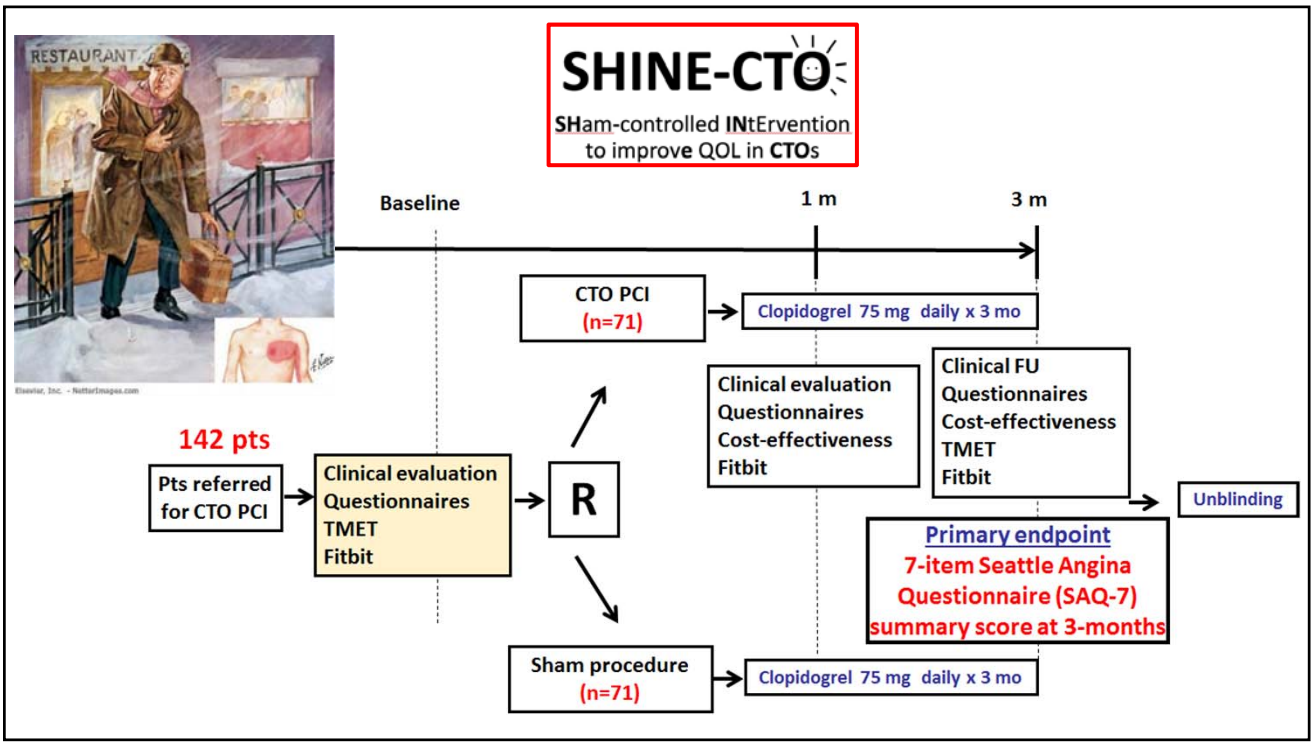
- Single center
- 94 pts
- 83% CTO PCI success



B

	Baseline			At 2 months			At 12 months		
	PCI group (n=39)	OMT group (n=33)	p	PCI group (n=39)	OMT group (n=33)	p	PCI group (n=39)	OMT group (n=33)	p
Physical Functioning, median (IQR)	40 (23; 45)	40 (30; 45)	0.42	45 (45; 75)*	41 (31; 45)	<0.01	45 (45; 70) *	40 (30; 45)	<0.01
Role Physical Functioning, median (IQR)	25 (0; 50)	25 (0; 75)	0.17	75 (50; 75) *	25 (25; 75)	<0.01	75 (50; 75) *	25 (25; 50)	<0.01
Bodily pain, median (IQR)	41 (22; 41)	41 (22; 51)	0.15	62 (41; 62) *	40 (40; 51)	<0.01	51 (41; 62) *	41 (32; 51)	<0.01
General Health, median (IQR)	25 (20; 45)	40 (25; 50)	0.07	50 (35; 57)	45 (20; 50)	0.02	50 (45; 55) *	40 (20; 50)	<0.01
Vitality, median (IQR)	30 (20; 38)	33 (25; 45)	0.22	45 (35; 50) *	35 (25; 45)	<0.01	45 (40; 50) *	33 (25; 40)	<0.01
Social Functioning, median (IQR)	50 (25; 54)	50 (25; 63)	0.43	75 (50; 75) *	50 (38; 75)	<0.01	63 (50; 75) *	50 (37; 63)	<0.01
Role-Emotional, median (IQR)	36 (33; 67)	38 (36; 69)	0.57	100 (67; 100) *	40 (34; 68)	<0.01	100 (66; 100) *	67 (33; 67)	<0.01
Mental Health, median (IQR)	40 (30; 46)	40 (32; 52)	0.22	52 (44; 62) *	40 (32; 52)	<0.01	52 (48; 60) *	40 (32; 48)	<0.01

Anton A. Obedinskiy et al. JCIN 2018;11:1309-1311

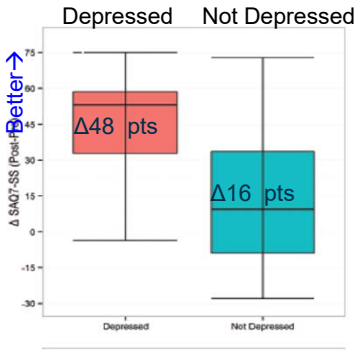


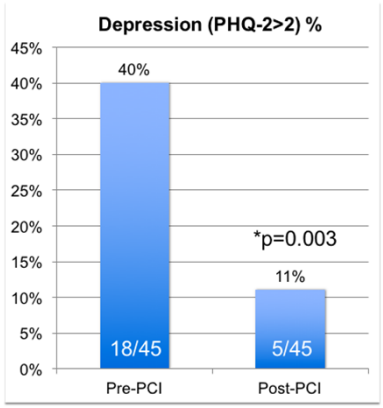
7 Global Principles for CTO PCI

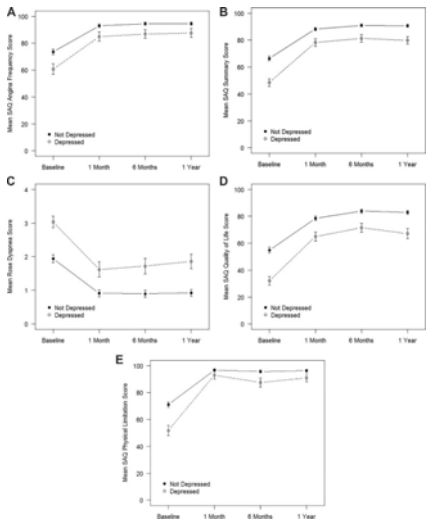
1. **Principal indication: to improve symptoms**
2. **Dual angiography + careful angiographic review**
3. **Use of microcatheter for guidewire support**
4. **4 CTO crossing strategies: AWE, ADR, RWE, RDR**
5. **Change increases likelihood of success**
6. **CTO PCI should be done at experienced-well equipped centers**
7. **Stent deployment should be optimized**

101 operators - 50 countries – Circulation 2019; in press

Effects of CTO PCI on QoL in Depressed and Non-Depressed Patients





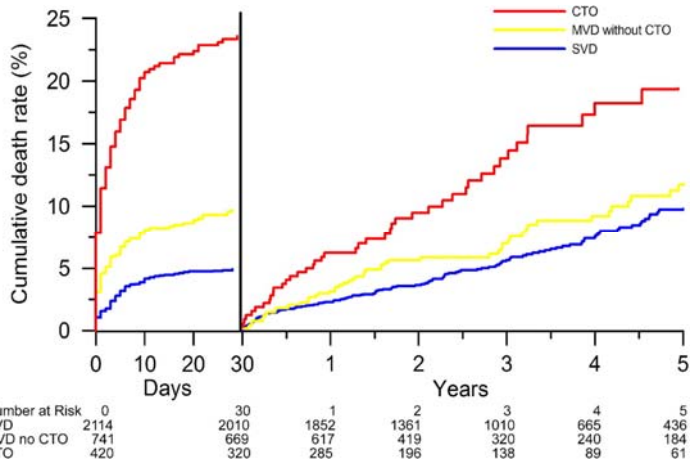


- **Following CTO PCI, depressed patients experienced ~3x the angina benefit as not depressed patients**
- **CTO PCI patients have 3-fold less depression at 1 month**

Bruckel et al, J Invasive Cardiol 2016

Robert W. Yeh et al. JCIN 2019;j.jcin.2018.12.029

Impact of CTO on outcomes post STEMI

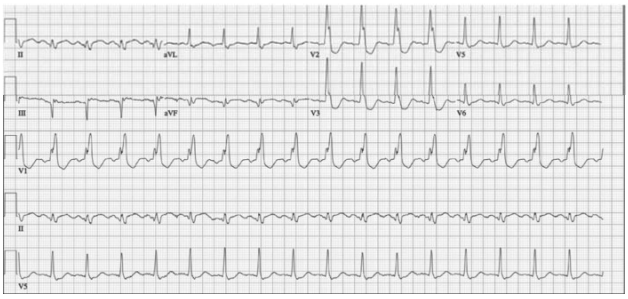


Number at Risk	0		30	1	2	3	4	5
SVD	2114		2010	1852	1361	1010	665	436
MVD no CTO	741		669	617	419	320	240	184
CTO	420		320	285	196	138	89	61

Claessen, B. et al. J Am Coll Cardiol Intv 2009;2:1128-1134

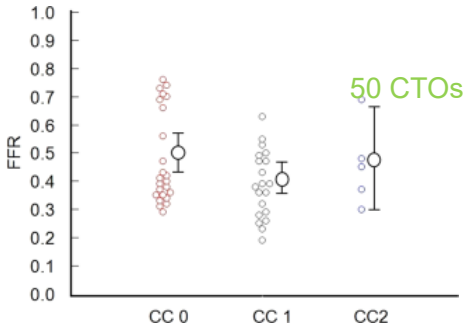
Ventricular tachycardic storm with a chronic total coronary artery occlusion treated with percutaneous coronary intervention

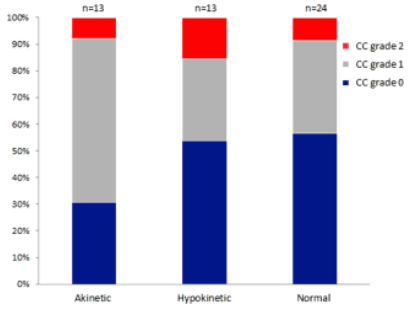
Timothy A. Mixon, MD

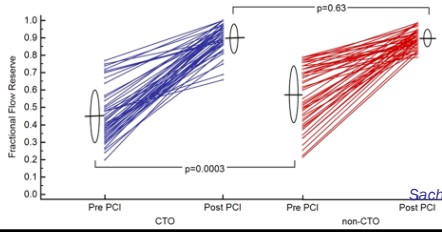


Proc (Bayl Univ Med Cent)
2015;28(2):196–199

The myocardium supplied by a chronic total occlusion is a persistently ischemic zone



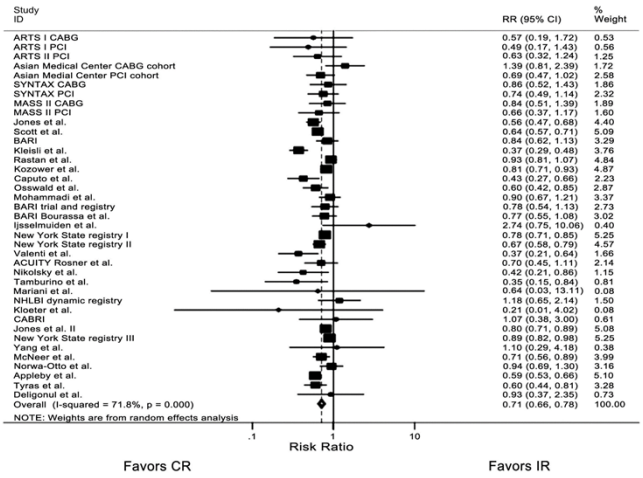




Sachdeva et al. CCI 2013

Complete vs. incomplete revascularization

89,883 Patients



12,259 out of 89,883 (13%) died during follow up.

Mortality benefit in patients treated with CABG (RR 0.70; 95% CI:0.61-0.80, p<0.001) and PCI (RR 0.72, 95% CI:0.64-0.81, p<0.001.

Mortality benefit did not vary with definition of CR.

RR = 0.71 [0.65-0.77], p<0.001 .

Garcia S, Sandoval Y, Roukoz H, Adabag S, Canoniero M, Yannopoulos D, Brilakis ES. *J Am Coll Cardiol*. 2013;62:1421-1431

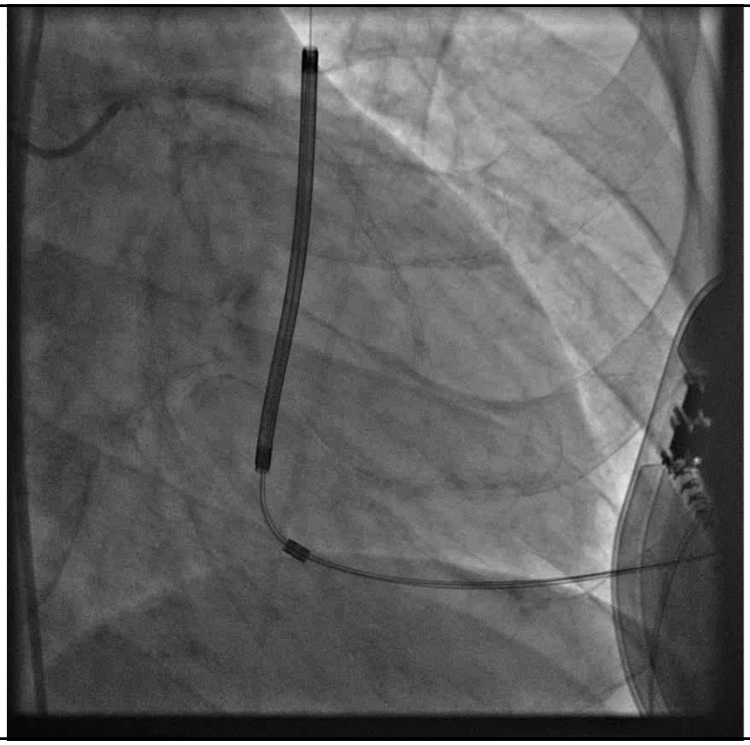
Case 3

History

- 61-year-old man with NSTEMI
- History of DM, HTN, dyslipidemia, PVD
- 3-vessel disease - turned down for CABG
- s/p LAD and Cx OM PCI (6 years prior)
- ICD implantation for secondary prevention (May, 2016)
- Echocardiography: severely depressed LV systolic function (EF: 24%), hypokinetic anterior septum, akinetic basal posterior, posterolateral and mid inferior segments

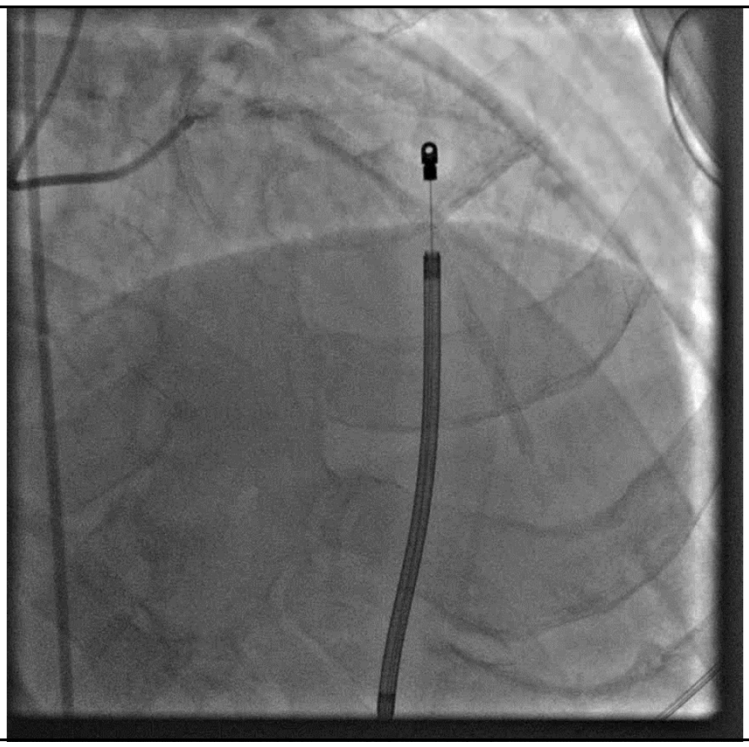
Baseline

Cx CTO

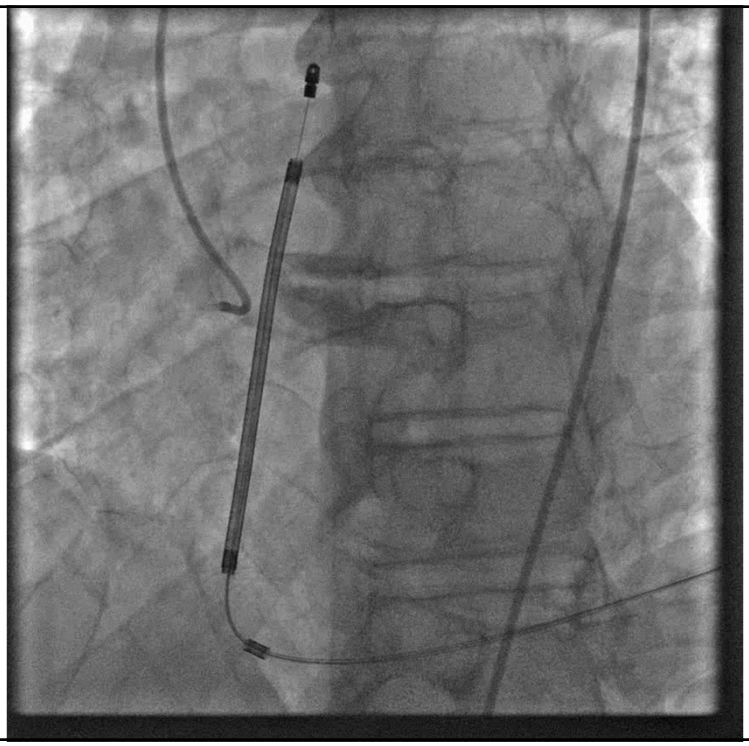


Baseline

LM-LAD ISR



RCA



EXPLORE trial design

- **Patients**

Patients with STEMI treated with pPCI and with a non-infarct related CTO.

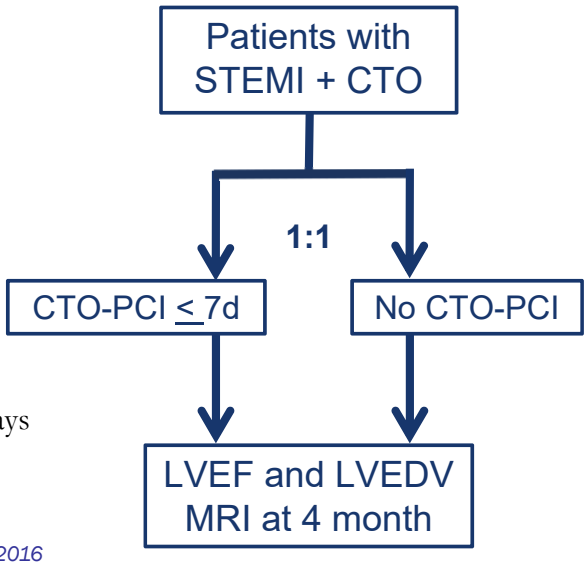
- **Design**

Global, multi-center, randomized, prospective two-arm trial with either CTO PCI or no CTO intervention after STEMI.

Blinded evaluation of endpoints.

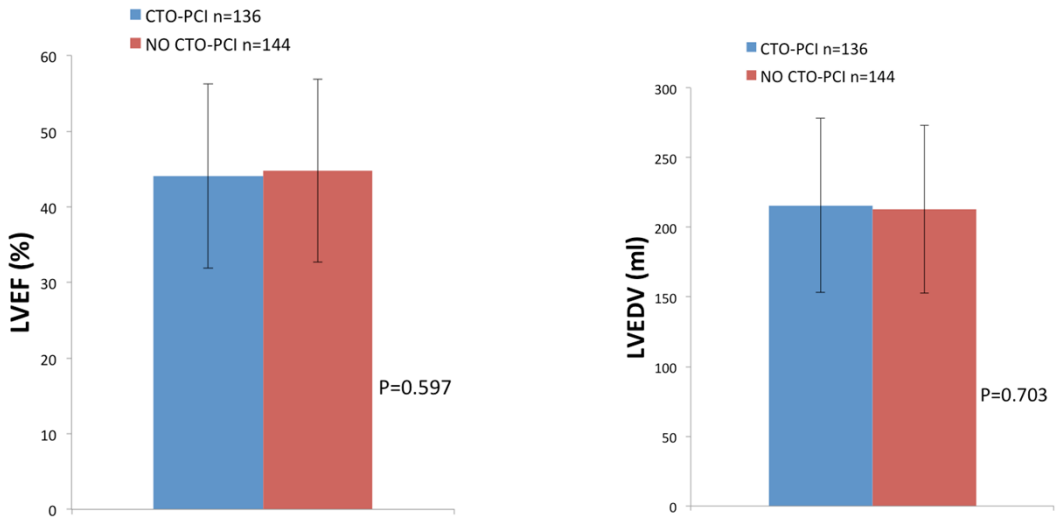
- **Objective**

To determine whether PCI of the CTO within 7 days after STEMI results in a higher LVEF and a lower LVEDV assessed by MRI at 4 months



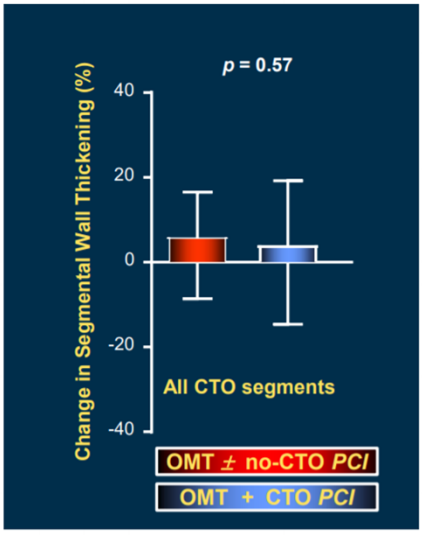
Henriques et al. J Am Coll Cardiol. 2016

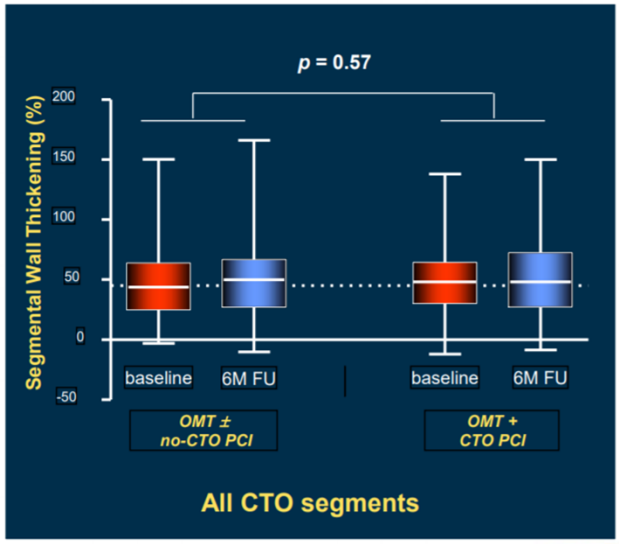
EXPLORE trial results



Henriques et al. J Am Coll Cardiol. 2016

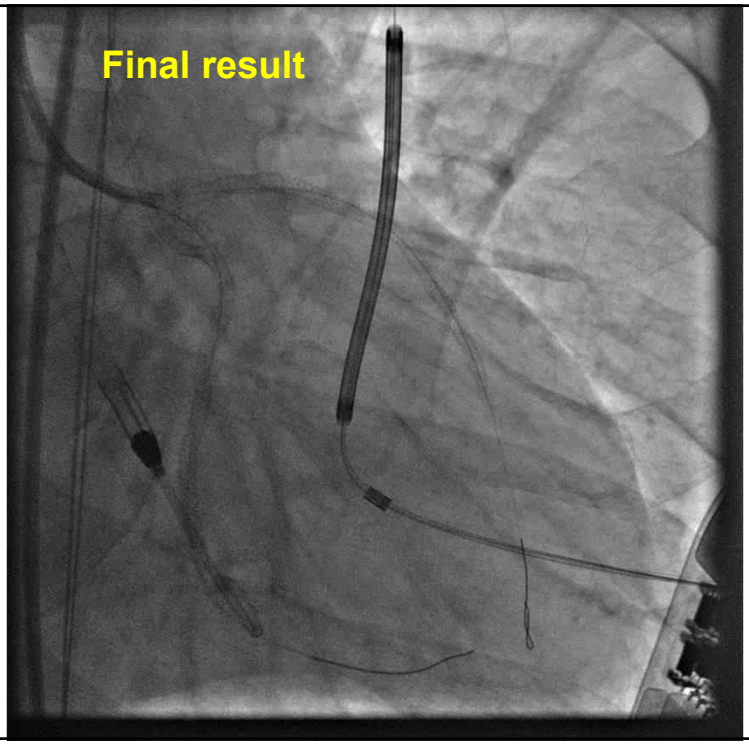
Revasc trial Primary endpoint:

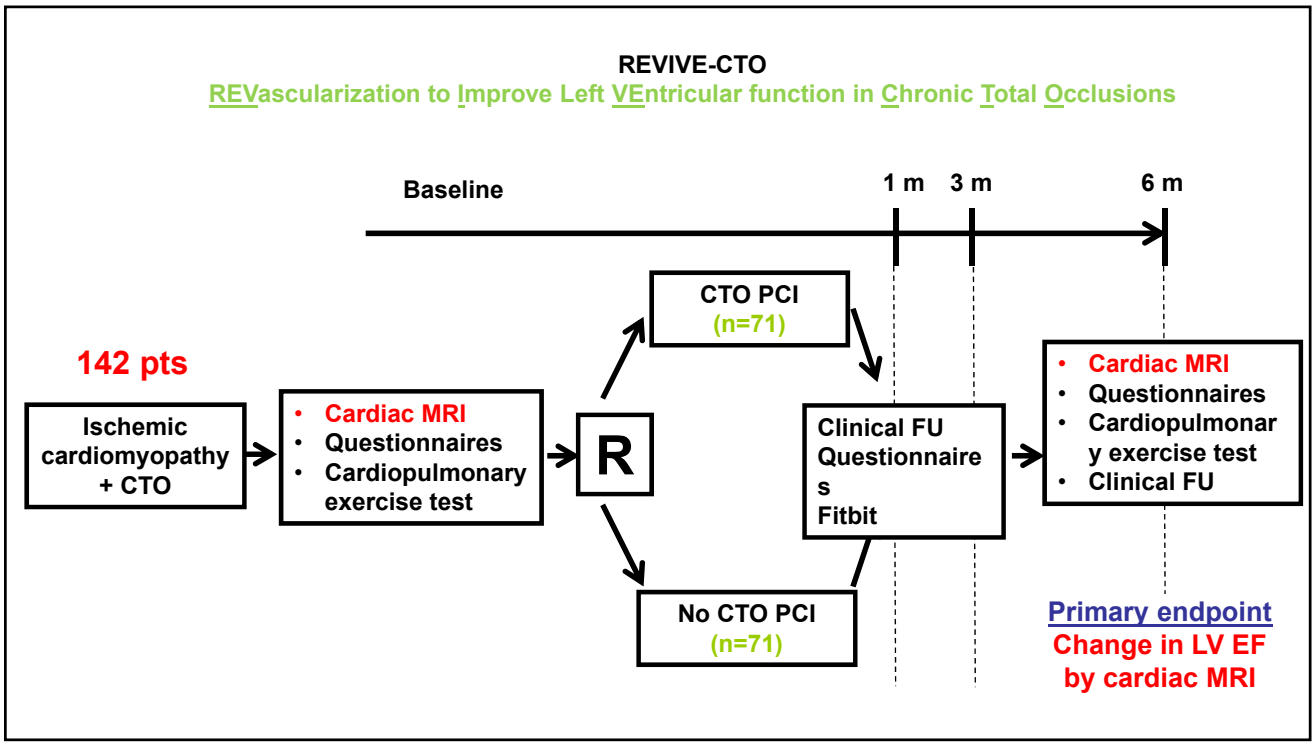




tct2017 Mashayekhi et al. JACC Intv 2018 Cardiovascular Research Foundation

EF improved to 45% 3 months later



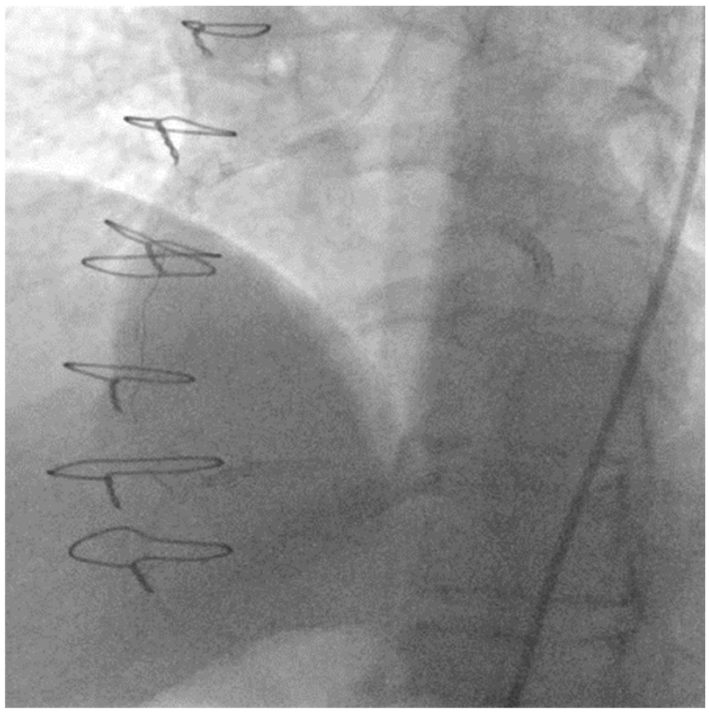

REVIVE-CTO
REVascularization to Improve Left VEntricular function in Chronic Total Occlusions
Baseline
1 m
3 m
6 m
142 pts
Ischemic cardiomyopathy + CTO
Cardiac MRI
Questionnaires
Cardiopulmonary exercise test
R
CTO PCI (n=71)
No CTO PCI (n=71)
Clinical FU Questionnaires Fitbit
Cardiac MRI
Questionnaires
Cardiopulmonary exercise test
Clinical FU
Primary endpoint
Change in LV EF by cardiac MRI

Case 4

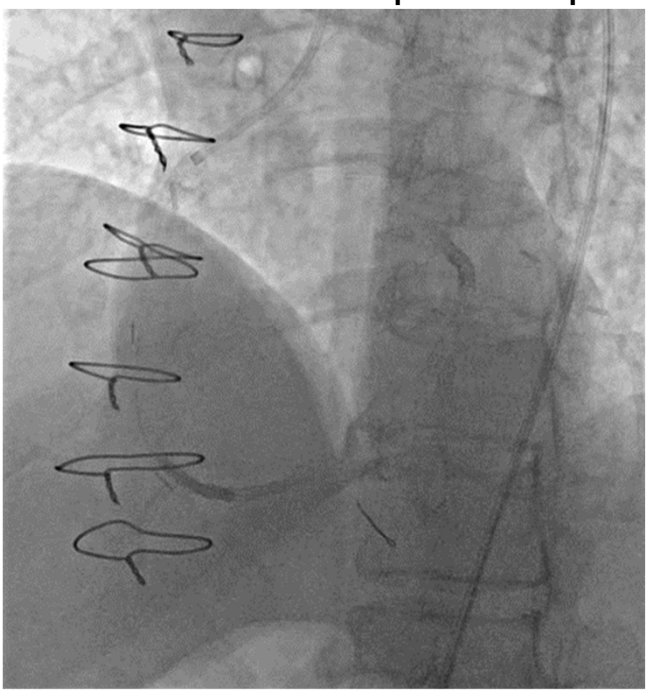
81-year-old woman

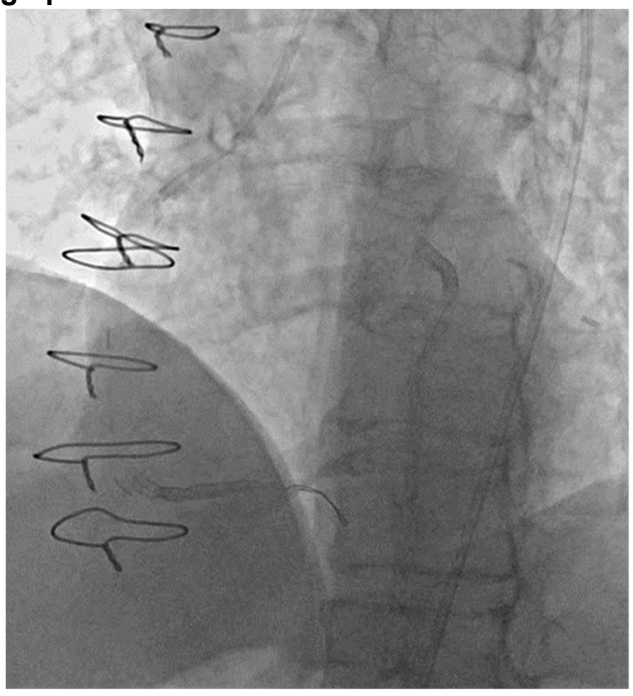
with non-NSTEMI

Occluded SVG-RCA



Stent under-expansion despite high pressure balloon inflations

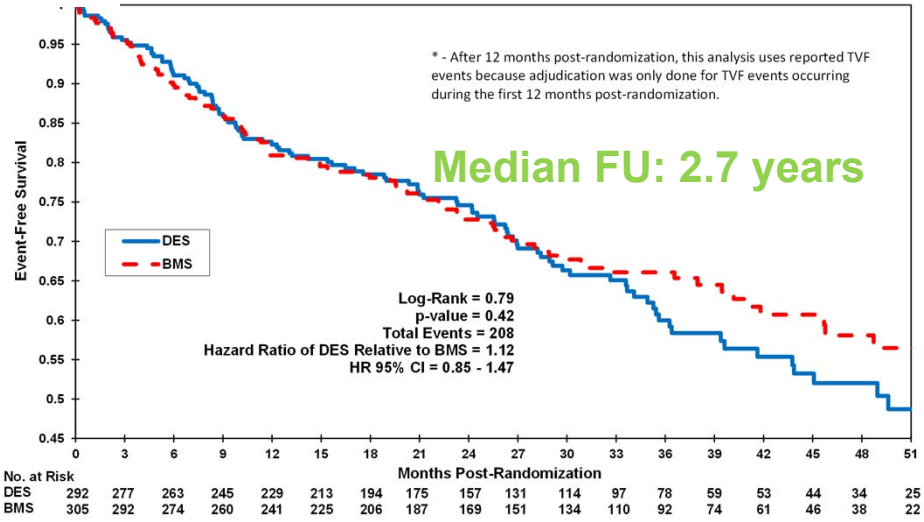




SVGs have poor long-term outcomes

DIVA

Target vessel failure



Brilakis et al. Lancet 2018

Native coronary PCI better than SVG PCI

E Death or MI or Revascularization

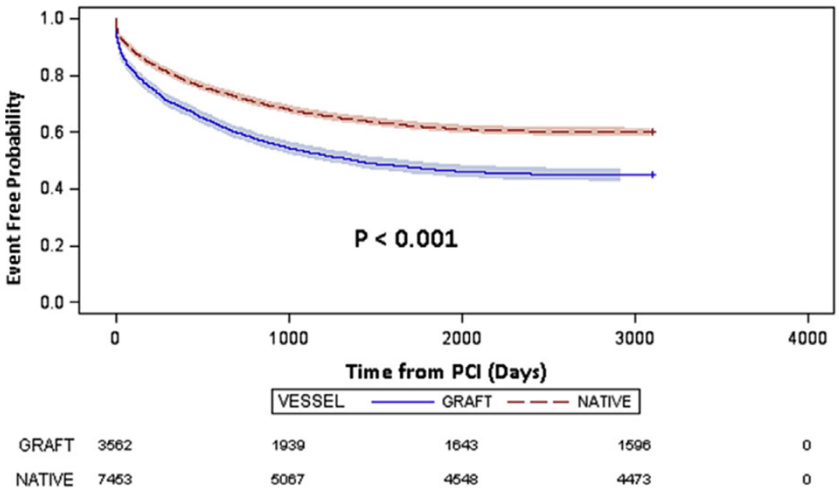
CLINICAL RESEARCH

CORONARY

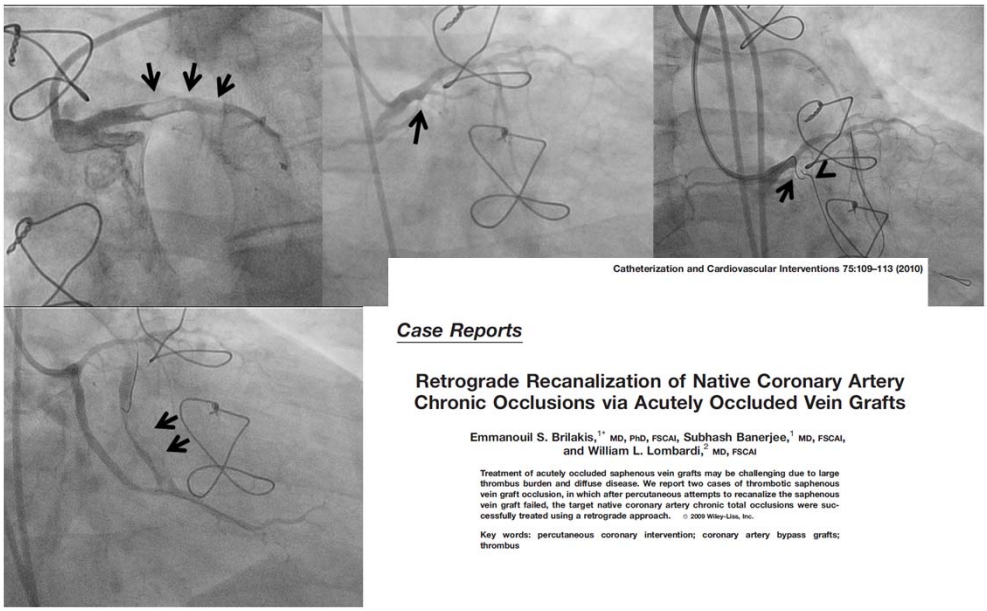
Percutaneous Coronary Intervention in Native Coronary Arteries Versus Bypass Grafts in Patients With Prior Coronary Artery Bypass Graft Surgery

Insights From the Veterans Affairs Clinical Assessment, Reporting, and Tracking Program

Emmanouil S. Brilakis, MD, PhD,[a] Colin I. O'Donnell, MS,[b,c,d] William Penny, MD,[e] Ehrin J. Armstrong, MD, PhD,[b,c,d] Thomas Tsai, MD, MSc,[b,c,d] Thomas M. Maddox, MD, MSc,[b,c,d] Mary E. Plomondon, PhD,[b,c,d] Subhash Banerjee, MD,[a] Sunil V. Rao, MD,[f] Santiago Garcia, MD,[g] Brahmajee Nallamothu, MD,[h] Kendrick A. Shunk, MD, PhD,[i] Kreton Mavromatis, MD,[j] Gary K. Grunwald, PhD,[b,c,d] Deepak L. Bhatt, MD, MPH[k]



2010: The "future": treat native coronary instead of SVG?



Catheterization and Cardiovascular Interventions 75:109–113 (2010)

Case Reports

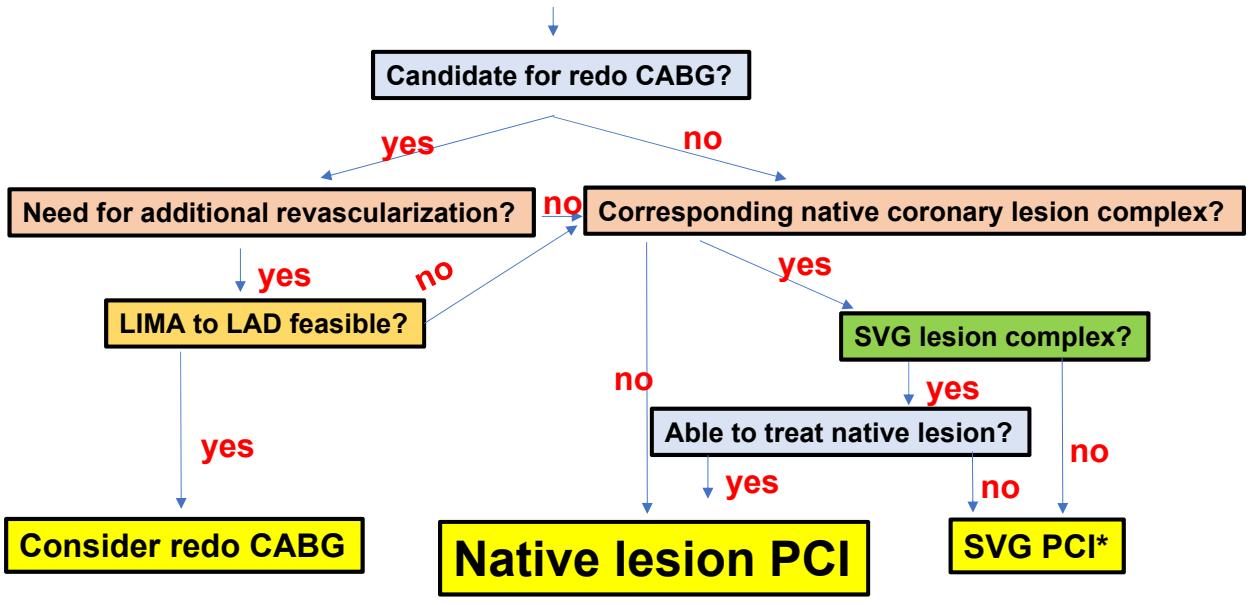
Retrograde Recanalization of Native Coronary Artery Chronic Occlusions via Acutely Occluded Vein Grafts

Emmanouil S. Brilakis,[1]* MD, PhD, FSCAI, Subhash Banerjee,[1] MD, FSCAI, and William L. Lombardi,[2] MD, FSCAI

Treatment of acutely occluded saphenous vein grafts may be challenging due to large thrombus burden and diffuse disease. We report two cases of thrombotic saphenous vein graft occlusion, in which after percutaneous attempts to recanalize the saphenous vein graft failed, the target native coronary artery chronic total occlusions were successfully treated using a retrograde approach. © 2009 Wiley-Liss, Inc.

Key words: percutaneous coronary intervention; coronary artery bypass grafts; thrombus

SVG lesion



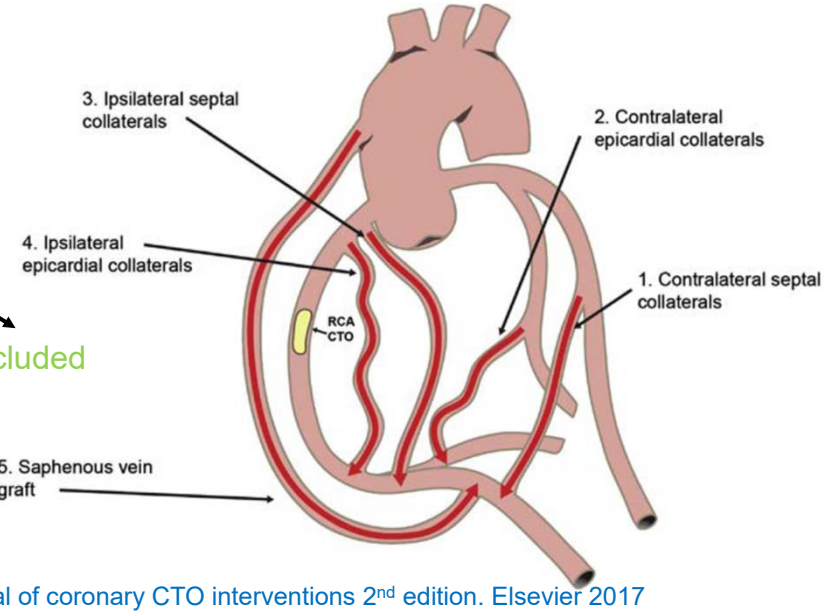
Brilakis et al. JACC 2018

Additional options = Grafts

Grafts

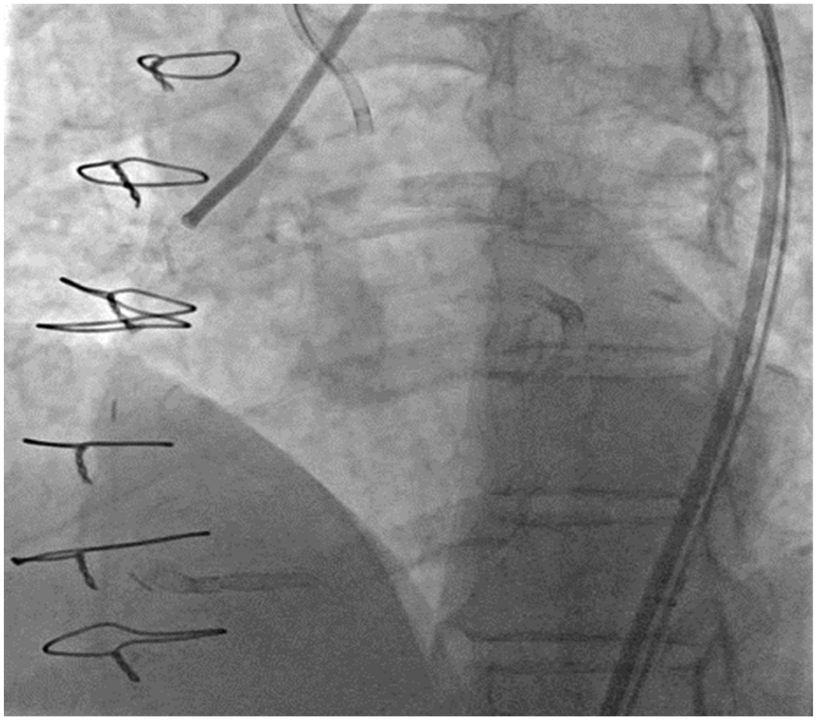
Arterial SVGs

patent occluded patent occluded



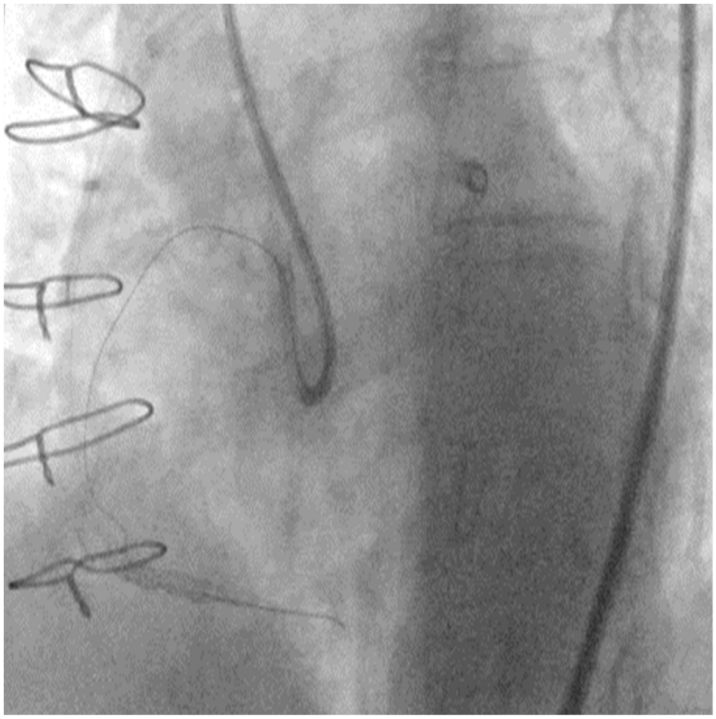
Brilakis ES. Manual of coronary CTO interventions 2nd edition. Elsevier 2017

3 weeks later



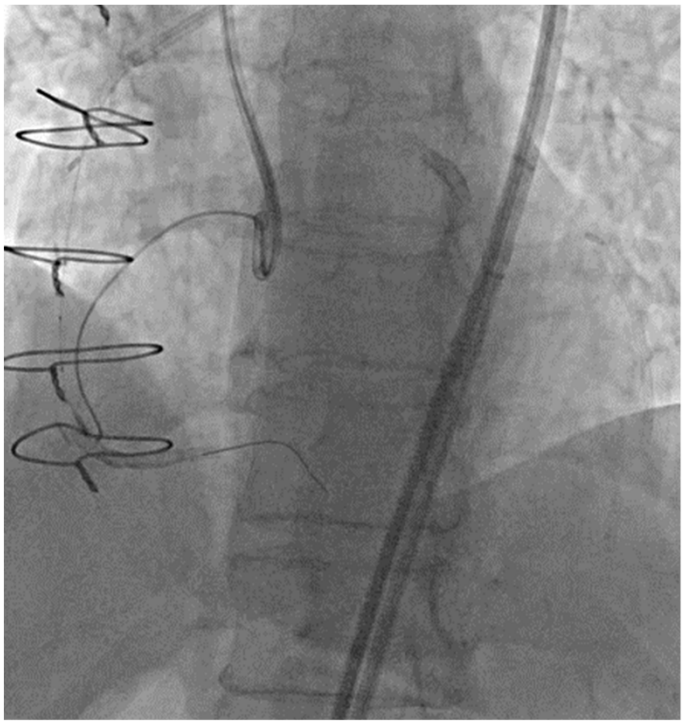
CT-angio

Antegrade wire escalation

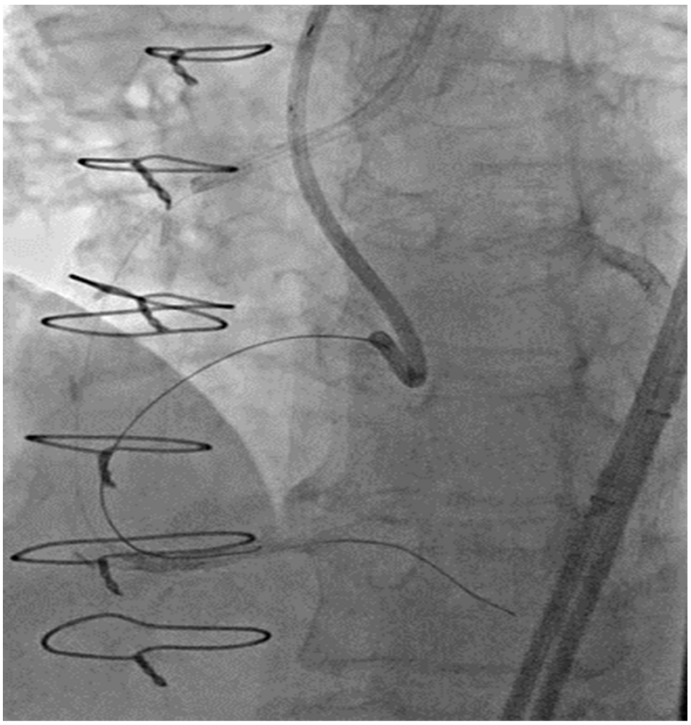


Unable to cross through prior stent

- Hornet 14
- Pilot 200
- Gaia 2nd
- Gaia 3rd



Pilot 200 subintimal (sub-stent) followed by Corsair



Stingray wire

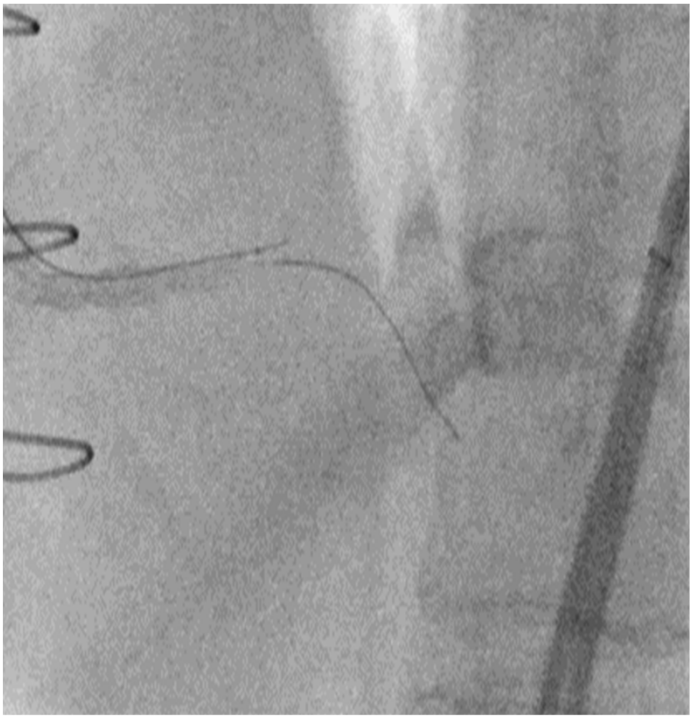
⇩

re-enter distal true lumen

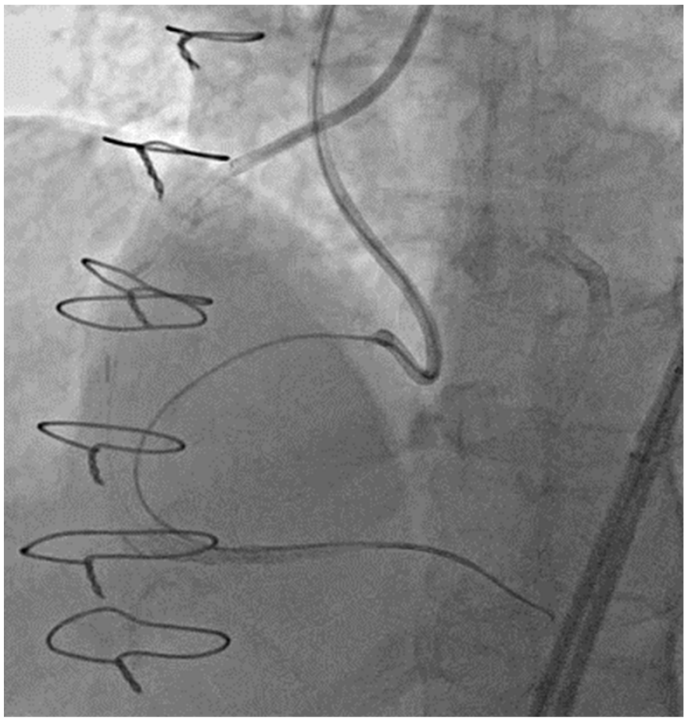
⇩

exchanged for Pilot 200

“Stick and swap”

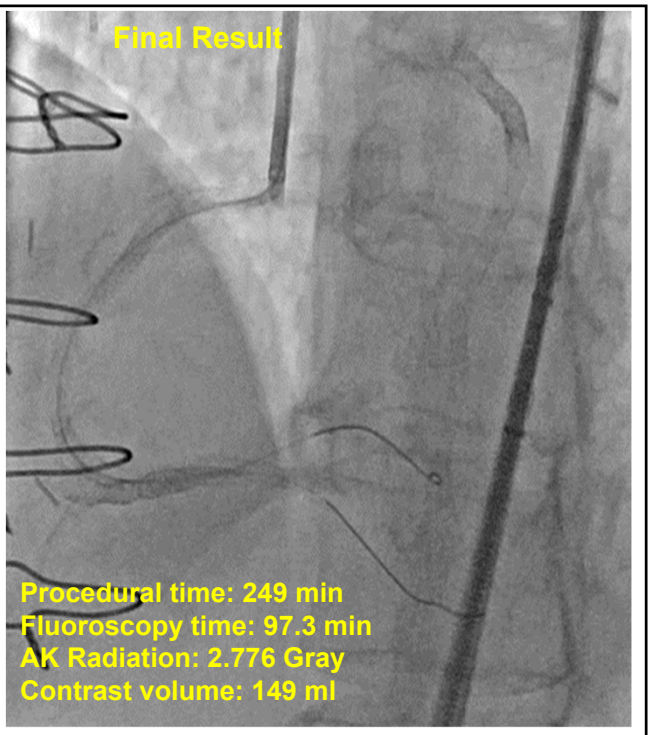


Pilot 200 into true lumen



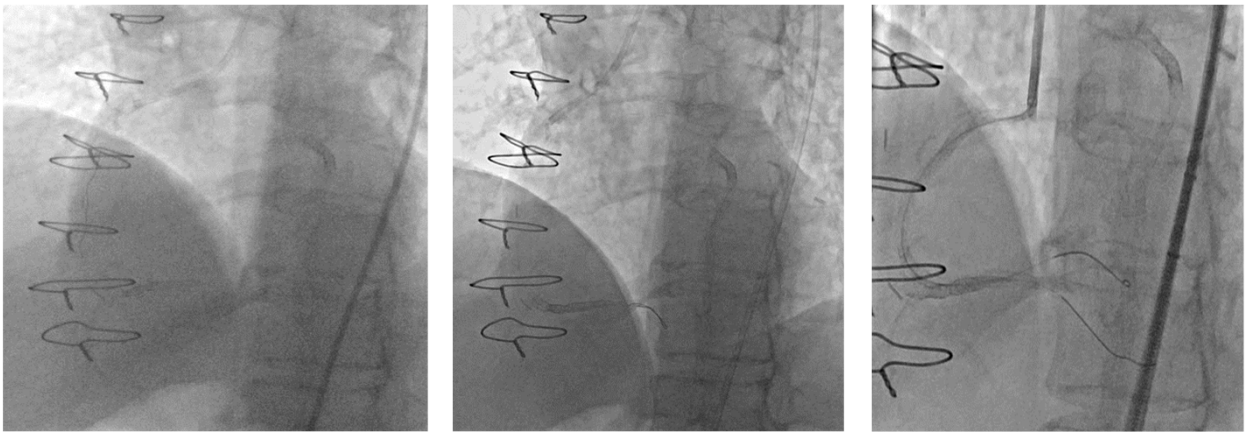
Conclusions

- Native coronary artery PCI is preferred to SVG PCI (esp after SVG occlusion), if feasible
- Treating ISR CTOs: sub-stent crossing, re-entry, and crushing stents
- Balloon undilatable lesion: subintimal crossing can provide effective treatment



"Staged SVG revascularization"

Acute SVG failure	Stage 1 SVG PCI	Stage 2 Native coronary PCI

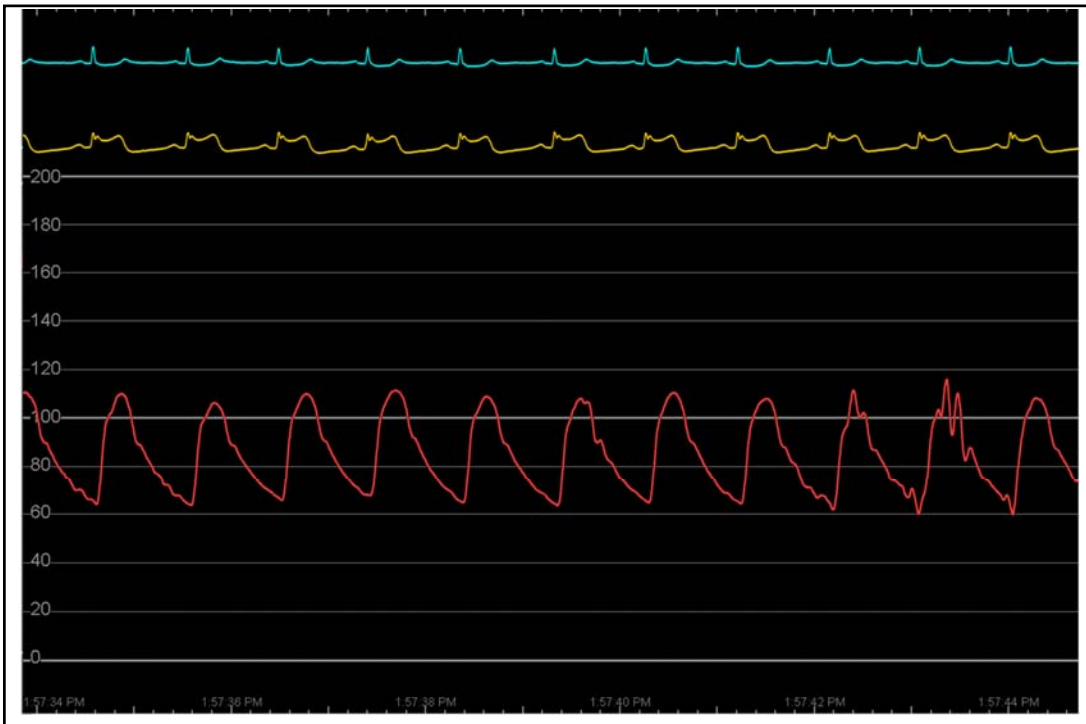


Xenogiannis I et al. Catheter Cardiovasc Interv 2018

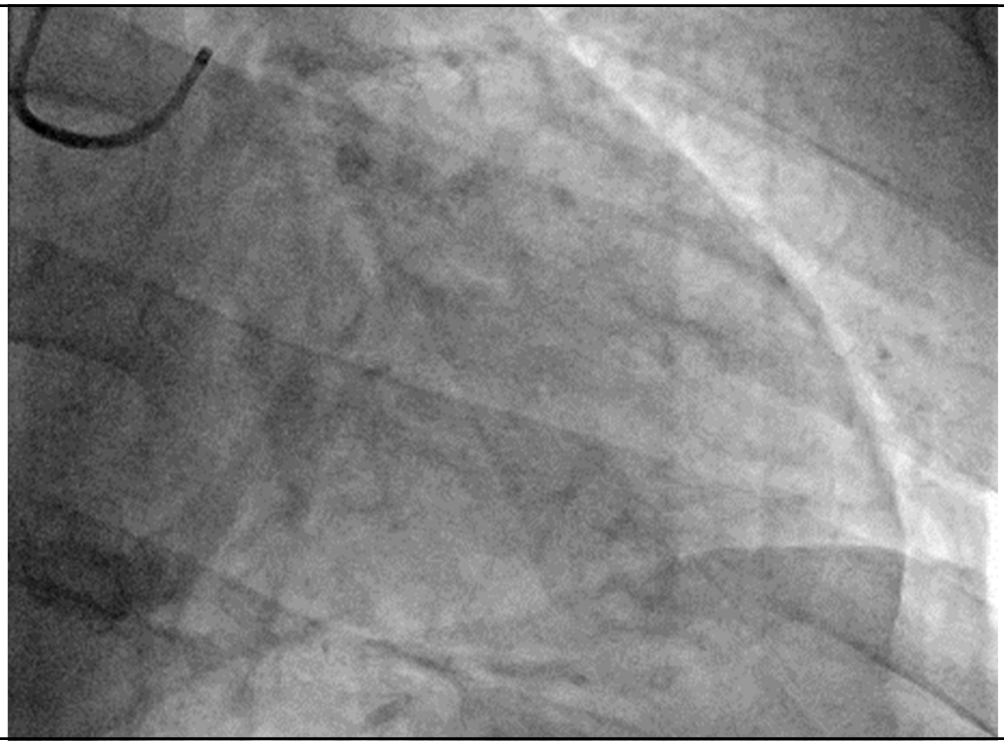
Case 5

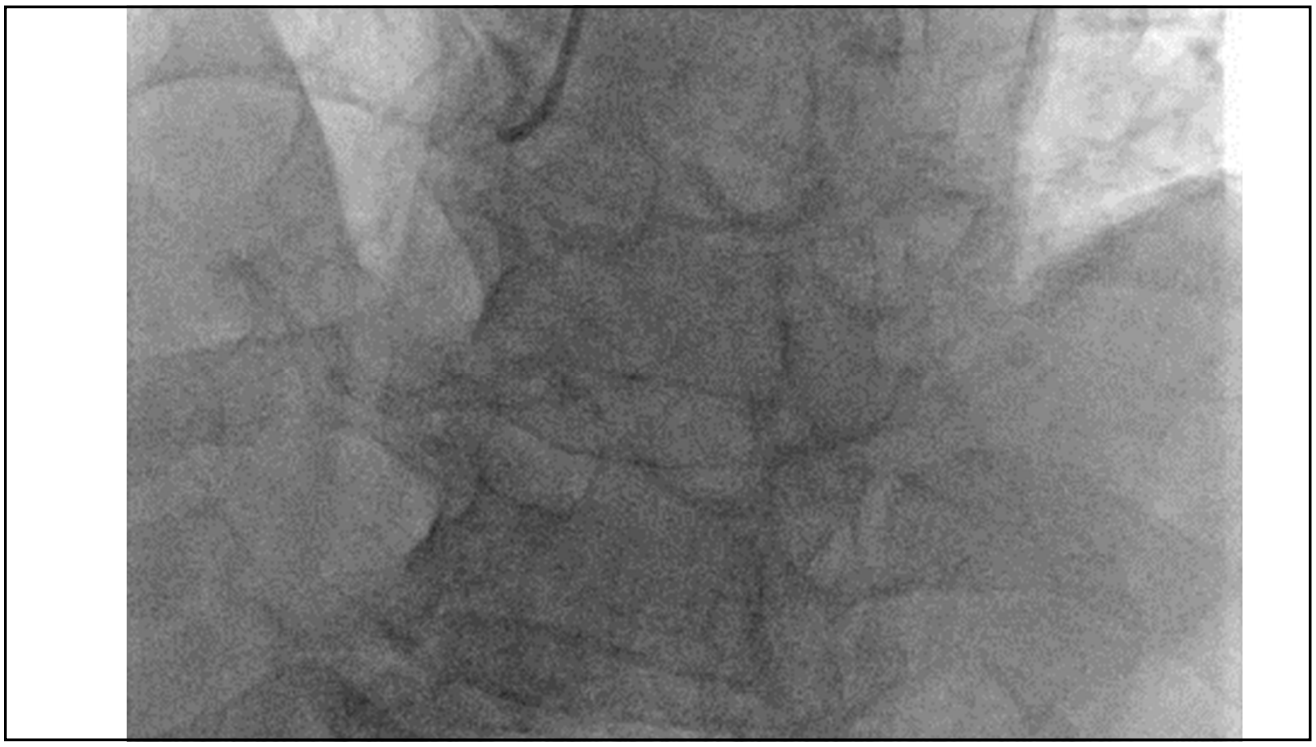
History

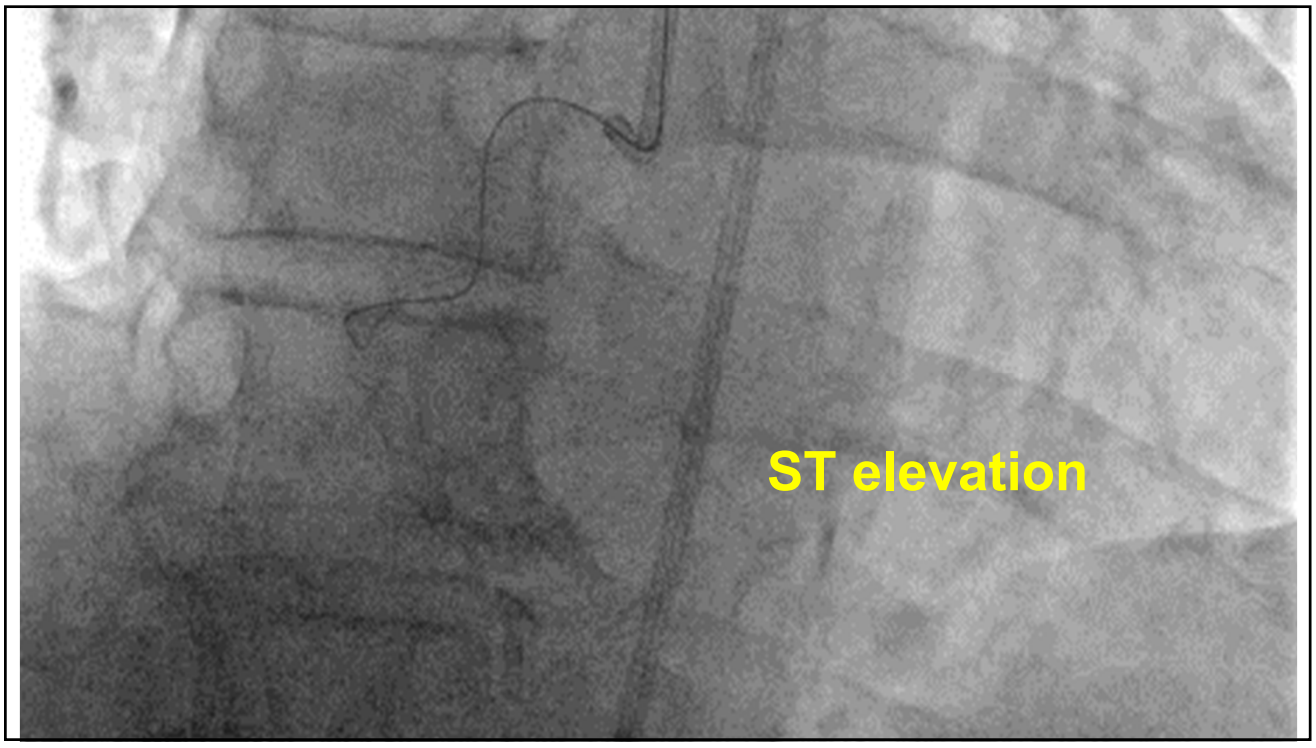
- 70-year-old man presented to ED with acute substernal pain
- ECG: inferior STEMI
- CAD (PCI 20 years prior), DM type II, HTN, dyslipidemia
- Driven to cath lab for primary PCI



Initial recording






ST elevation

Change to right femoral access

↓

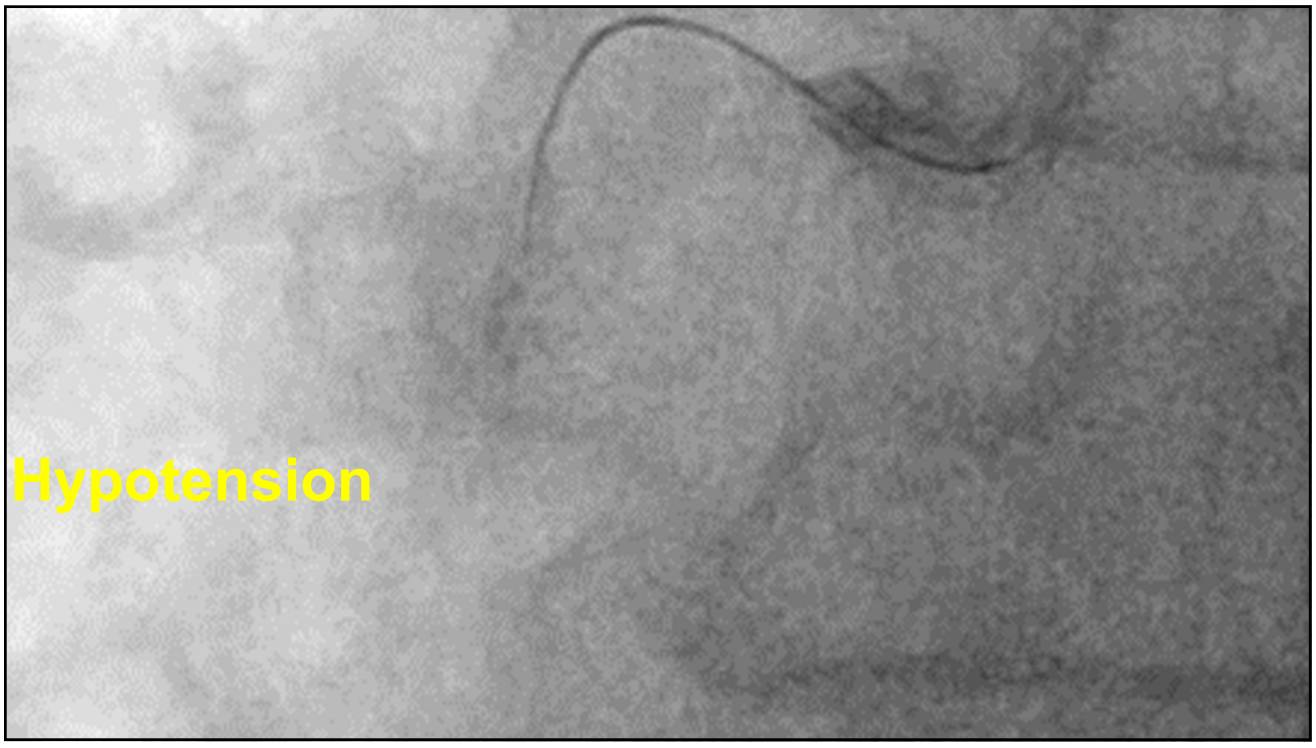
Difficulty to pass external iliac due to aneurysm

↓

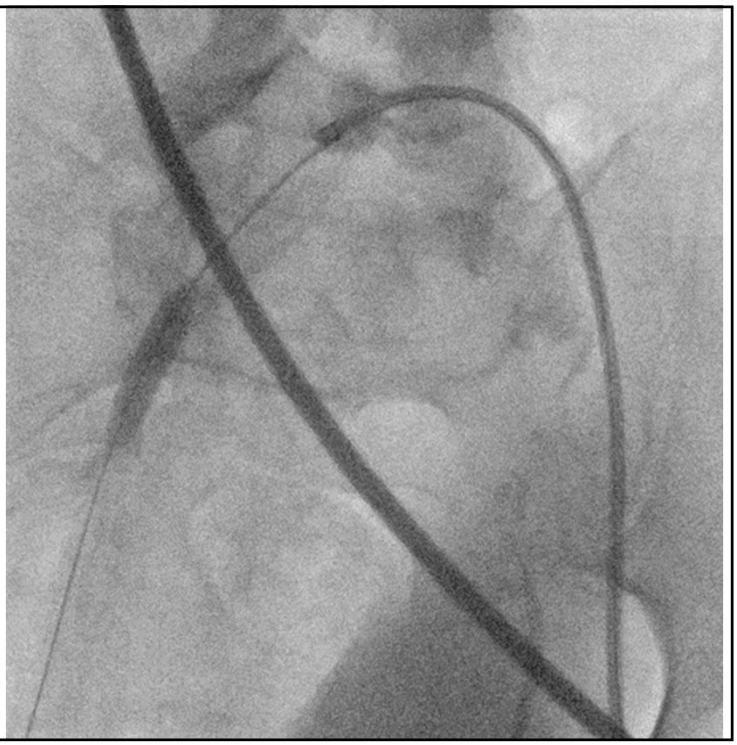
Access was lost

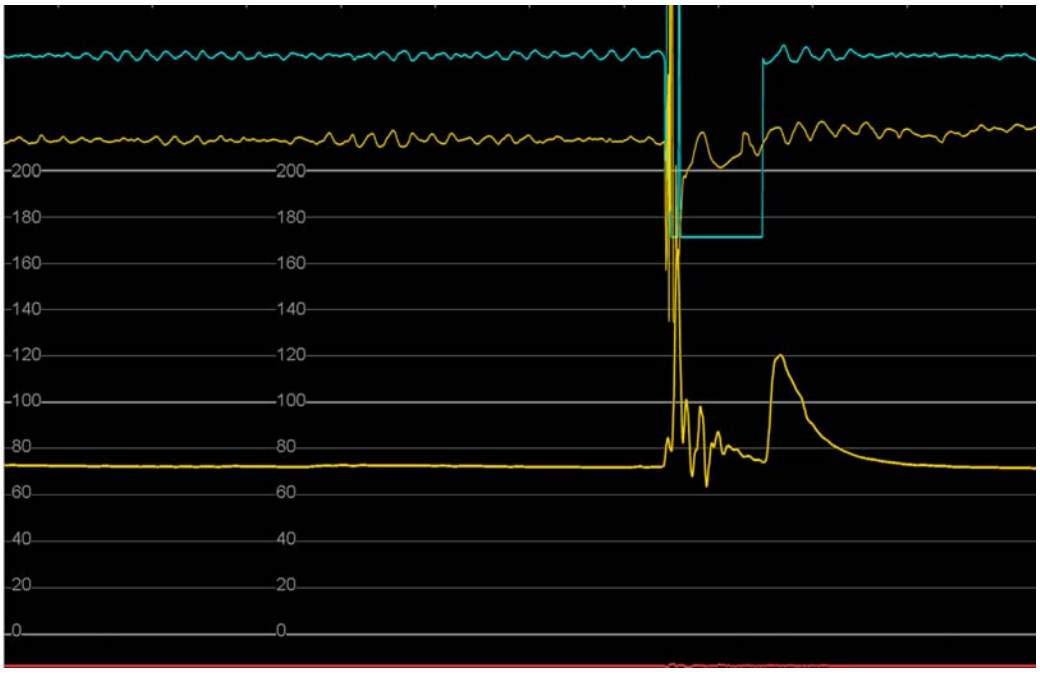
↓

Manual pressure over RFA, access through LFA

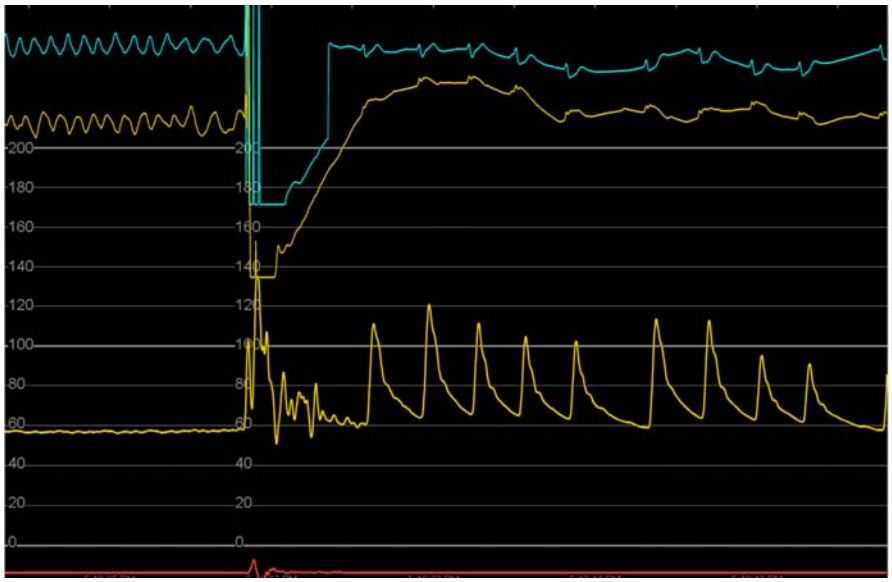


8x20 mm balloon





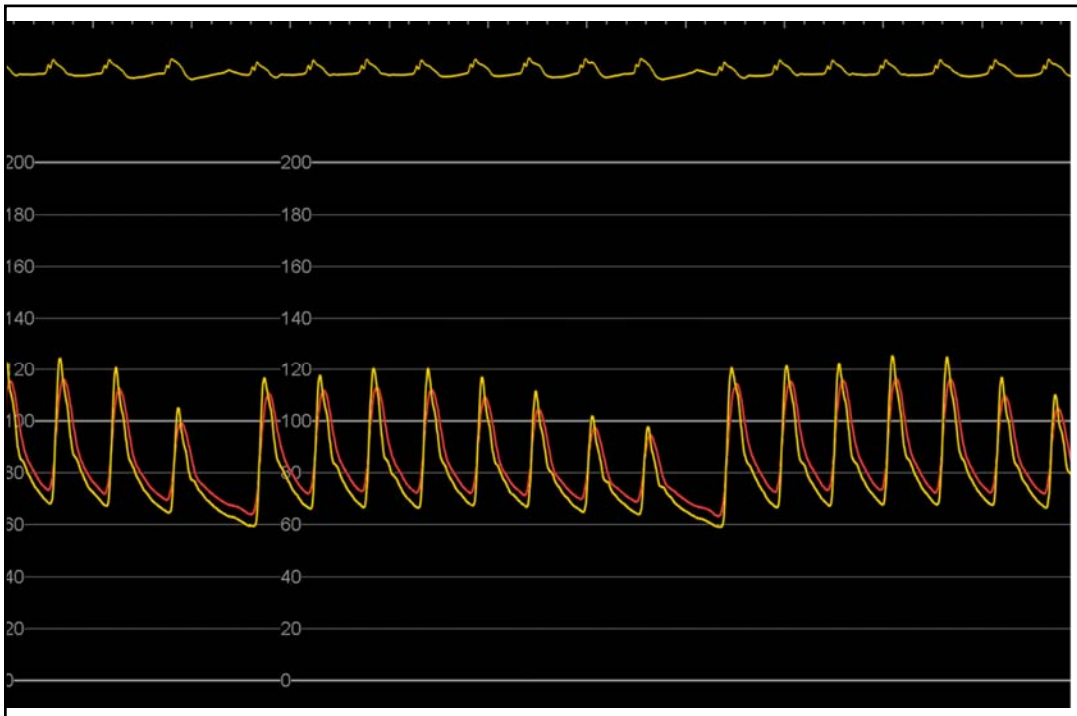
VF
Defibrillation
⬇
VF



VT
Defibrillation
↓
SR

Cardiac arrest

Lucas Device



ECMO

IV fluids, noradrenaline, adrenaline and RBC transfusion

↓

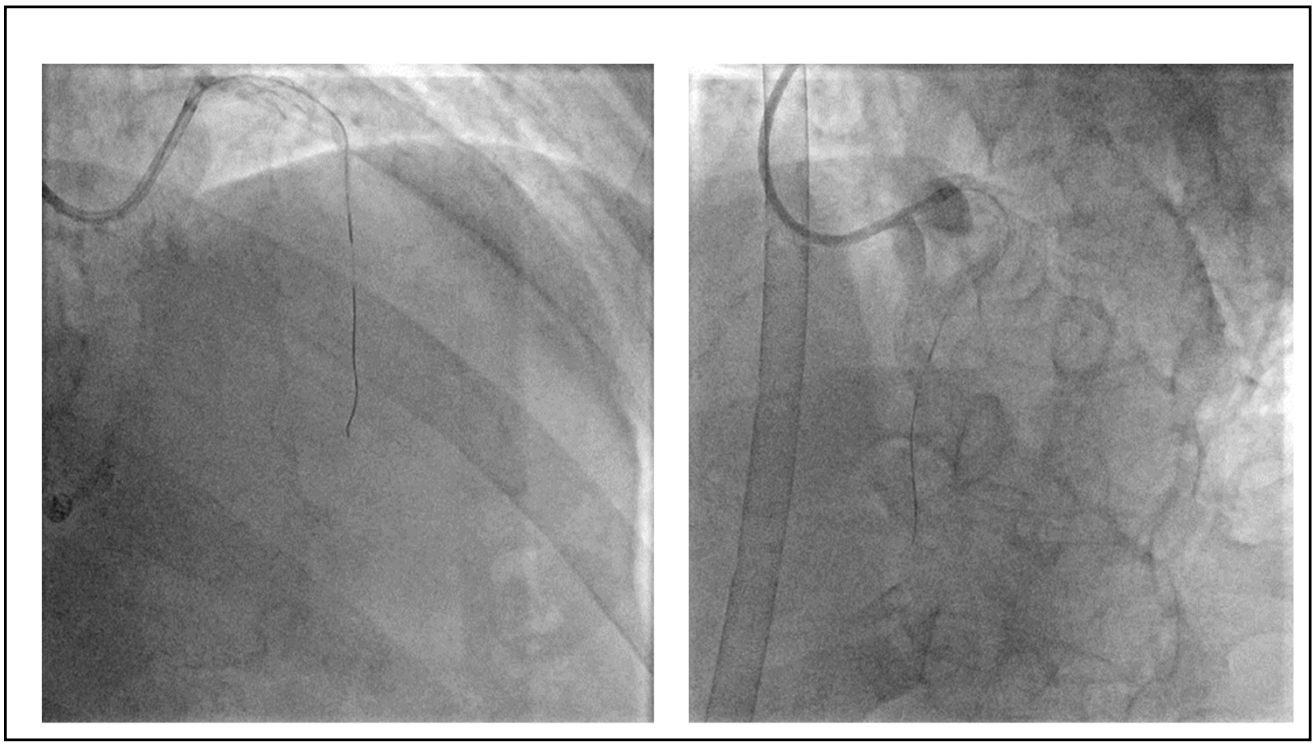
Vascular surgeons were notified

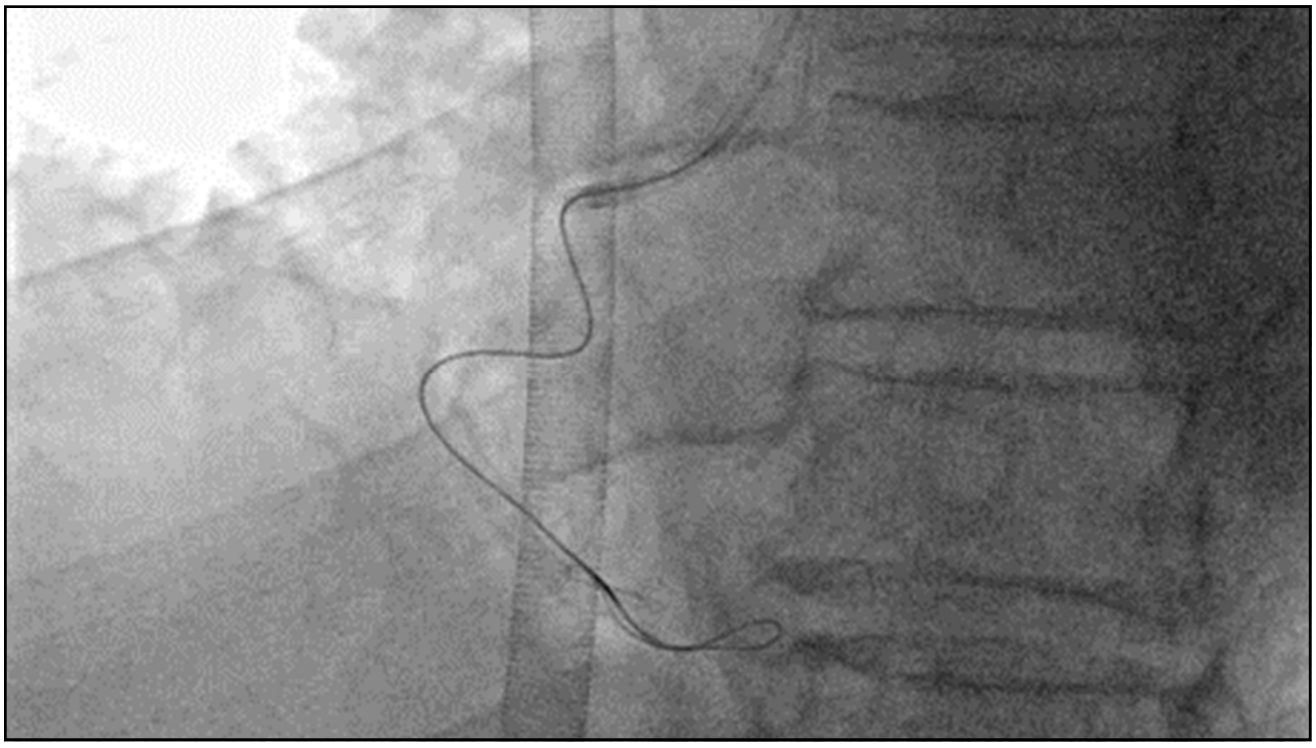
↓

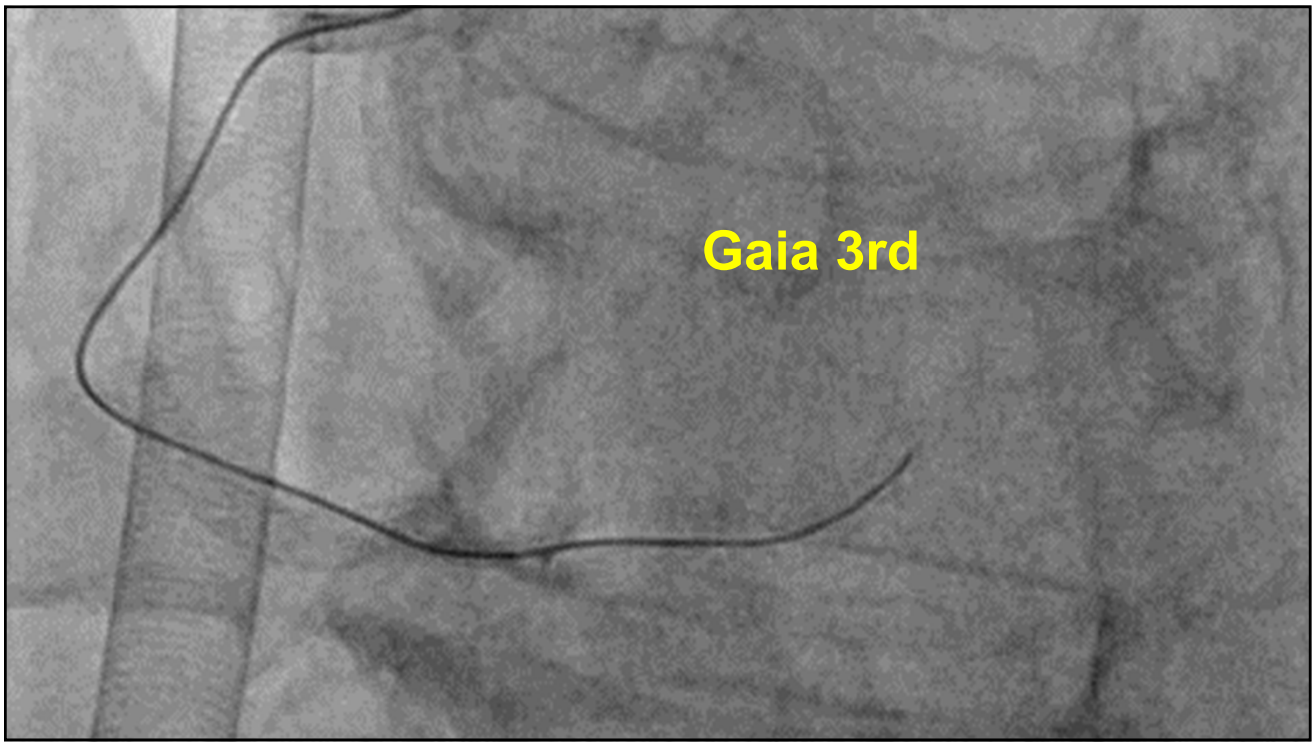
Suddenly the patient collapsed => Cardiac arrest (VF)

↓

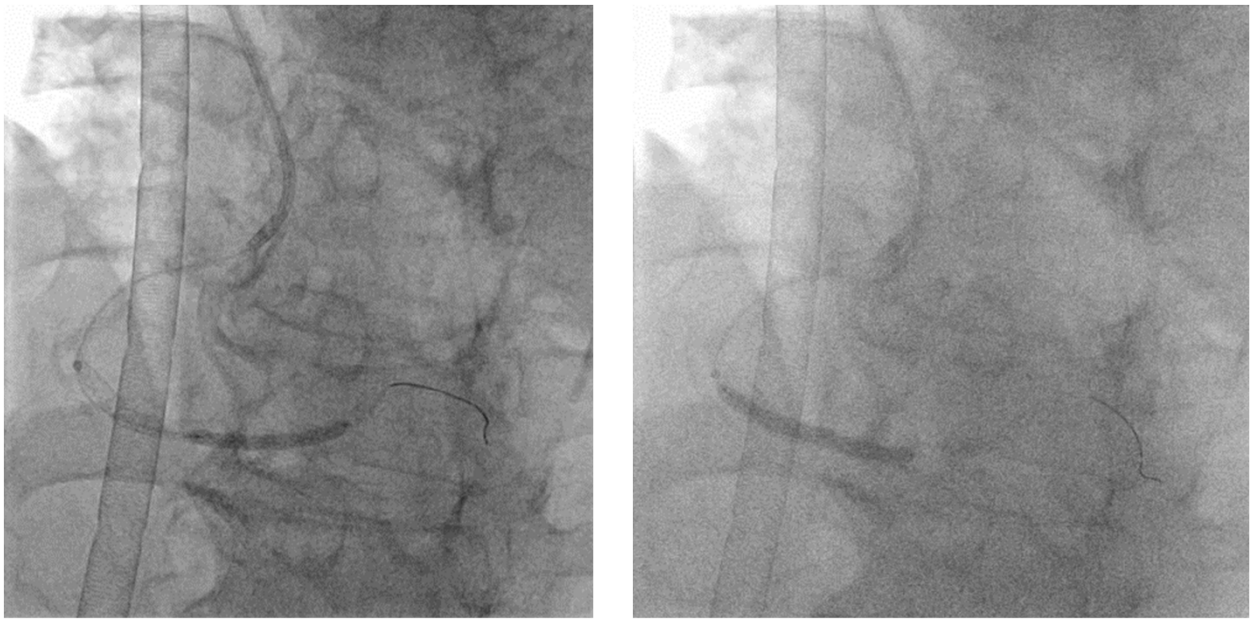
CPR, Lukas device, Defib, intubation, VA-ECMO

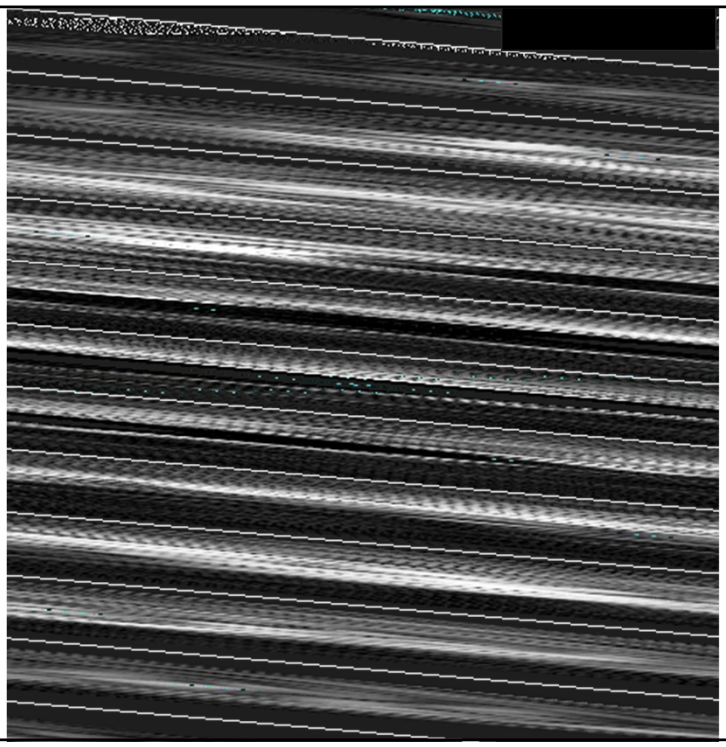




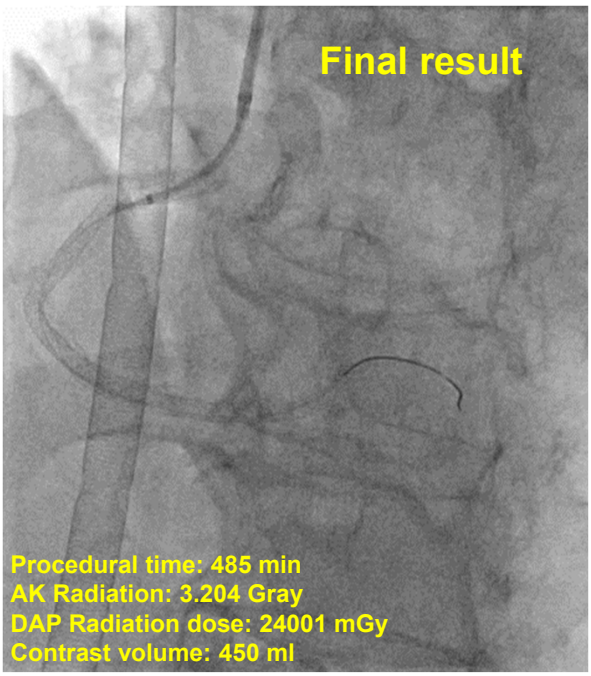


4 DES



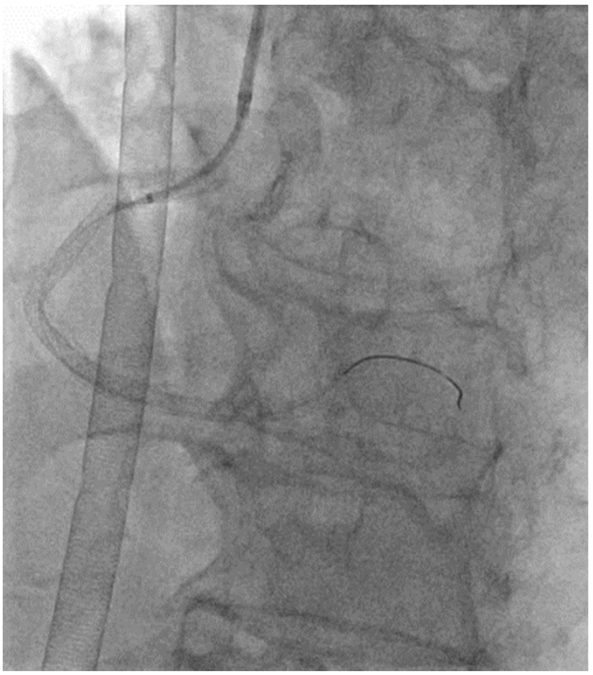


- The patient was transferred intubated, in critical condition to the ICU
- Developed AKI and acute hypoxemic encephalopathy
- VA-ECMO was decannulated 2 days later
- Discharged after 17 days and referred to a rehabilitation center



Conclusions

1. Acute vessel closure can be a lethal complication
2. Indented bladder sign: retroperitoneal hematoma
3. VA-ECMO for cardiac arrest
4. ADR for acute vessel closure
5. Collaboration key to success!



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WILEY

CASE REPORT

Use of chronic total occlusion percutaneous coronary intervention techniques for treating acute vessel closure

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Minneapolis Heart Institute, Abbott Northwestern Hospital and Minneapolis Heart Institute Foundation, Minneapolis, Minnesota

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Email: esbrilakis@gmail.com

Abstract

Acute vessel closure due to dissection is a known complication of percutaneous coronary intervention and can be challenging to treat, especially if guidewire position is lost. Re-entering into the distal true lumen is commonly done during chronic total occlusion interventions, as part of antegrade dissection strategies. We report two cases of acute vessel closure and guidewire position loss in which the Stingray LP system was successfully used to advance a guidewire into the distal true lumen and recanalize the occluded vessel.

KEYWORDS

complications, coronary aneurysm/dissection/perforation, coronary artery disease, PCI

CTO Corner
Insights into the expanding field of chronic total occlusion interventions.

THE WHY AND HOW OF CTO INTERVENTIONS

by Emmanouil S. Brilakis, MD, PhD

38 Cardiology today Intervention | January/February 2012

Hybrid CTO crossing algorithm

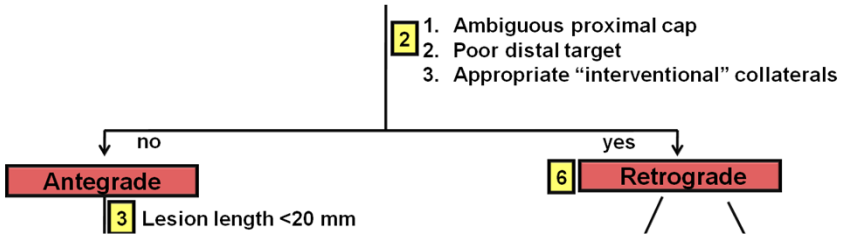
Part I

1 Dual injection

Brilakis, Grantham, Rinfret, Wyman, Burke, Karmpaliotis, Lembo, Pershad, Kandzari, Buller, De Martini, Lombardi, Thompson. JACC Intv 2012

Hybrid CTO crossing algorithm

Part II

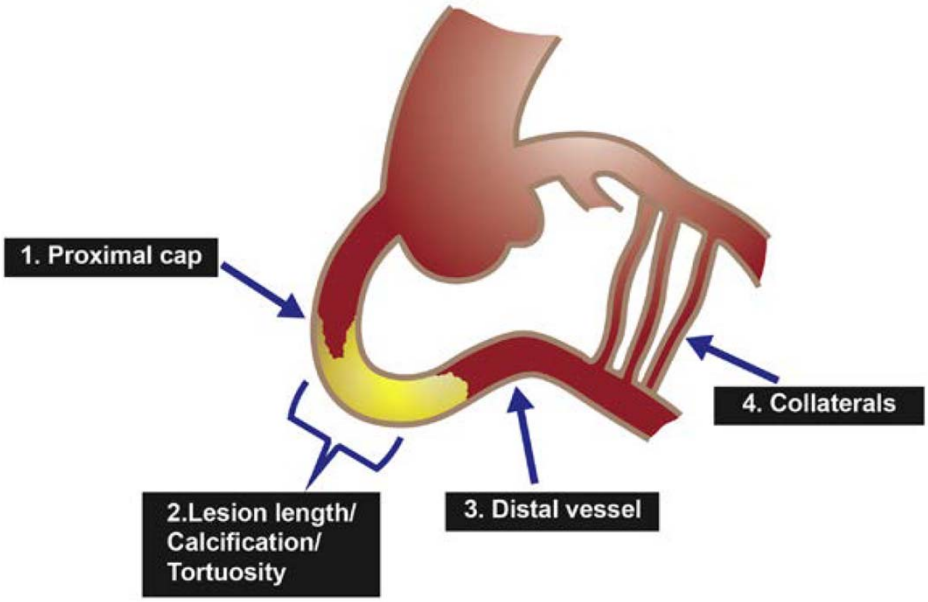


Studying the CTO

1. By whom? — Entire cath team
2. How long? — 15-30 min
3. How? — 4 characteristics

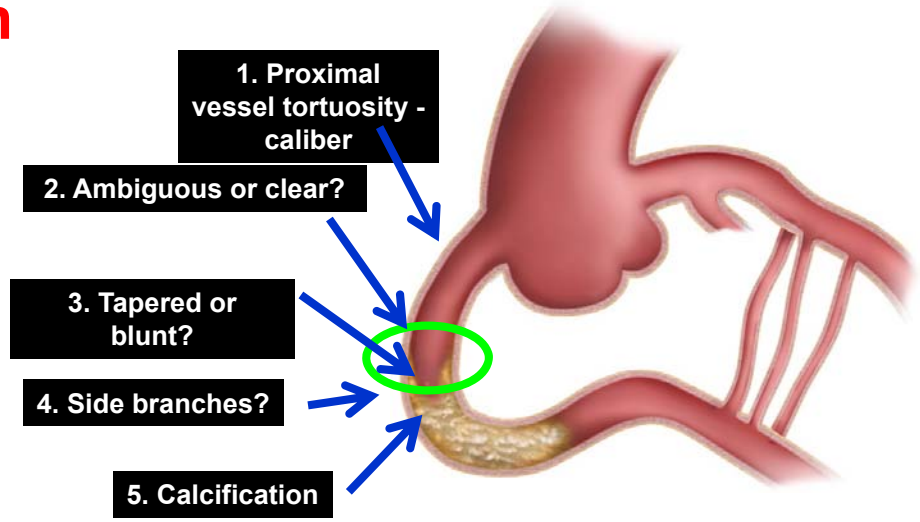
Brilakis, Grantham, Rinfret, Wyman, Burke, Karmpaliotis, Lembo, Pershad, Kandzari, Buller, De Martini, Lombardi, Thompson. JACC Intv 2012

Angiographic review: 4 key components

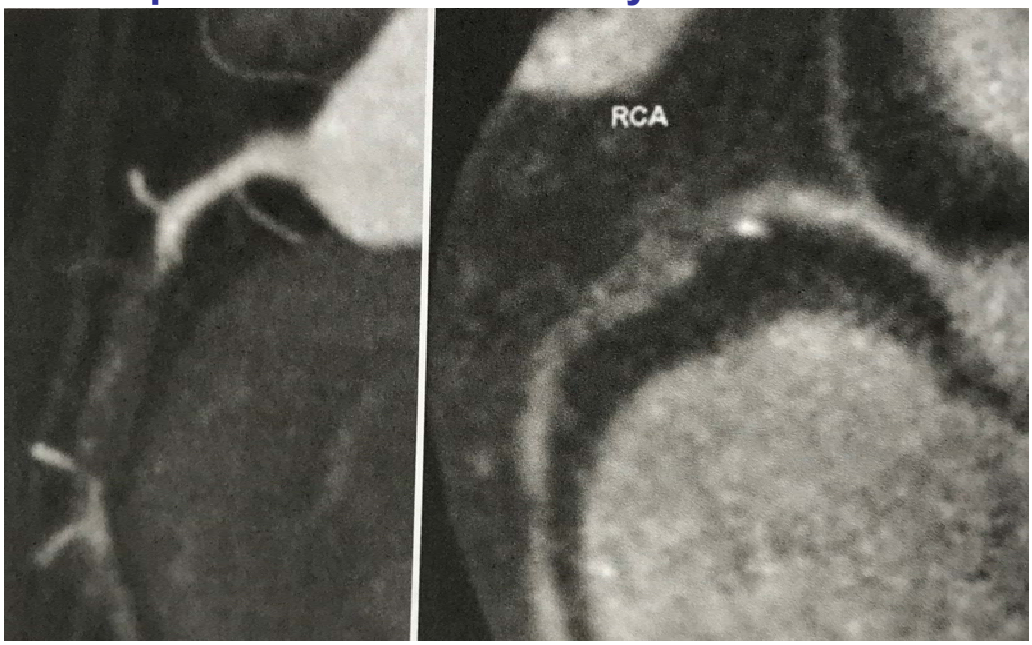


Studying the lesion

1. Proximal cap

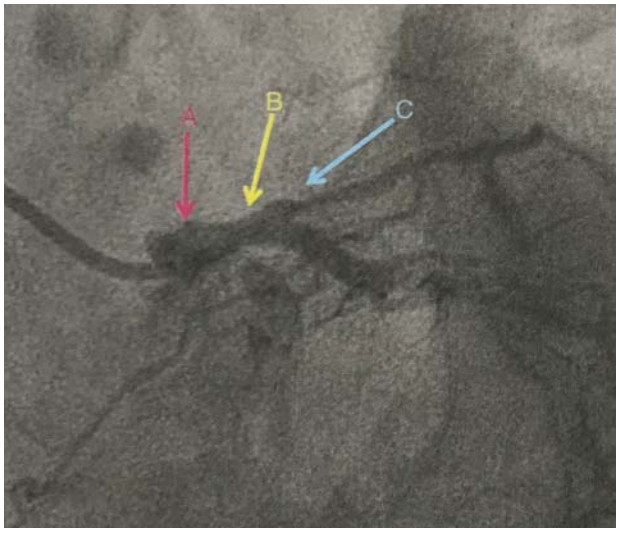


Which proximal vessel would you rather have?

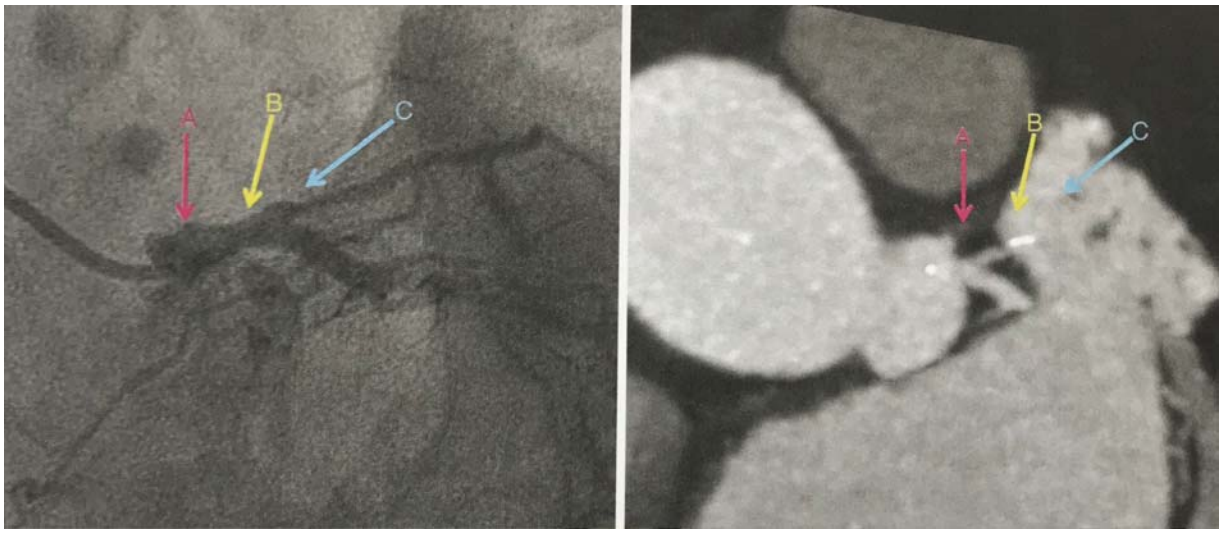


Jang Y. PCI for CTO. Springer 2019

Where is the proximal cap?

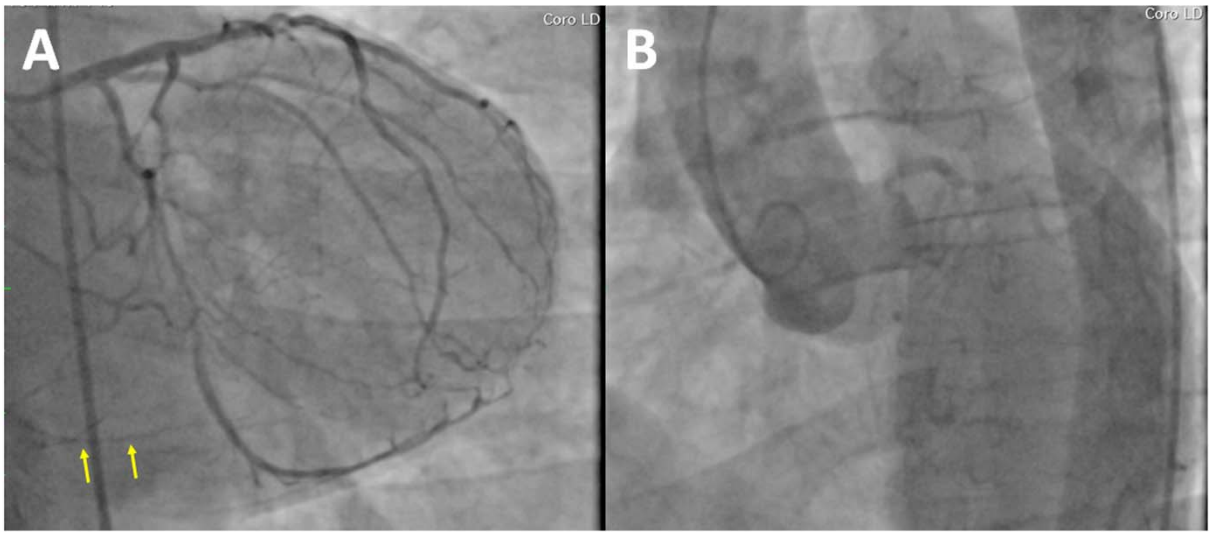


Jang Y. PCI for CTO. Springer 2019



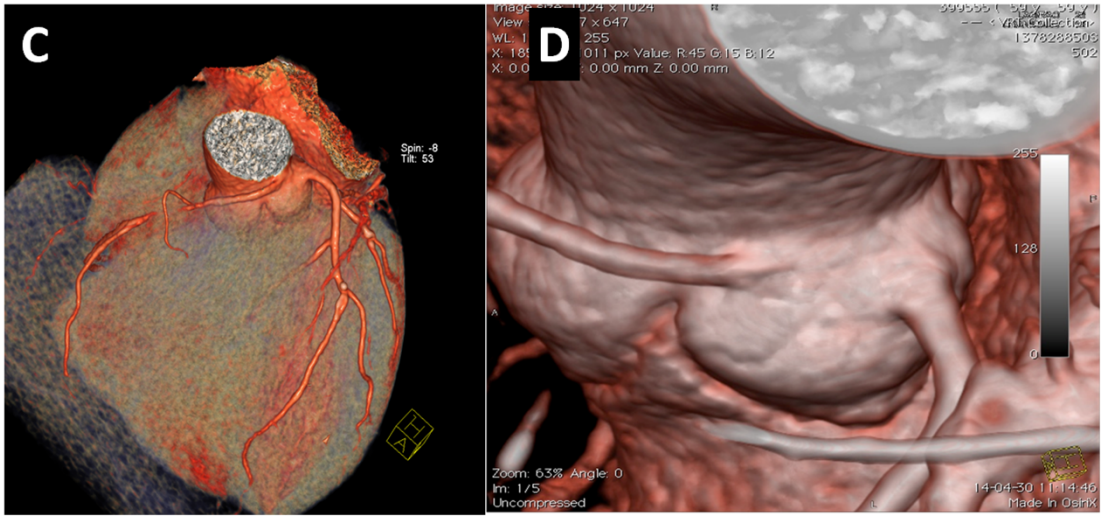
Jang Y. PCI for CTO. Springer 2019

Flush RCA CTO?



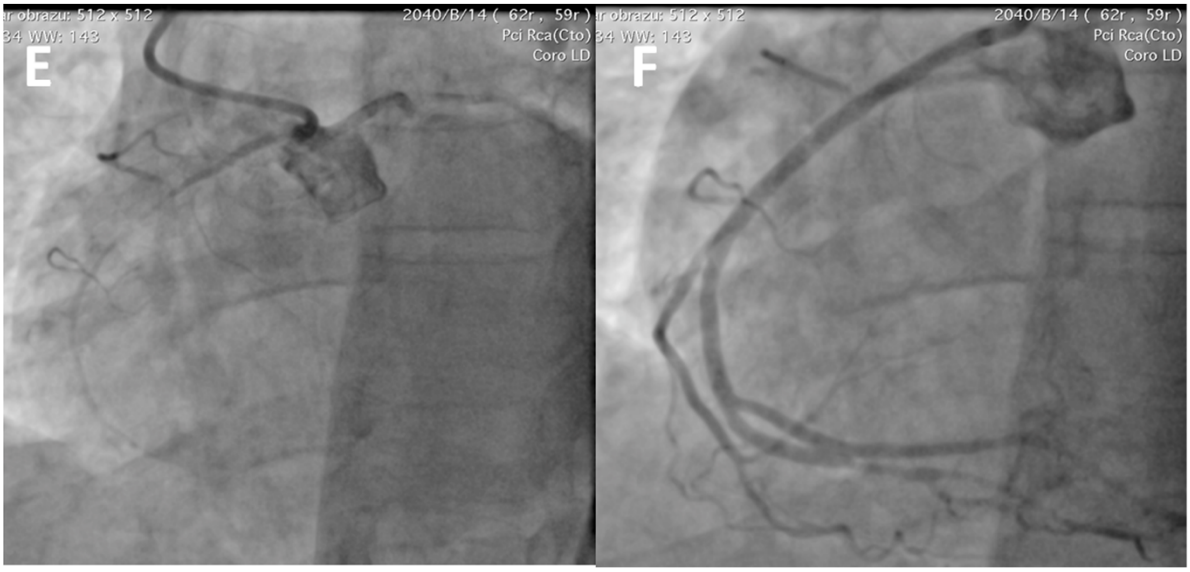
Brilakis ES. Manual of coronary CTO interventions. Elsevier 2017
courtesy Leszek Bryniarski, MD

Flush RCA CTO?



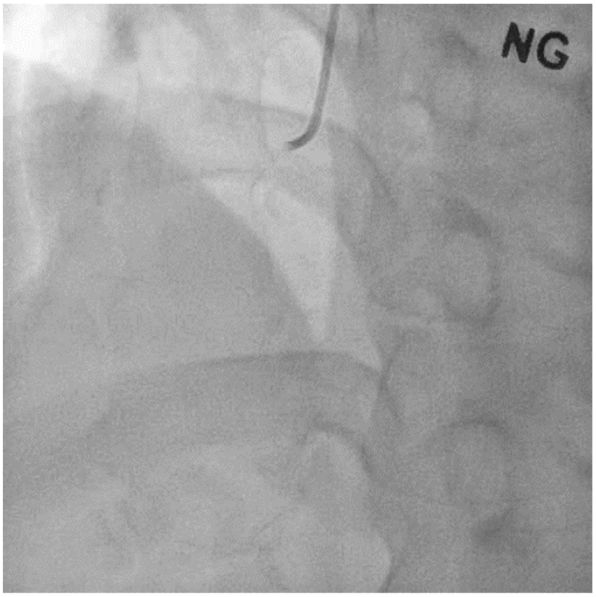
Brilakis ES. Manual of coronary CTO interventions. Elsevier 2017
courtesy Leszek Bryniarski, MD

Flush RCA CTO?

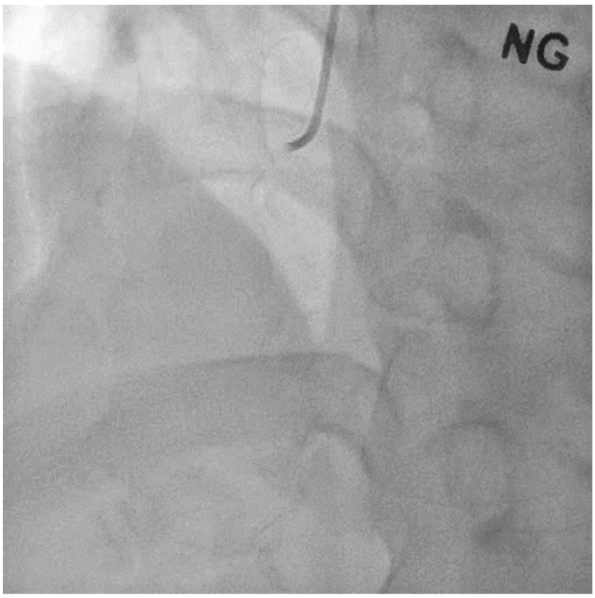


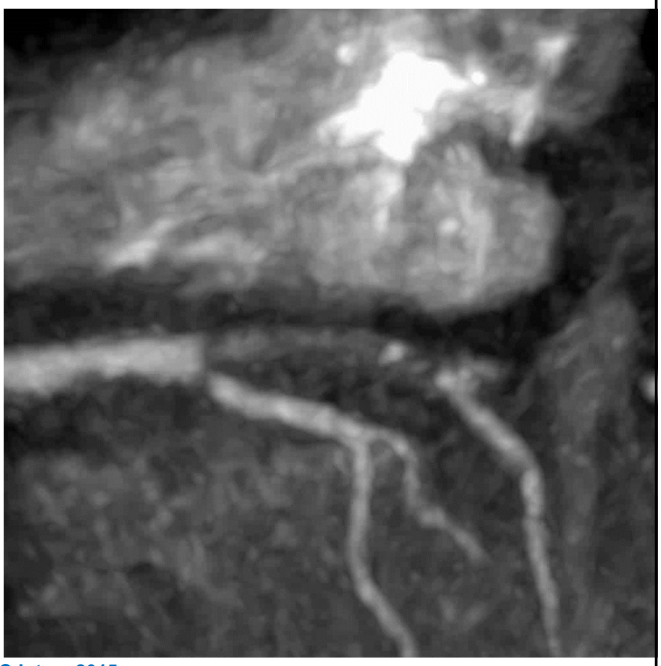
Brilakis ES. Manual of coronary CTO interventions. Elsevier 2017
courtesy Leszek Bryniarski, MD

Where is the proximal cap?

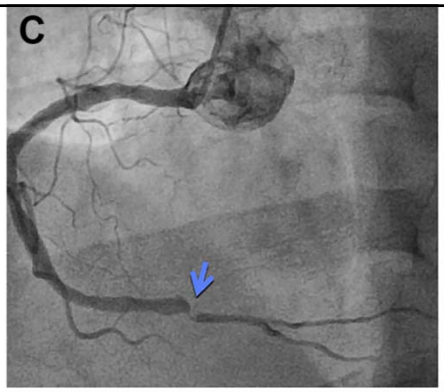


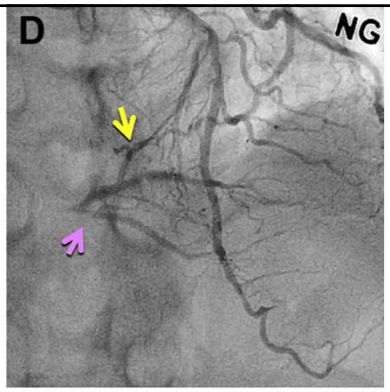
Choi et al. JACC Interv 2015

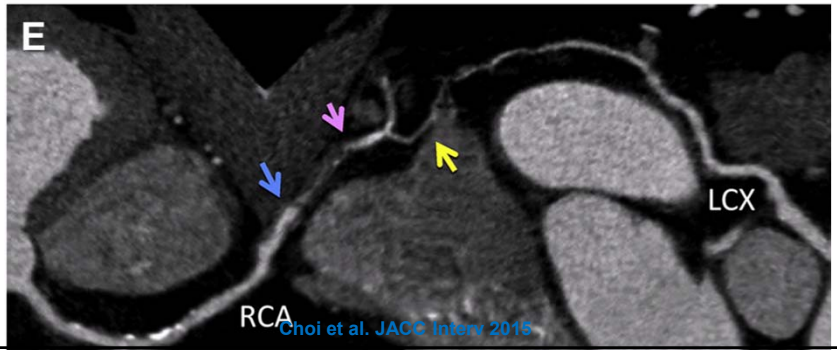




Choi et al. JACC Interv 2015



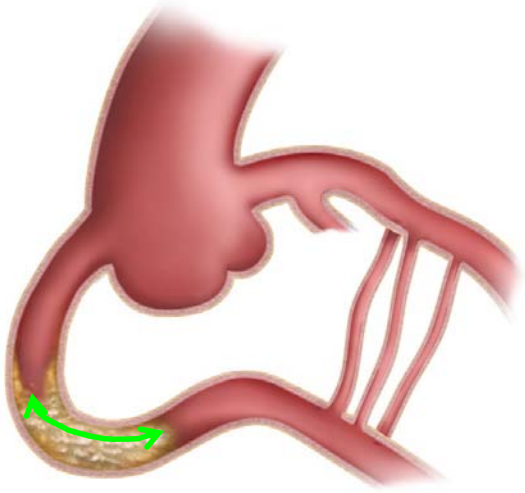




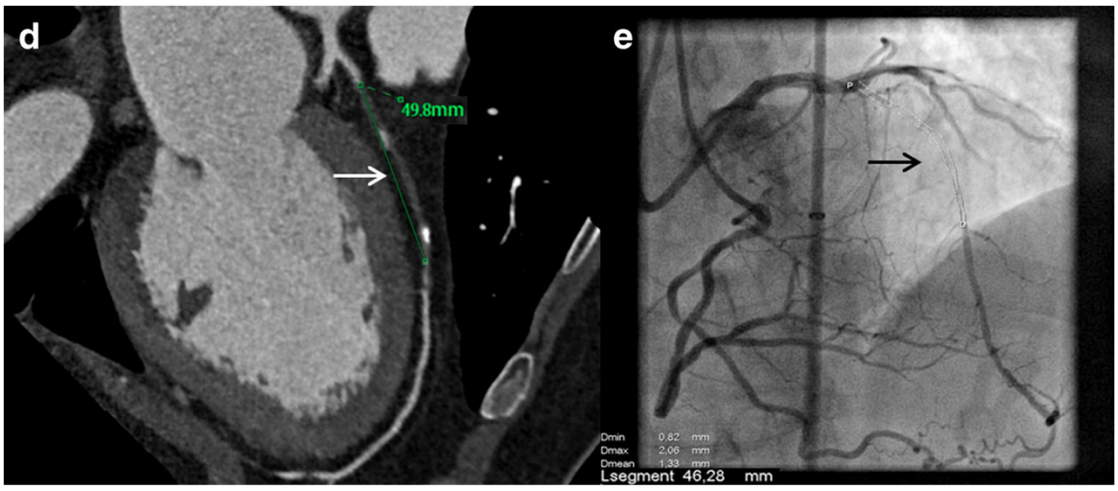
Choi et al. JACC Interv 2015

Studying the lesion

2. Lesion length – tortuosity - composition

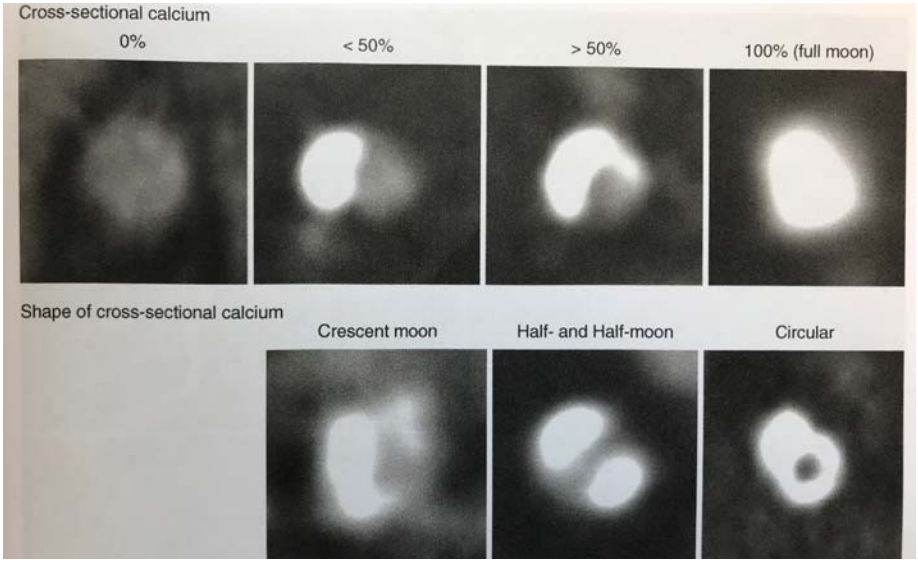


Lesion length



Stuijfzand WJ. et. al. Curr Cardiovasc Imaging Rep 2015

Calcification

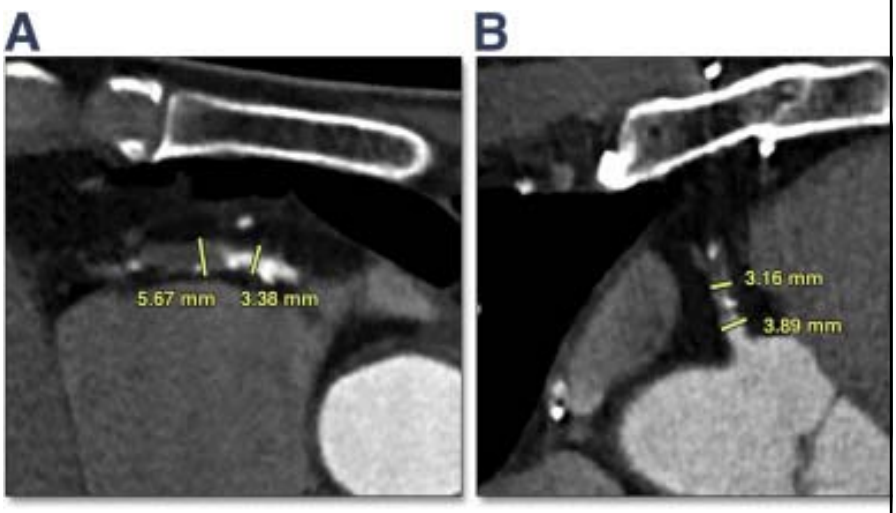


Jang Y. PCI for CTO. Springer 2019

Predictors of antegrade failure

- Length >32 mm
- Ostial or bifurcation lesions
- Negative remodeling

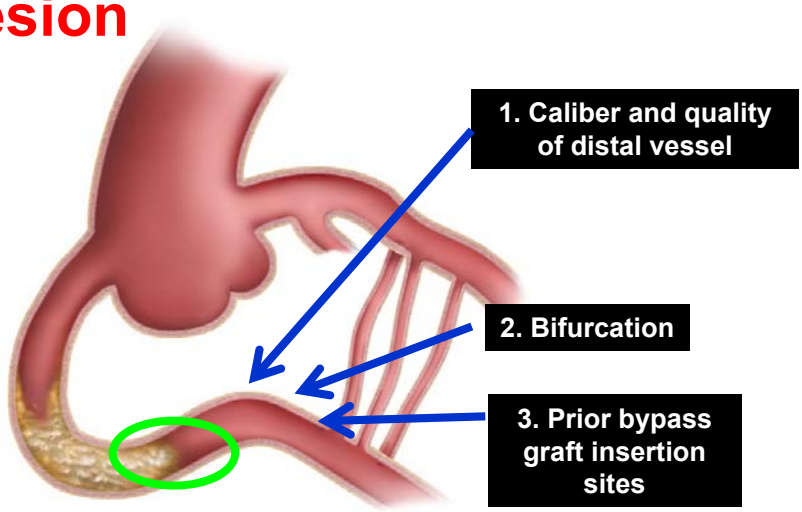
Remodeling



Luo et al. JACC CV Imaging 2015

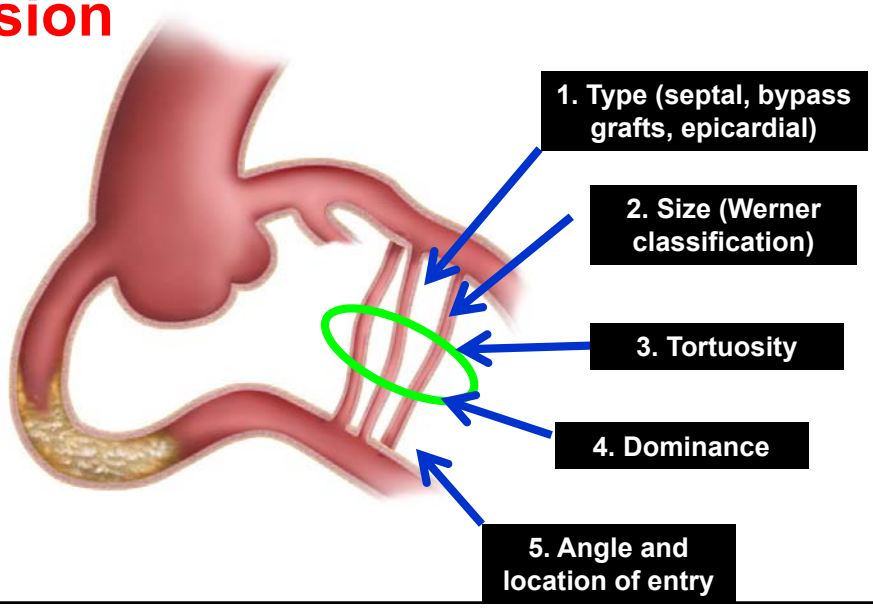
Studying the lesion

3. Distal vessel



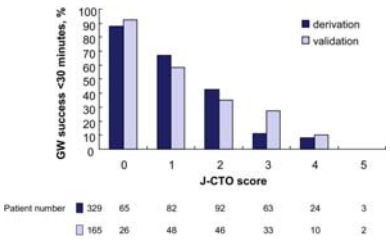
Studying the lesion

4. Collaterals



J-CTO Score

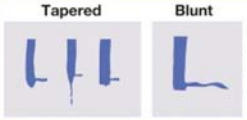
494 native CTO lesions
Crossing within 30 minutes



Morino, Y. et al. JACC Intv 2011;4:213-221

Variables and definitions

Tapered / **Blunt**



Entry with any tapered tip or dimple indicating direction of true lumen is categorized as "tapered".

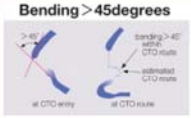
Entry shape
☐ Tapered (0)
☐ Blunt (1)
point

Calcification

Regardless of severity, 1 point is assigned if any evident calcification is detected within the CTO segment.

Calcification
☐ Absence (0)
☐ Presence (1)
point

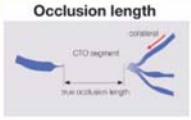
Bending >45degrees



One point is assigned if bending > 45 degrees is detected within the CTO segment. Any tortuosity separated from the CTO segment is excluded from this assessment.

Bending >45°
☐ Absence (0)
☐ Presence (1)
point

Occlusion length



Using good collateral images, try to measure "true" distance of occulusion, which tends to be shorter than the first impression.

Occl.Length
☐ <20mm (0)
☐ ≥20mm (1)
point

Re-try lesion

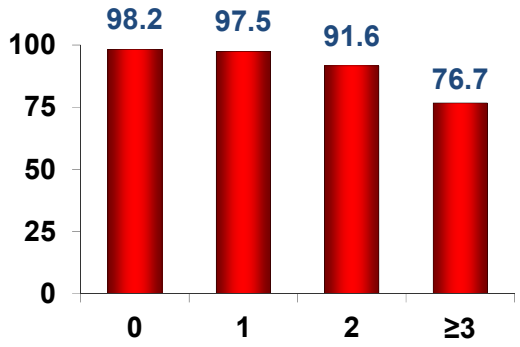
Is this Re-try (2nd attempt) lesion ? (previously attempted but failed)

Re-try lesion
☐ No (0)
☐ Yes (1)
point

Category of difficulty (total point)
☐ easy (0) ☐ Intermediate (1)
☐ difficult (2) ☐ very difficult (≥3)

Total ____ points

PROGRESS CTO score

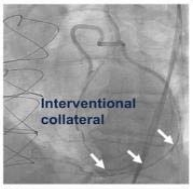


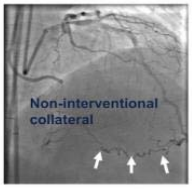
Christopoulos, Kandzari, Yeh, Jaffer, Karmpaliotis, Wyman, Alaswad, Lombardi, Grantham, Moses, Christakopoulos, Tarar, Rangan, Lembo, Garcia, Cipher, Thompson, Banerjee, Brilakis. JACC Intv 2016;9:1–9

Proximal cap ambiguity (1 point)

Poor cap visualization or absence of clearly tapered stump

Absence of "interventional" collaterals (1 point)

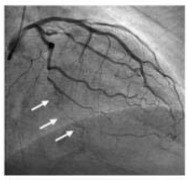




Moderate/ severe tortuosity (1 point)

2 bends>70 degrees or 1 bend>90 degrees

Circumflex CTO (1 point)



Choose the CTO lesions you attempt wisely…

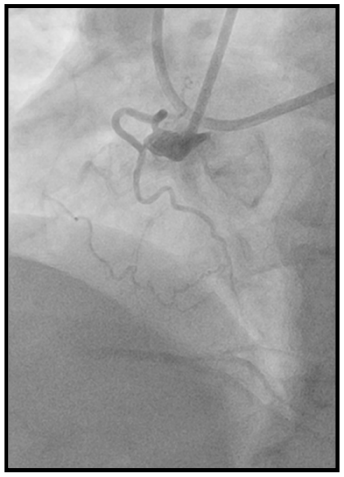
Early: J-CTO 0-1

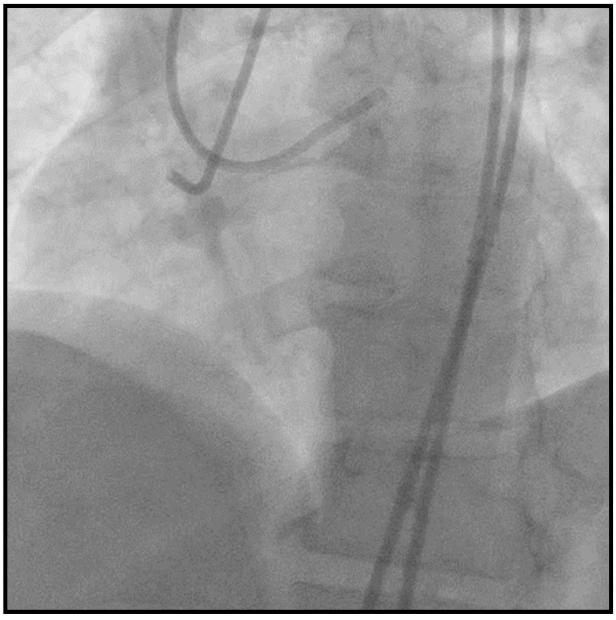
Next: J-CTO 2

Later: J-CTO ≥3

Dual injection

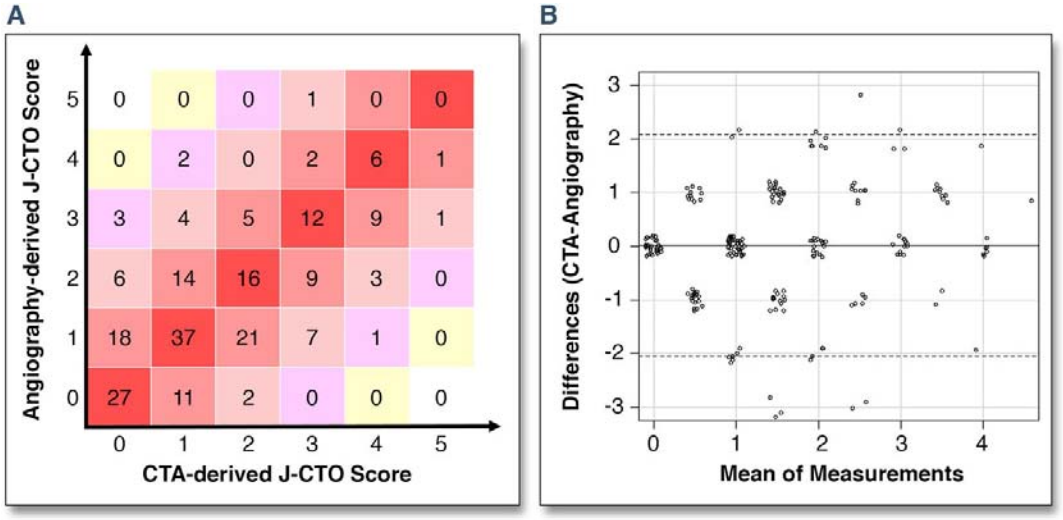
Entry shape ☐ Tapered (0) ☐ Blunt (1) point	1
Calcification ☐ Absence (0) ☐ Presence (1) point	0
Bending >45° ☐ Absence (0) ☐ Presence (1) point	1
Occl.Length ☐ <20mm (0) ☐ ≥20mm (1) point	1
Re-try lesion ☐ No (0) ☐ Yes (1) point	0
Total points	3





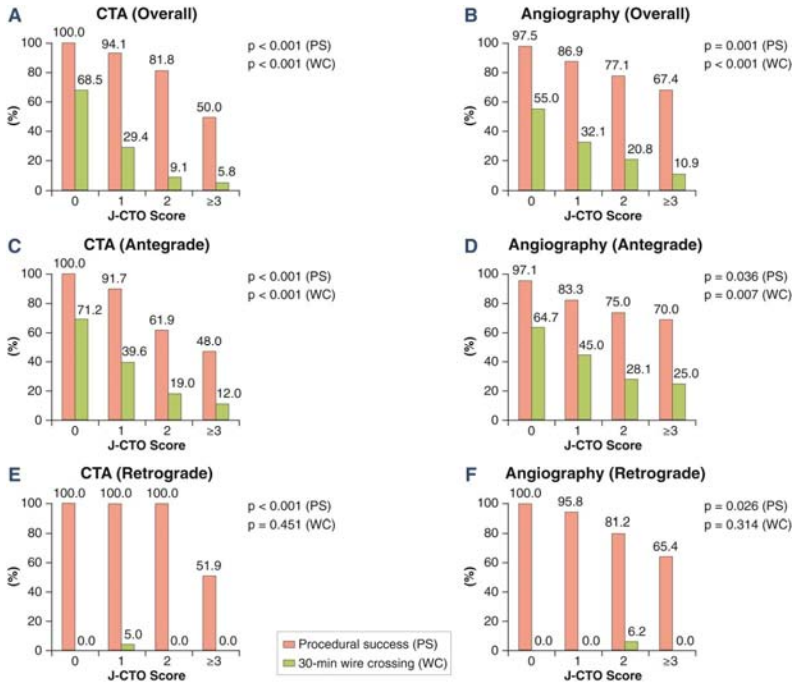
CCTA vs angiography J-CTO score

218 CTO PCIs in 205 pts - 45% equal - 30% higher – 25% lower



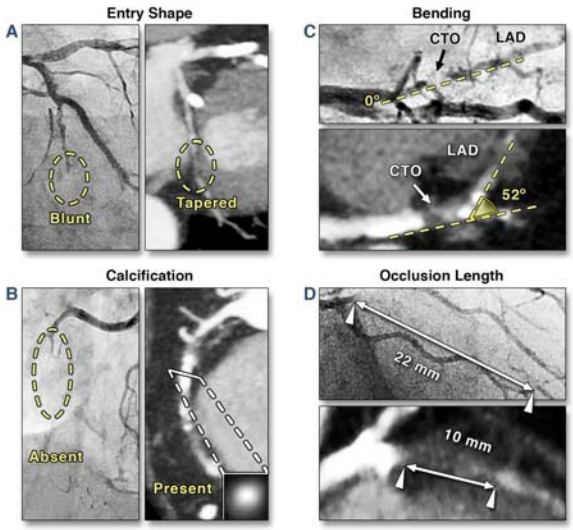
Fujino et al. JIMG 2018;11:209-217

218 CTO PCIs in 205 pts
Success: 82.6%
30-min wire crossing: 29.4%



Fujino et al. JIMG 2018;11:209-217

CCTA vs angiography J-CTO score



218 CTO PCIs in 205 pts
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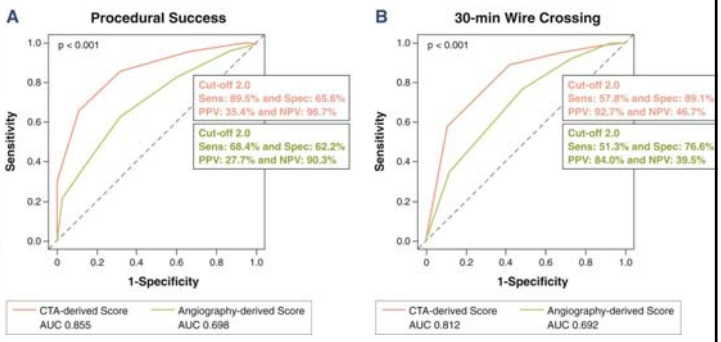

Fujino et al. JIMG 2018;11:209-217

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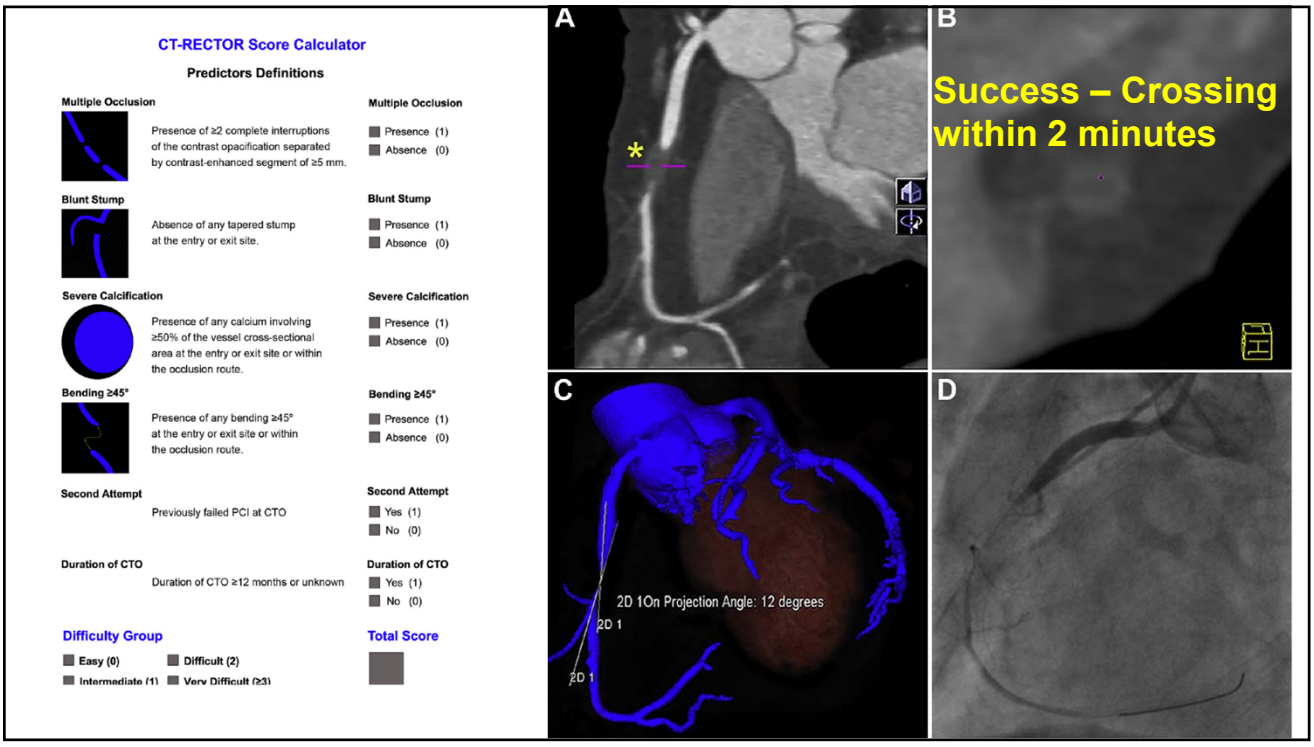
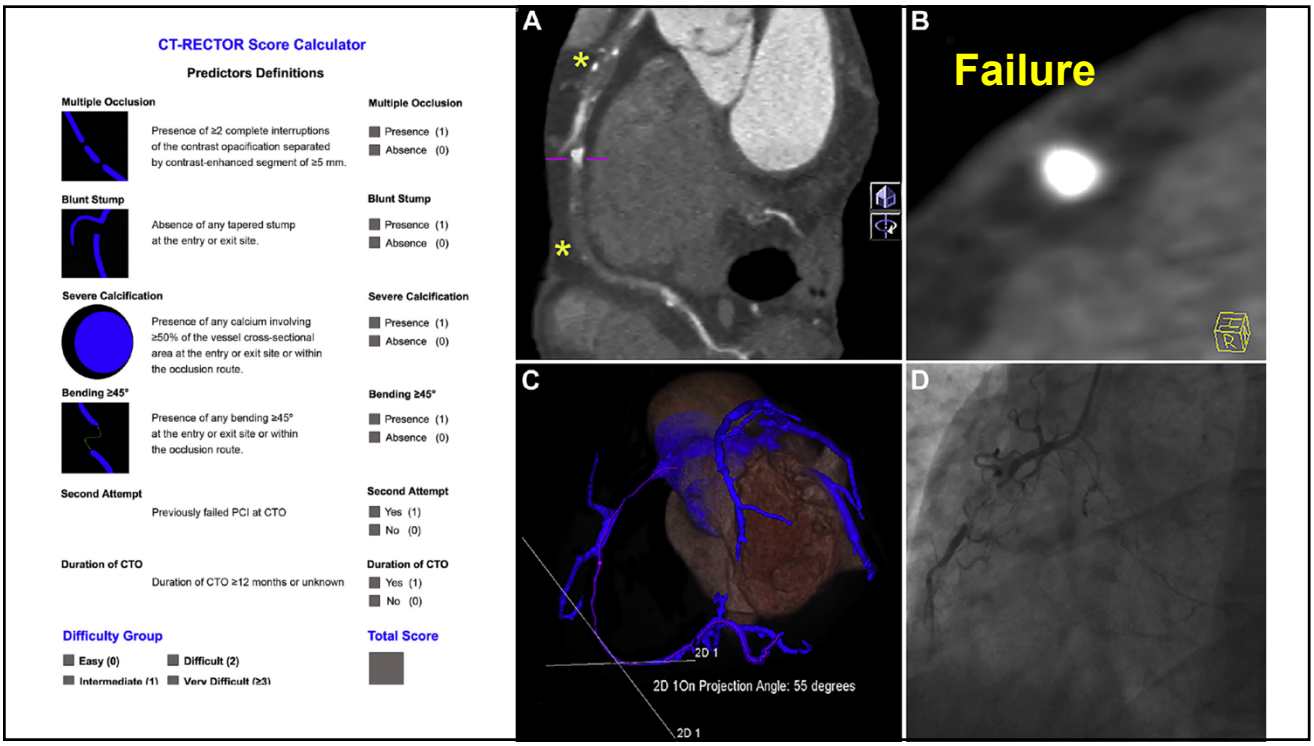
Coronary Computed Tomographic Prediction Rule for Time-Efficient Guidewire Crossing Through Chronic Total Occlusion

Insights From the CT-RECTOR Multicenter Registry (Computed Tomography Registry of Chronic Total Occlusion Revascularization)

Maksymilian P. Opolski, MD,*† Stephan Achenbach, MD,‡ Annika Schuhbäck, MD,‡ Andreas Rolf, MD,* Helge Möllmann, MD,* Holger Nef, MD,§ Johannes Rixe, MD,§ Matthias Renker, MD,§ Adam Witkowski, MD,† Cezary Kepka, MD,‖ Claudia Walther, MD,* Christian Schlundt, MD,‡ Artur Debski, MD,† Michal Jakubczyk, MSc,¶ Christian W. Hamm, MD*§


CT-RECTOR Score Calculator
Predictors Definitions
Multiple Occlusion
Presence of ≥2 complete interruptions of the contrast opacification separated by contrast-enhanced segment of ≥5 mm.
Multiple Occlusion
Presence (1)
Absence (0)
Blunt Stump
Absence of any tapered stump at the entry or exit site.
Blunt Stump
Presence (1)
Absence (0)
Severe Calcification
Presence of any calcium involving ≥50% of the vessel cross-sectional area at the entry or exit site or within the occlusion route.
Severe Calcification
Presence (1)
Absence (0)
Bending ≥45°
Presence of any bending ≥45° at the entry or exit site or within the occlusion route.
Bending ≥45°
Presence (1)
Absence (0)
Second Attempt
Previously failed PCI at CTO
Second Attempt
Yes (1)
No (0)
Duration of CTO
Duration of CTO ≥12 months or unknown
Duration of CTO
Yes (1)
No (0)
Difficulty Group
Easy (0)
Difficult (2)
Intermediate (1)
Very Difficult (≥3)
Total Score
A
B
Success – Crossing within 2 minutes
C
2D 1On Projection Angle: 12 degrees
2D 1
2D 1
D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Presence (1)
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Severe Calcification
Presence (1)
Absence (0)
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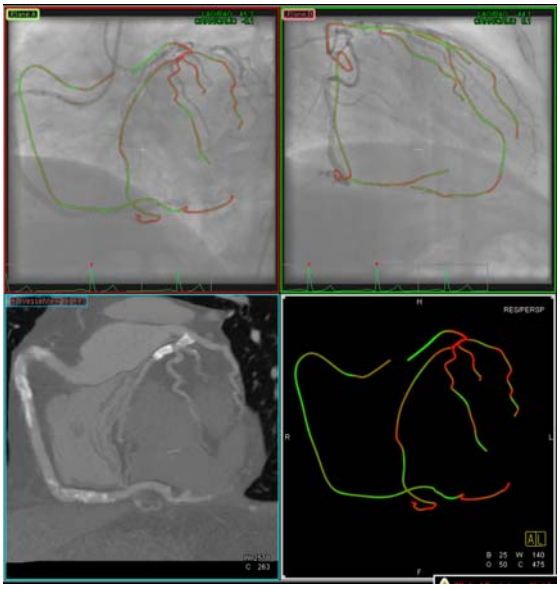
Bending ≥45°
Presence (1)
Absence (0)
Second Attempt
Previously failed PCI at CTO
Second Attempt
Yes (1)
No (0)
Duration of CTO
Duration of CTO ≥12 months or unknown
Duration of CTO
Yes (1)
No (0)
Difficulty Group
Easy (0)
Difficult (2)
Intermediate (1)
Very Difficult (≥3)
Total Score
A
B
Failure
C
2D 1
2D 1On Projection Angle: 55 degrees
2D 1
D

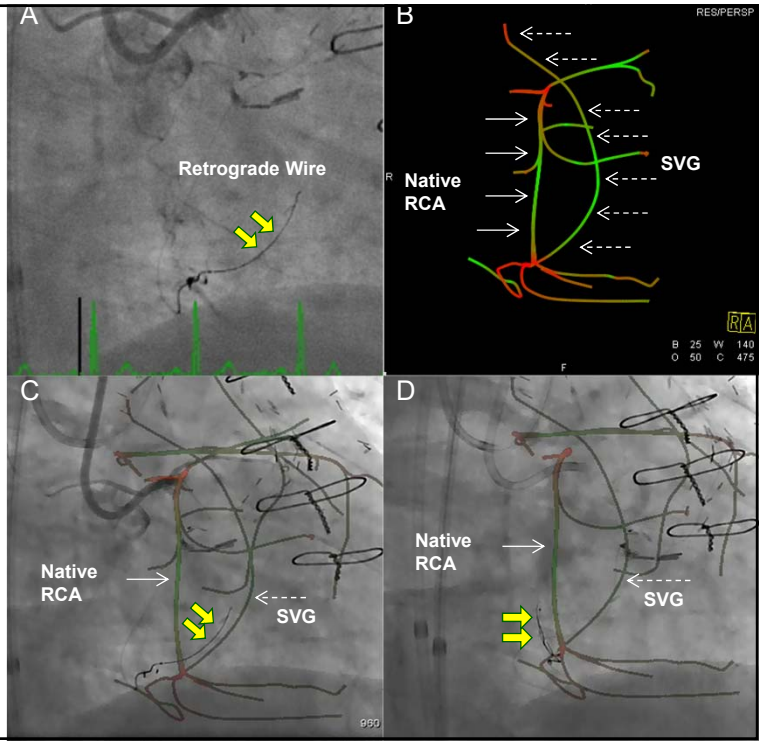
Real time CCTA fusion

- Centerlines are displayed. Coloring indicates degree of foreshortening (green=low, red=high)
- Calcification can be toggled on and off
- Individual vessel centerlines can be toggled on or off



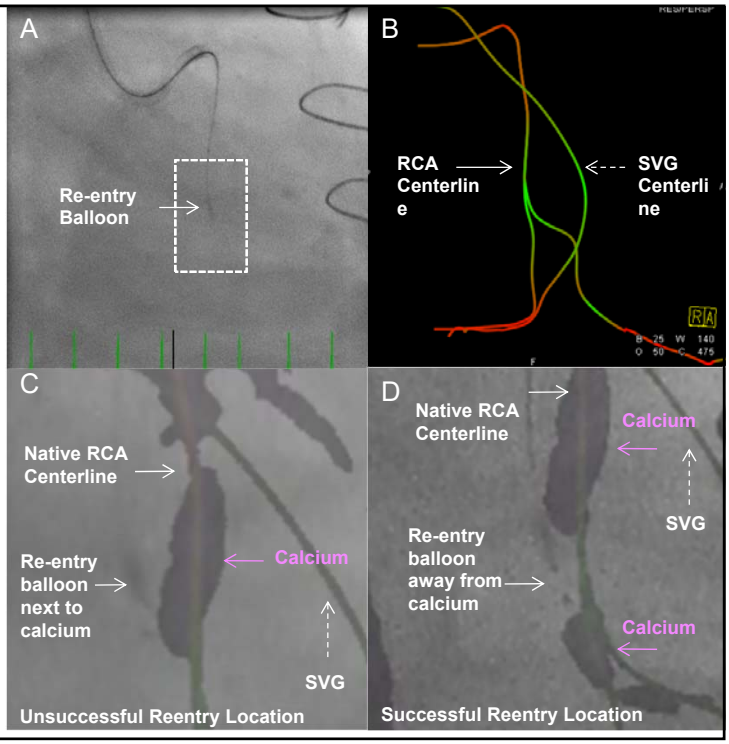
Ghoshhajra, …., Jaffer. European Radiology 2016

Where is the retrograde wire?



Ghoshhajra, …., Jaffer. European Radiology 2016

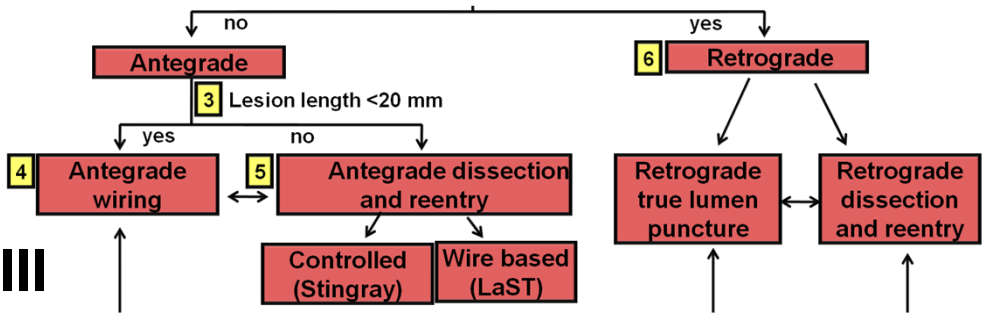
Failed re-entry Why?



Ghoshhajra, …., Jaffer. European Radiology 2016

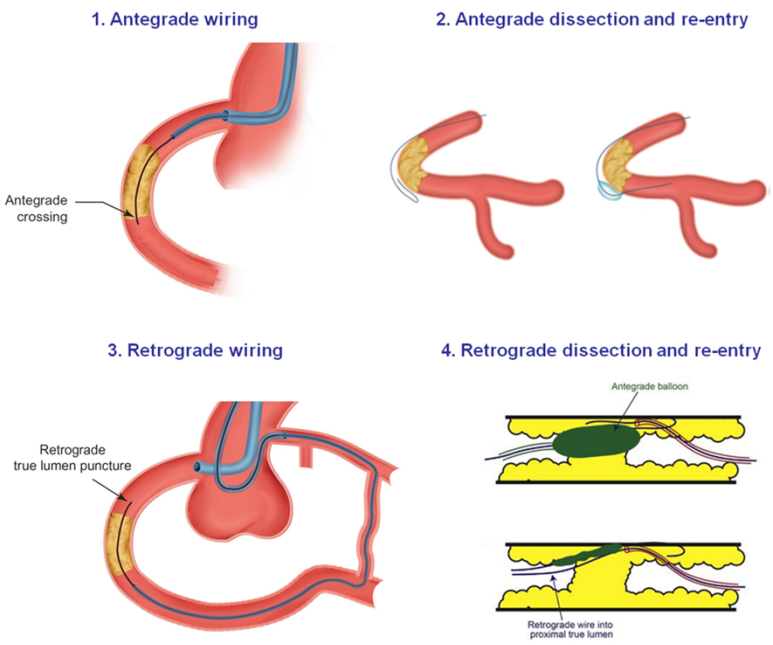
Hybrid CTO crossing algorithm

Part III



Brilakis, Grantham, Rinfret, Wyman, Burke, Karmpaliotis, Lembo, Pershad, Kandzari, Buller, De Martini, Lombardi, Thompson. JACC Intv 2012

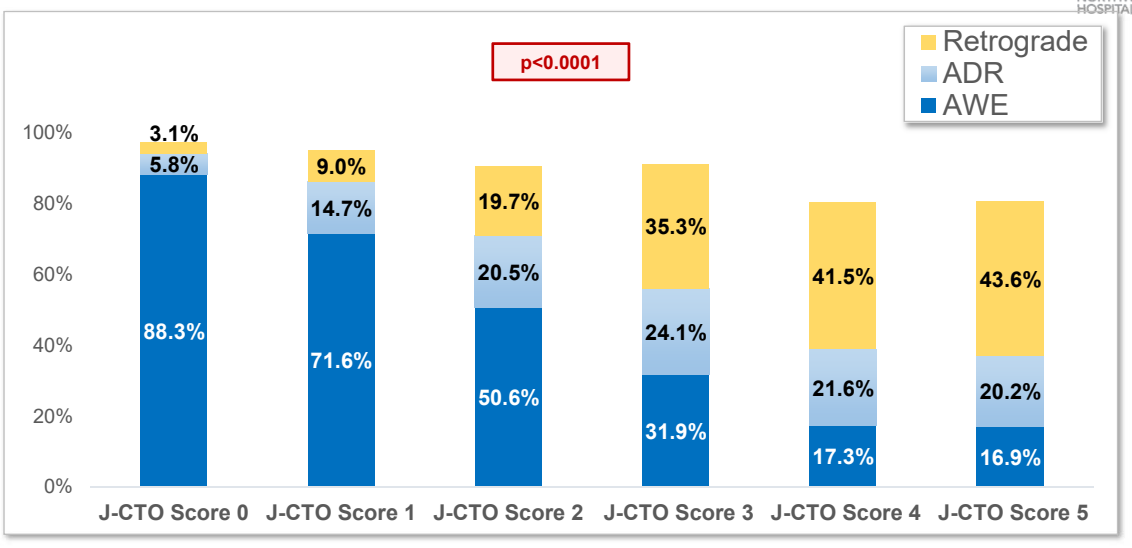
All crossing strategies have a role



PROspective Global REgiStry for the Study of CTO interventions

www.progresscto.org

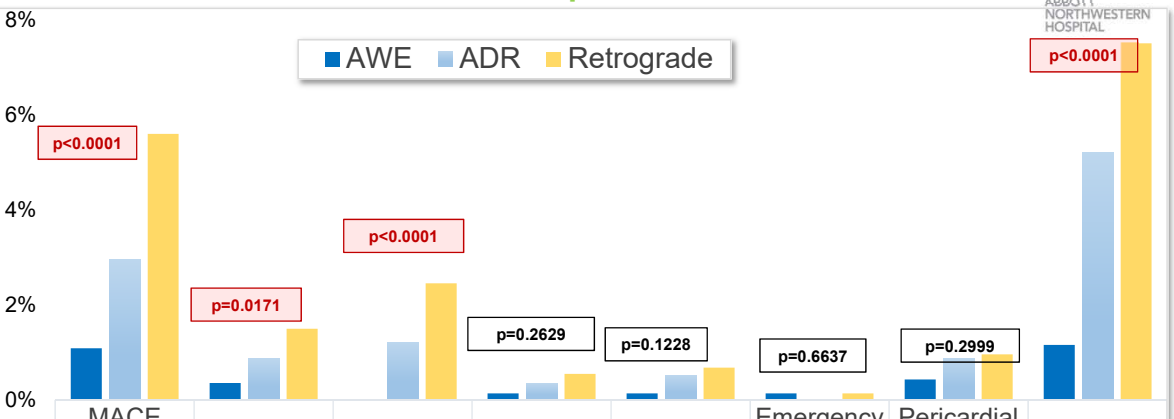
Successful crossing strategy stratified by J-CTO score



PROspective Global REgiStry for the Study of CTO interventions

www.progresscto.org

Procedural complications



	MACE overall	Death	Acute MI	Stroke	Re-PCI	Emergency CABG	Pericardial tamponade	Perforation
AWE	1.09%	0.36%	0.00%	0.14%	0.14%	0.14%	0.43%	1.16%
ADR	2.96%	0.87%	1.22%	0.35%	0.52%	0.00%	0.87%	5.22%
Retrograde	5.61%	1.50%	2.46%	0.55%	0.68%	0.14%	0.96%	7.52%

Hybrid CTO crossing algorithm

Part IV

7 Switch Strategy

Brilakis, Grantham, Rinfret, Wyman, Burke, Karmpaliotis, Lembo, Pershad, Kandzari, Buller, De Martini, Lombardi, Thompson. JACC Intv 2012

7 Global Principles for CTO PCI

1. Principal indication: to improve symptoms
2. Dual angiography + careful angiographic review
3. Use of microcatheter for guidewire support
4. 4 CTO crossing strategies: AWE, ADR, RWE, RDR
5. Change increases likelihood of success
6. CTO PCI should be done at experienced-well equipped centers
7. Stent deployment should be optimized

101 operators - 50 countries – Circulation 2019; in press

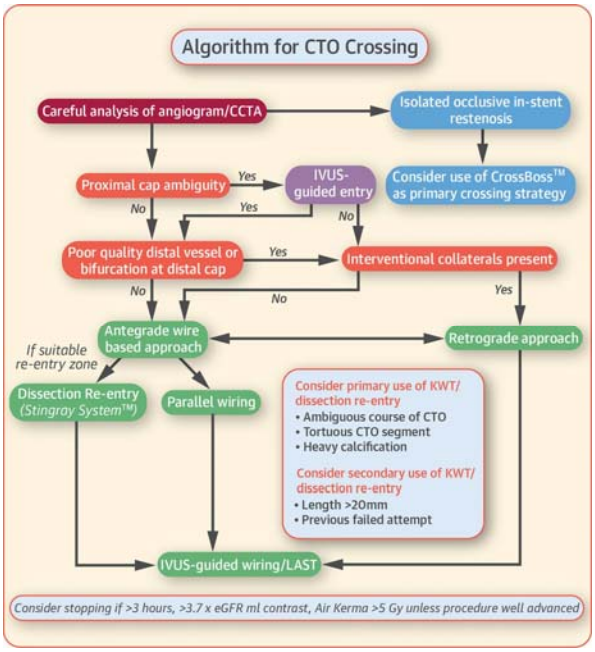
STATE-OF-THE-ART REVIEW

A New Algorithm for Crossing Chronic Total Occlusions From the Asia Pacific Chronic Total Occlusion Club

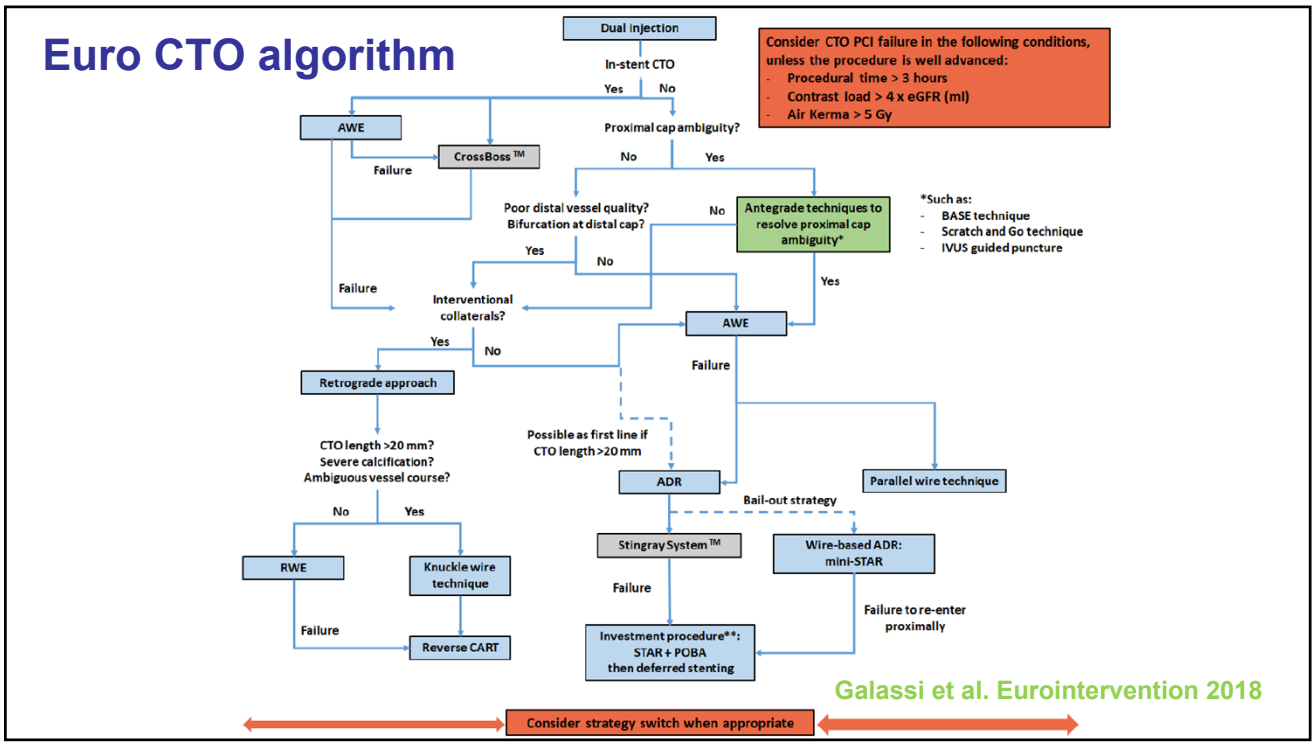
Scott A. Harding, MD,[a] Eugene B. Wu, MD,[b] Sidney Lo, MBBS,[c] Soo Teik Lim, MD,[d] Lei Ge, MD,[e] Ji-Yan Chen, MD,[f] Jie Quan, MD,[g] Seung-Whan Lee, MD, PhD,[h] Hsien-Li Kao, MD,[i] Etsuo Tsuchikane, MD, PhD[j]

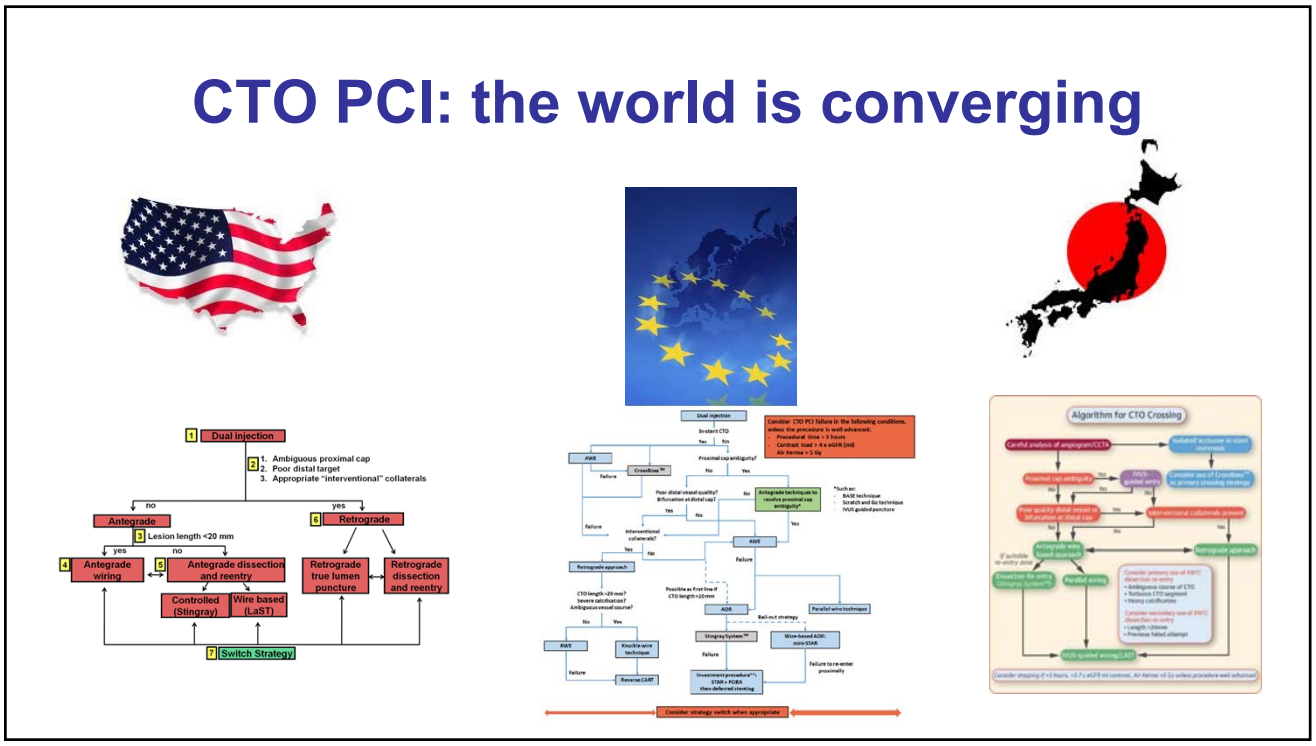
ABSTRACT

Although the hybrid chronic total occlusion (CTO) algorithm had many excellent recommendations, there has been infrequent adoption in the Asia Pacific region. The Asia Pacific CTO club propose an algorithm for case selection based on the Japan-CTO score and a new CTO algorithm, which is applicable globally. This algorithm allows for differing skill sets and equipment availability and contains practical teaching for CTO percutaneous coronary intervention. Similar to the hybrid algorithm there are 3 main questions that determine whether the primary approach is antegrade or retrograde: 1) is there proximal cap ambiguity; 2) is the distal vessel of poor quality; and 3) are there interventional collaterals present. In contrast to the hybrid algorithm occlusion length alone does not determine the choice of either a wire escalation strategy or a dissection re-entry strategy. Rather a combination of factors including ambiguity of the vessel course, severe calcification, tortuosity, length, and previous failure are used to determine this. The role of intravascular ultrasound-guided entry to overcome proximal cap ambiguity and the CrossBoss catheter in occlusive in-stent restenosis are highlighted in the algorithm. Both the parallel wire technique and dissection re-entry with the Stingray system have been included as options when the initial antegrade wire passage fails. Intravascular ultrasound-guided wiring along with limited subintimal tracking and re-entry are included as final options in the algorithm. Finally, the algorithm incorporates guidance on when to stop the procedure. It is hoped that this algorithm will serve as the basis for future CTO percutaneous coronary intervention proctoring and training. (J Am Coll Cardiol Intv 2017;10:2135–43) © 2017 by the American College of Cardiology Foundation.



Scott A. Harding et al. JCIN 2017;10:2135-2143


Euro CTO algorithm
Dual injection
In-stent CTO
Yes
No
AWE
Failure
CrossBoss TM
Proximal cap ambiguity?
No
Yes
Poor distal vessel quality?
Bifurcation at distal cap?
No
Antegrade techniques to resolve proximal cap ambiguity*
*Such as:
- BASE technique
- Scratch and Go technique
- IVUS guided puncture
Yes
No
Failure
Interventional collaterals?
Yes
No
AWE
Yes
Failure
Retrograde approach
CTO length >20 mm?
Severe calcification?
Ambiguous vessel course?
Possible as first line if CTO length >20 mm
ADR
Parallel wire technique
Bail-out strategy
No
Yes
RWE
Knuckle wire technique
Stingray System TM
Wire-based ADR: mini-STAR
Failure
Failure
Failure to re-enter proximally
Reverse CART
Investment procedure**: STAR + POBA then deferred stenting
Consider CTO PCI failure in the following conditions, unless the procedure is well advanced:
- Procedural time > 3 hours
- Contrast load > 4 x eGFR (ml)
- Air Kerma > 5 Gy
Galassi et al. Eurointervention 2018
Consider strategy switch when appropriate


CTO PCI: the world is converging
1 Dual injection
2 1. Ambiguous proximal cap
2. Poor distal target
3. Appropriate "interventional" collaterals
no
yes
Antegrade
6 Retrograde
3 Lesion length <20 mm
yes
no
4 Antegrade wiring
5 Antegrade dissection and reentry
Retrograde true lumen puncture
Retrograde dissection and reentry
Controlled (Stingray)
Wire based (LaST)
7 Switch Strategy
Algorithm for CTO Crossing

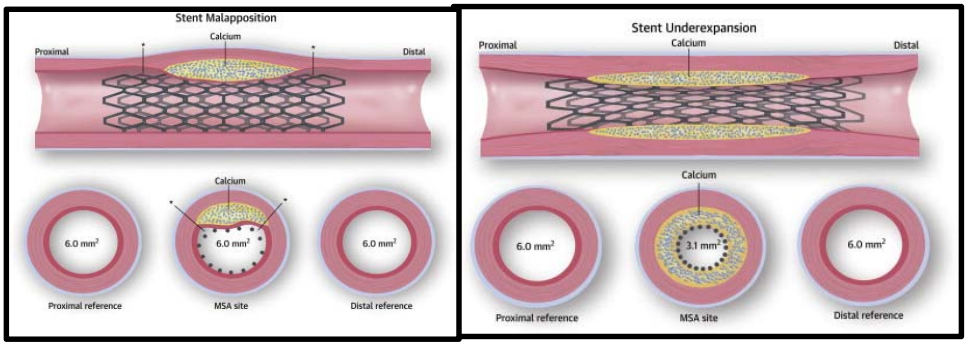
7 Global Principles for CTO PCI

1. Principal indication: to improve symptoms
2. Dual angiography + careful angiographic review
3. Use of microcatheter for guidewire support
4. 4 CTO crossing strategies: AWE, ADR, RWE, RDR
5. Change increases likelihood of success
6. CTO PCI should be done at experienced-well equipped centers
7. Stent deployment should be optimized

101 operators - 50 countries – Circulation 2019; in press

Expand the stent!

Malapposition **Underexpansion**

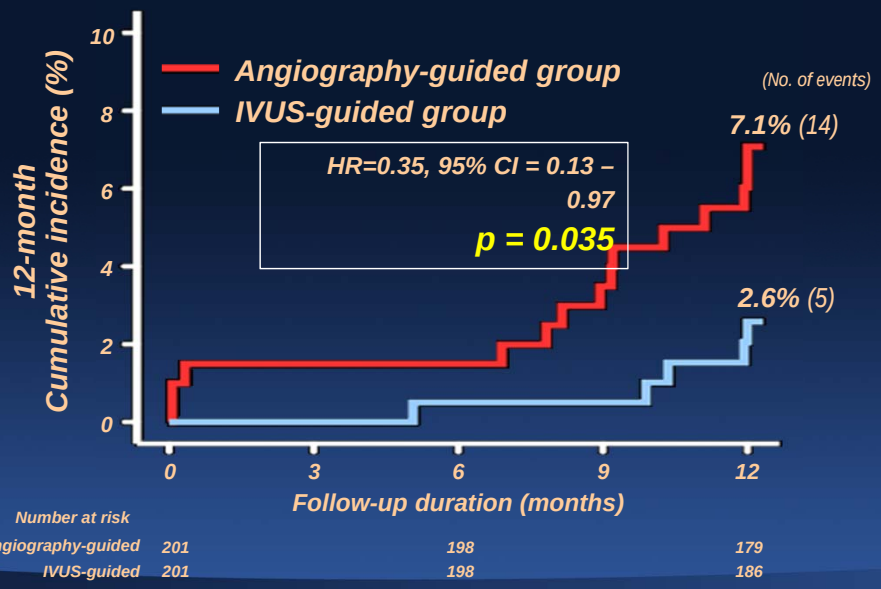


Mintz et al. J Am Coll Cardiol. 2014;64:207-222

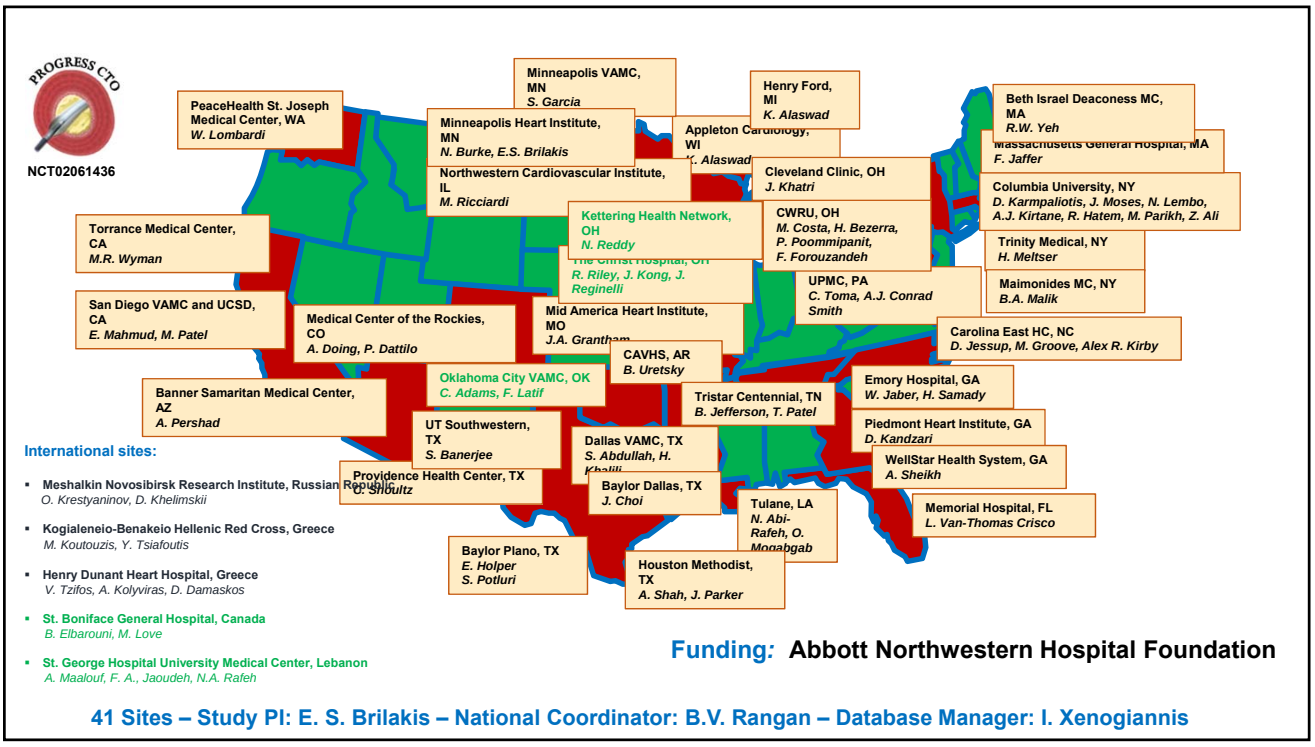
Stent patency rates in CTO PCI

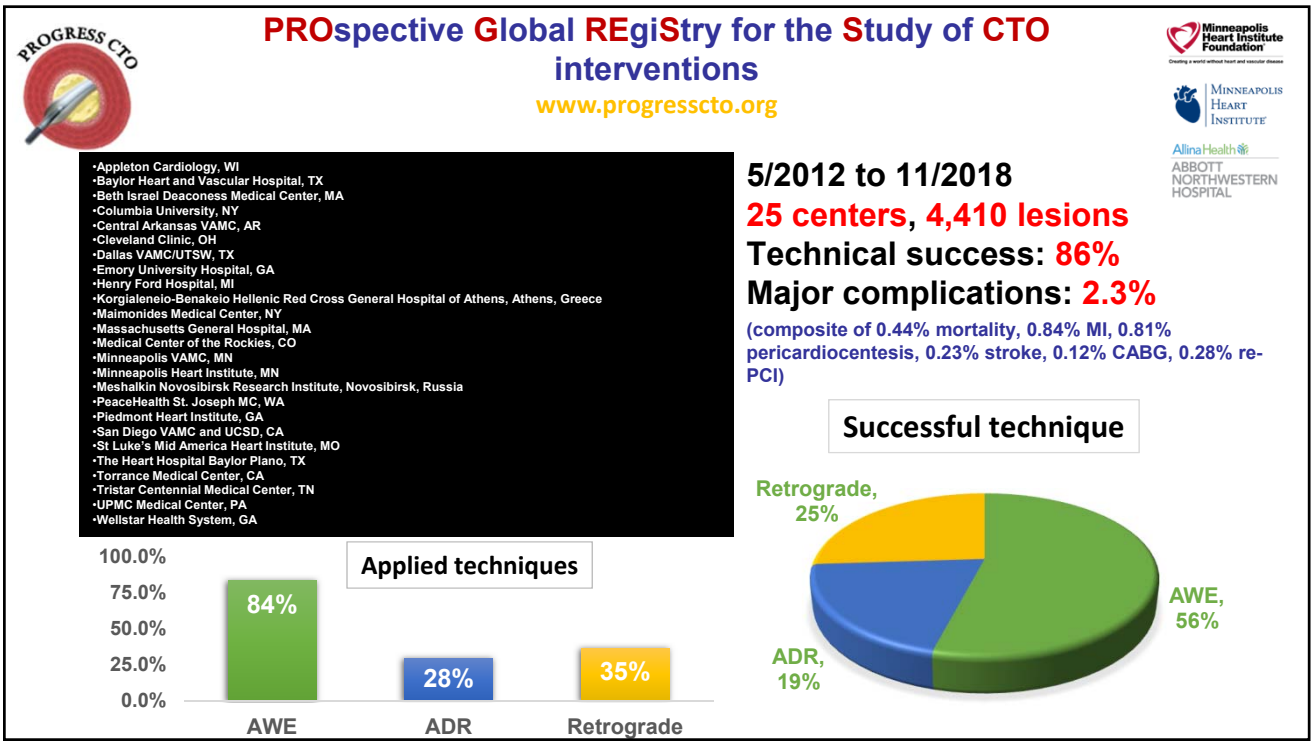
Author	Year	Stent	n	FU angio time	Prior CABG	Total stent length (mm)	In-stent restenosis (%)	In-segment restenosis (%)	TLR (%)	TVR (%)
PRISON II	2006	SES	100	6 months	3	32±15	7	11	4	8
ACROSS-TOSCA 4	2009	SES	200	6 months	8.5	45.9 (30.2, 62.1)	9.5	12.4	9.8	11.4
GISSOC II	2010	SES	78	8 months	6.7	41+18	8.2	9.8	8.1	14.9
CIBELES	2012	SES	101	9 months	4	47±24		10.5		11.6
		EES	106	9 months	4.7	50±23		9.1		7.9
ACE-CTO	2012	EES	100	8 months	27	85 ±34	45	45	40	43

IVUS-CTO: Primary endpoint (Cardiac death, MI, TVR)



Kim et al. Circ Cardiovasc Interv. 2015;8:e002592


PROGRESS CTO
NCT02061436
PeaceHealth St. Joseph Medical Center, WA
W. Lombardi
Minneapolis VAMC, MN
S. Garcia
Minneapolis Heart Institute, MN
N. Burke, E.S. Brilakis
Northwestern Cardiovascular Institute, IL
M. Ricciardi
Henry Ford, MI
K. Alaswad
Cleveland Clinic, OH
J. Khatri
Kettering Health Network, OH
N. Reddy
CWRU, OH
M. Costa, H. Bezerra, P. Poommipanit, F. Forouzandeh
R. Riley, J. Kong, J. Reginelli
UPMC, PA
C. Toma, A.J. Conrad Smith
Beth Israel Deaconess MC, MA
R.W. Yeh
F. Jaffer
Columbia University, NY
D. Karmpaliotis, J. Moses, N. Lembo, A.J. Kirtane, R. Hatem, M. Parikh, Z. Ali
Trinity Medical, NY
H. Meltser
Maimonides MC, NY
B.A. Malik
Carolina East HC, NC
D. Jessup, M. Groove, Alex R. Kirby
Torrance Medical Center, CA
M.R. Wyman
San Diego VAMC and UCSD, CA
E. Mahmud, M. Patel
Medical Center of the Rockies, CO
A. Doing, P. Dattilo
Mid America Heart Institute, MO
J.A. Grantham
CAVHS, AR
B. Uretsky
Oklahoma City VAMC, OK
C. Adams, F. Latif
Banner Samaritan Medical Center, AZ
A. Pershad
UT Southwestern, TX
S. Banerjee
Dallas VAMC, TX
S. Abdullah, H. Khalili
Providence Health Center, TX
G. Shoultz
Baylor Dallas, TX
J. Choi
Tristar Centennial, TN
B. Jefferson, T. Patel
Emory Hospital, GA
W. Jaber, H. Samady
Piedmont Heart Institute, GA
D. Kandzari
WellStar Health System, GA
A. Sheikh
Memorial Hospital, FL
L. Van-Thomas Crisco
Tulane, LA
N. Abi-Rafeh, O. Mogabgab
Baylor Plano, TX
E. Holper
S. Potluri
Houston Methodist, TX
A. Shah, J. Parker
International sites:
Meshalkin Novosibirsk Research Institute, Russian Republic
O. Krestyaninov, D. Khelimskii
Kogialeneio-Benakeio Hellenic Red Cross, Greece
M. Koutouzis, Y. Tsiafoutis
Henry Dunant Heart Hospital, Greece
V. Tzifos, A. Kolyviras, D. Damaskos
St. Boniface General Hospital, Canada
B. Elbarouni, M. Love
St. George Hospital University Medical Center, Lebanon
A. Maalouf, F. A., Jaoudeh, N.A. Rafeh
Funding: Abbott Northwestern Hospital Foundation
41 Sites – Study PI: E. S. Brilakis – National Coordinator: B.V. Rangan – Database Manager: I. Xenogiannis


PROGRESS CTO
PROspective Global REgiStry for the Study of CTO interventions
www.progresscto.org
Minneapolis Heart Institute Foundation
Minneapolis Heart Institute
Allina Health
Abbott Northwestern Hospital
•Appleton Cardiology, WI
•Baylor Heart and Vascular Hospital, TX
•Beth Israel Deaconess Medical Center, MA
•Columbia University, NY
•Central Arkansas VAMC, AR
•Cleveland Clinic, OH
•Dallas VAMC/UTSW, TX
•Emory University Hospital, GA
•Henry Ford Hospital, MI
•Korgialeneio-Benakeio Hellenic Red Cross General Hospital of Athens, Athens, Greece
•Maimonides Medical Center, NY
•Massachusetts General Hospital, MA
•Medical Center of the Rockies, CO
•Minneapolis VAMC, MN
•Minneapolis Heart Institute, MN
•Meshalkin Novosibirsk Research Institute, Novosibirsk, Russia
•PeaceHealth St. Joseph MC, WA
•Piedmont Heart Institute, GA
•San Diego VAMC and UCSD, CA
•St Luke's Mid America Heart Institute, MO
•The Heart Hospital Baylor Plano, TX
•Torrance Medical Center, CA
•Tristar Centennial Medical Center, TN
•UPMC Medical Center, PA
•Wellstar Health System, GA
5/2012 to 11/2018
25 centers, 4,410 lesions
Technical success: 86%
Major complications: 2.3%
(composite of 0.44% mortality, 0.84% MI, 0.81% pericardiocentesis, 0.23% stroke, 0.12% CABG, 0.28% re-PCI)
Applied techniques
100.0%
75.0%
50.0%
25.0%
0.0%
84%
28%
35%
AWE
ADR
Retrograde
Successful technique
Retrograde, 25%
AWE, 56%
ADR, 19%

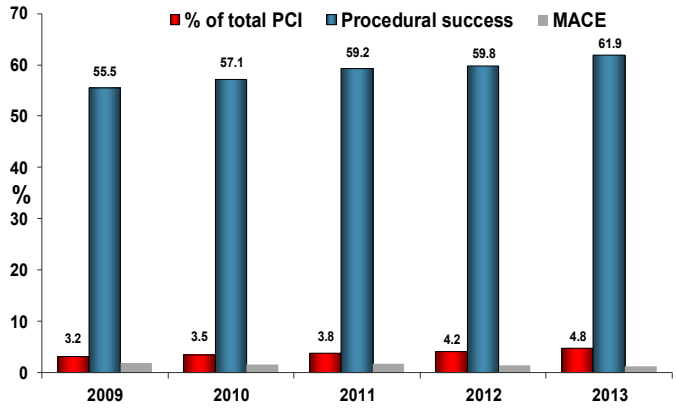
CTO PCI: success and complications

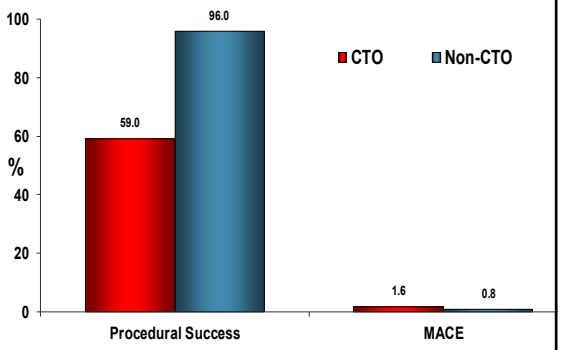
First Author		Study Period	Centers	Cases	Technical Success	Procedural Success	Overall MACE	Death	Acute MI	Stroke	TVR	Tamponade
Konstantinidis	EURO-CTO registry	2008-2015	53	17,626	85%	—	0.6%	0.2%	—	—	—	0.4%
Habara	Japanese Retrograde Summit Registry	2012–2013	56	3,229	—	88%	0.5%	0.2%	0.1%	0.1%	—	0.3%
Tajti	PROGRESS-CTO	2012–2017	20	3,055	87%	85%	3.0%	0.3%	0.7%	0.1%	0.2%	0.5%
Wilson	UK Hybrid	2012–2014	7	1,156	90%	—	1.6%	0.0%	0.8%	0.4%	0.0%	0.7%
Maeremans	RECHARGE	2014–2015	17	1,253	89%	86%	2.6%	0.2%	0.2%	2.2%	0.1%	1.3%
Sapontis	OPEN CTO	2013–2017	12	1,000	86%	85%	7.0%	0.9%	2.6%	0.0%	0.1%	—

Success: 12 of 12
Complications: none

CTO PCI in NCDR

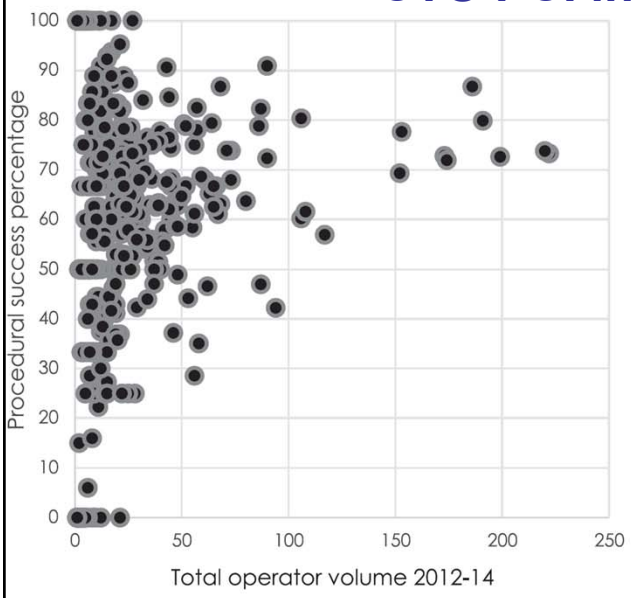
594,510 procedures
22,365 CTO PCI
2009-2013

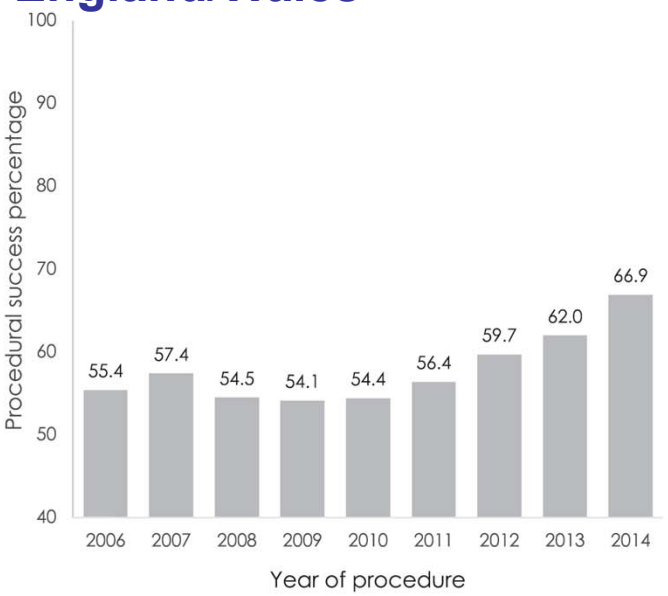




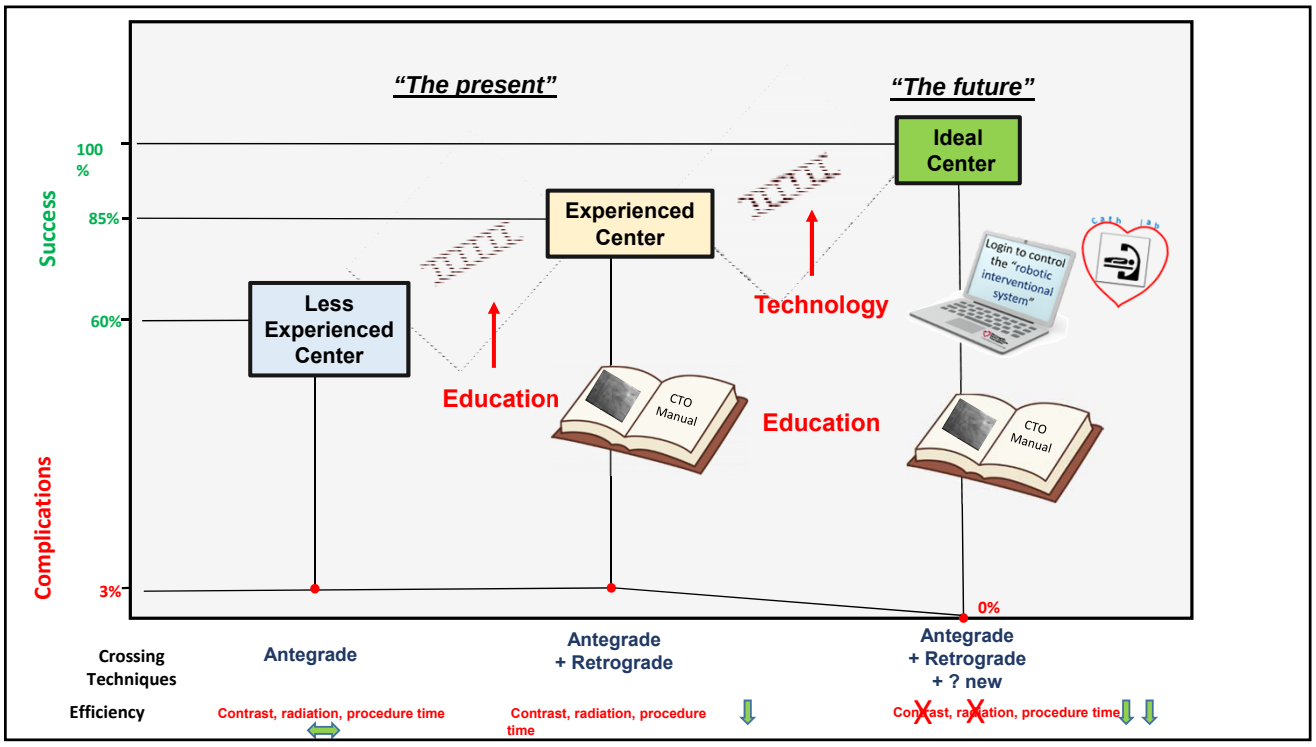
Brilakis, Banerjee, Karmpaliotis, Lombardi, Tsai, Shunk, Kennedy, Spertus, Holmes, Grantham.
J Am Coll Cardiol Intv 2015;8:245–53

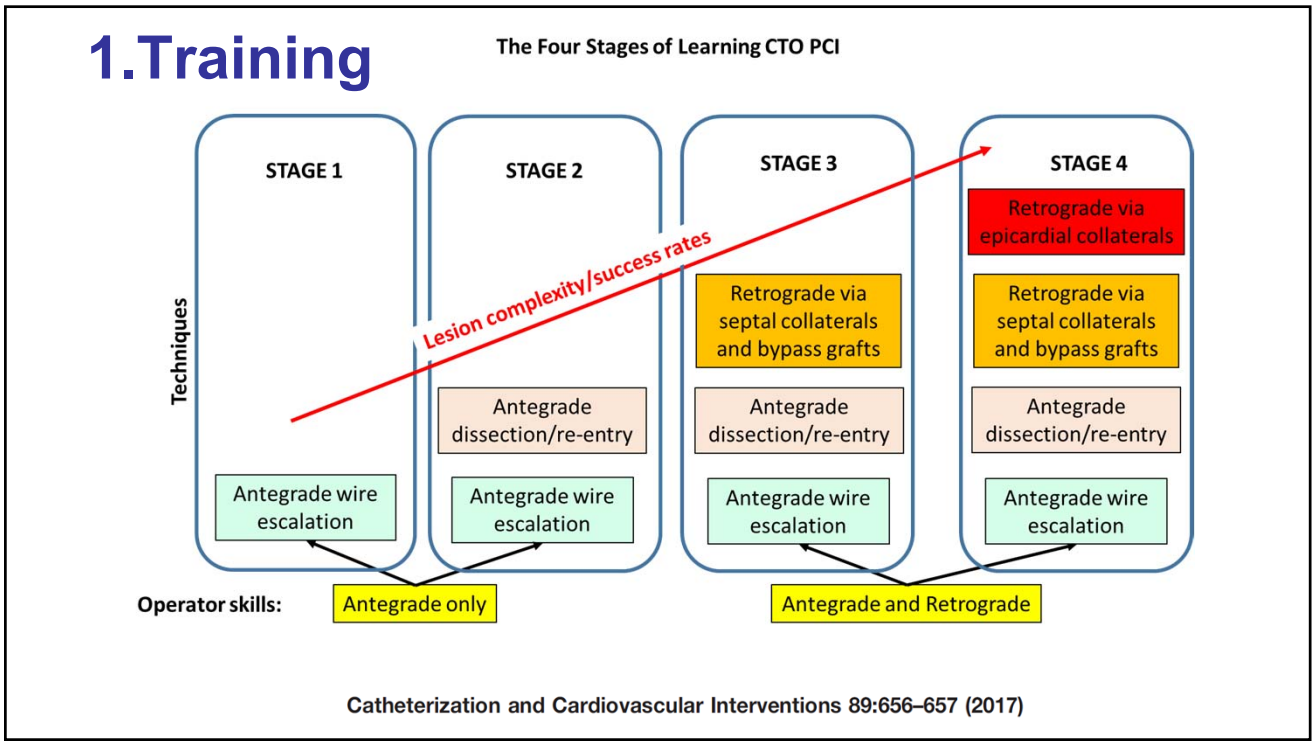
CTO PCI in England/Wales

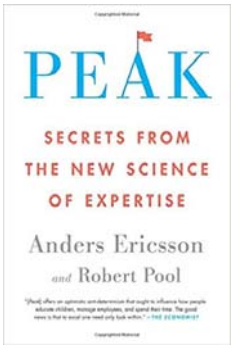




Kinnaird et al. Circulation Intervention 2018


"The present"
"The future"
Ideal Center
Experienced Center
Less Experienced Center
100 %
85%
60%
3%
0%
Success
Complications
Technology
Education
Education
Login to control the "robotic interventional system"
CTO Manual
CTO Manual
Crossing Techniques
Antegrade
Antegrade + Retrograde
Antegrade + Retrograde + ? new
Efficiency
Contrast, radiation, procedure time
Contrast, radiation, procedure time
Contrast, radiation, procedure time


1.Training
The Four Stages of Learning CTO PCI
STAGE 1
STAGE 2
STAGE 3
STAGE 4
Lesion complexity/success rates
Techniques
Retrograde via epicardial collaterals
Retrograde via septal collaterals and bypass grafts
Retrograde via septal collaterals and bypass grafts
Antegrade dissection/re-entry
Antegrade dissection/re-entry
Antegrade dissection/re-entry
Antegrade wire escalation
Antegrade wire escalation
Antegrade wire escalation
Antegrade wire escalation
Operator skills:
Antegrade only
Antegrade and Retrograde
Catheterization and Cardiovascular Interventions 89:656–657 (2017)



Naive practice

Purposeful practice

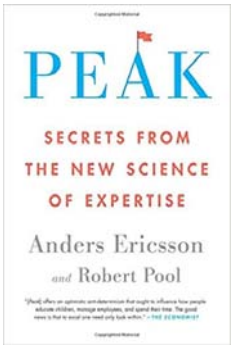
1. Goals
2. Challenge
3. Focused
4. Monitor progress
5. Motivated

Deliberate practice

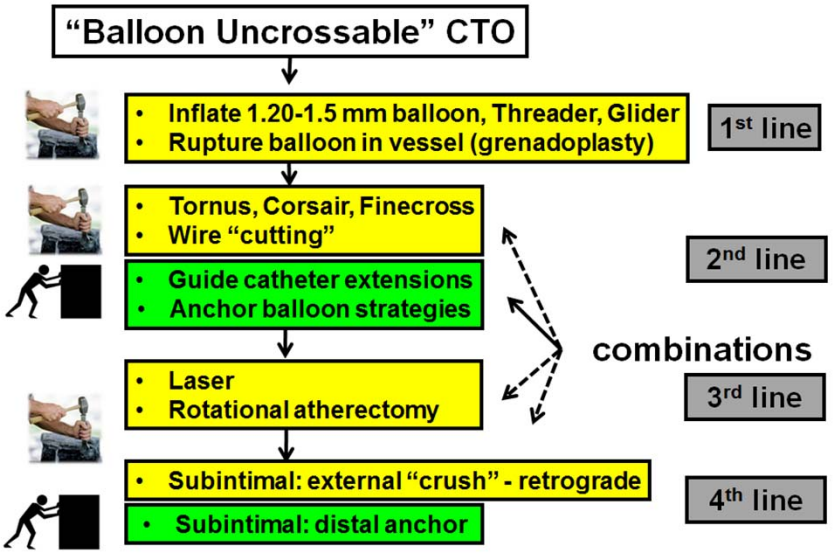
Purposeful +

1. Well established field
2. Teacher

Mental representations

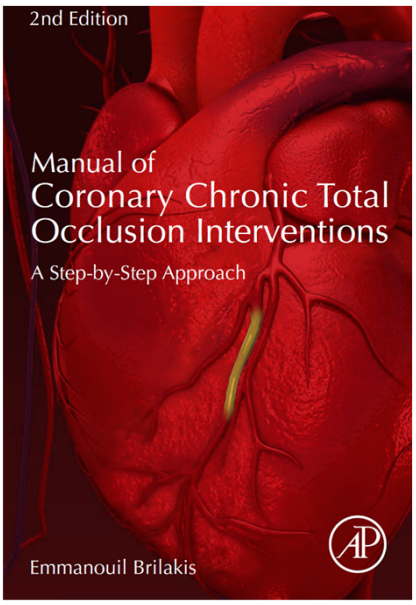


Approach to "balloon uncrossable" CTO

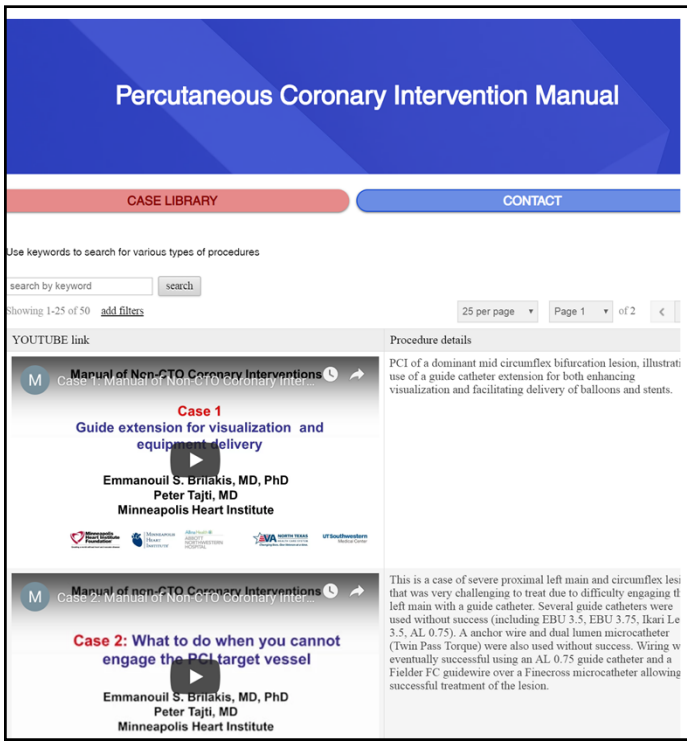


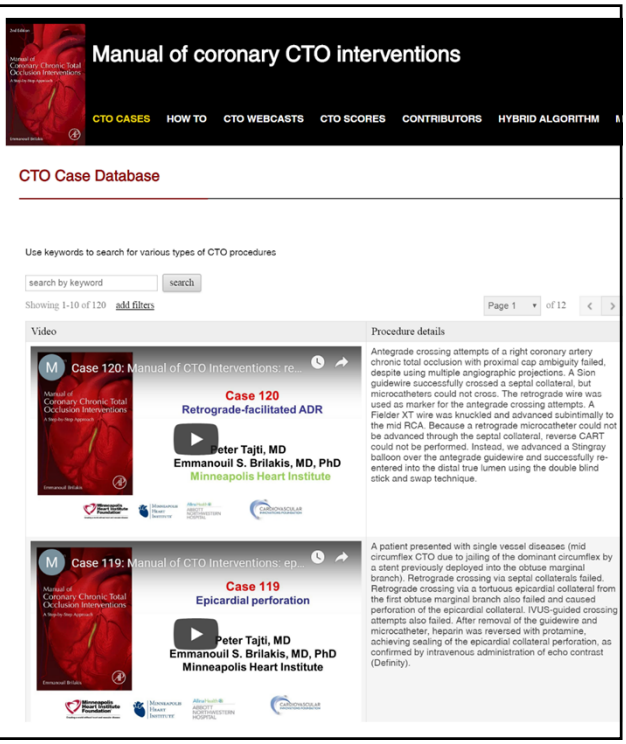
How to learn CTO PCI

1. Books
2. Journals
3. Online
4. Courses
5. Proctoring
6. Doing
7. Community
8. Participating in studies
9. Keep track of outcomes
10. Publish

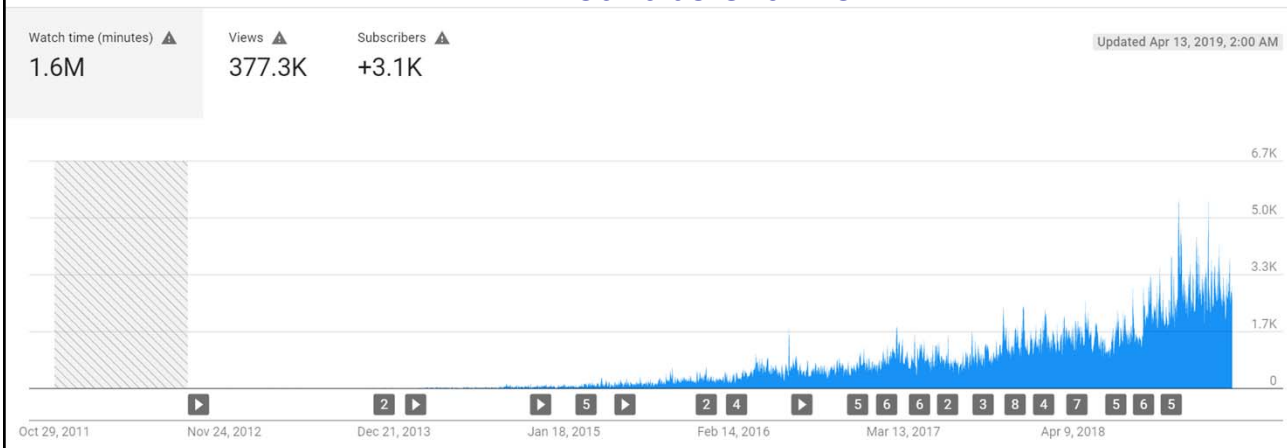


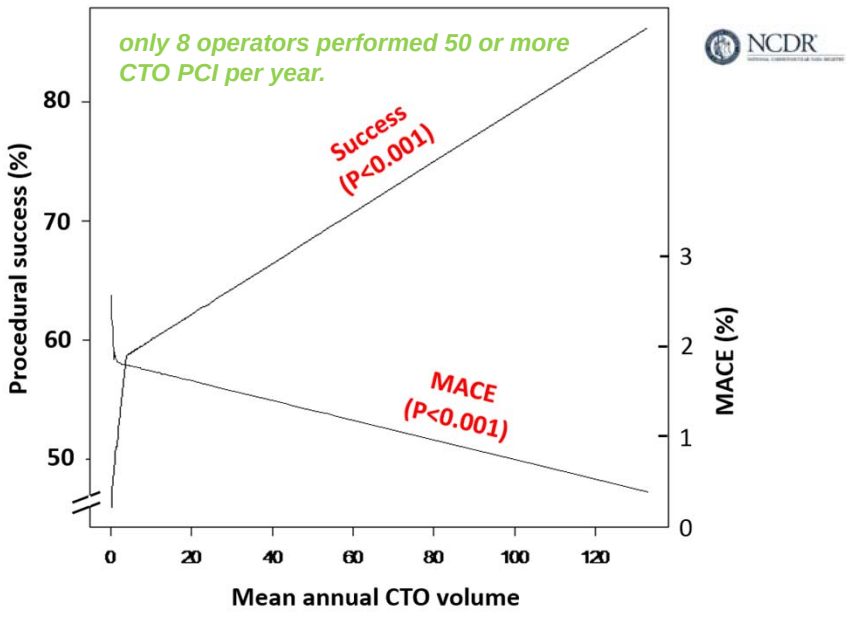
www.progresscto.org
www.ctomanual.org





Global cardiovascular education
CCAD YouTube channel





Brilakis, Banerjee, Karmpaliotis, Lombardi, Tsai, Shunk, Kennedy, Spertus, Holmes, Grantham.
J Am Coll Cardiol Intv 2015;8:245–53

2. Technology

1. Sheaths
2. Guides
3. Microcatheters
4. Guidewires
5. Dissection/re-entry
6. Snares
7. "Balloon Uncrossable" equipment
8. Intravascular Imaging - physiology
9. Complication management
10. Radiation protection
11. Balloons and Stents
12. Hemodynamic support
13. Contrast management

Microcatheter classification

A. NEW "Big"	B. NEW "Small"	C. Angulated	D. Dual lumen NEW	E. Plaque modification
Mamba	Mamba Flex		Sasuke	
Teleport Control	Teleport		NHancer Rx	
M-Cath			ReCross	
EXISTING	**EXISTING**	**EXISTING**	**EXISTING**	**EXISTING**
Corsair Pro	Caravel	SuperCross	FineDuo	
Turnpike	Turnpike LP		Crusade	Tornus
Turnpike Spiral	FineCross	Venture	Twin-Pass Torque & Twin-Pass	Turnpike Gold
Nhancer Pro X	MicroCross 14			

Vemmou E. et al. Expert Rev Med Devices 2019; in press

Guidewires

1. Workhorse

1. Composite core
   - Sion
   - Sion blue
   - Suoh 03
2. Dual coil
   - Samurai RC
3. Other
   - Runthrough
   - BMW
   - ?????

2. Polymer jacketed

1. Fielder FC, XT, XT-A, XT-R
2. Fighter
3. Sion black
4. Whisper
5. Pilot 50
6. Pilot 200
7. PT2
8. Gladius, Mongo
9. Bandit, Raider

3. Stiff

1. Gaia
2. Confianza Pro 12
3. Hornet 14

4. Support

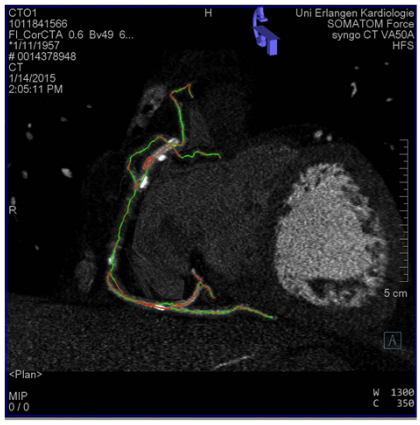
1. Grand Slam
2. Ironman
3. Mailman

5. Other

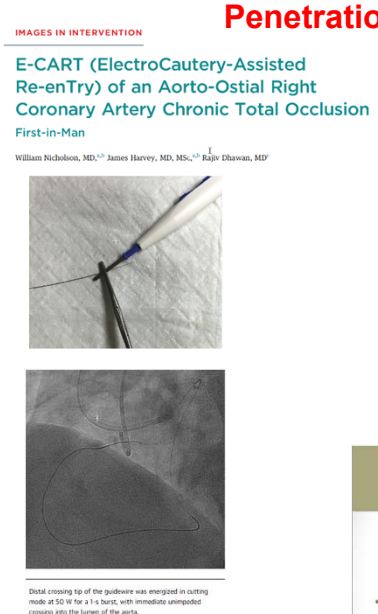
1. Wiggle
2. Suoh 03
3. Externalization wires
4. Rotafloppy - Viper

Upcoming techniques/devices

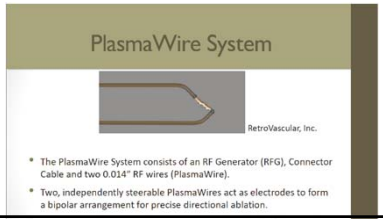
Guidance



Penetration



Soundbite system

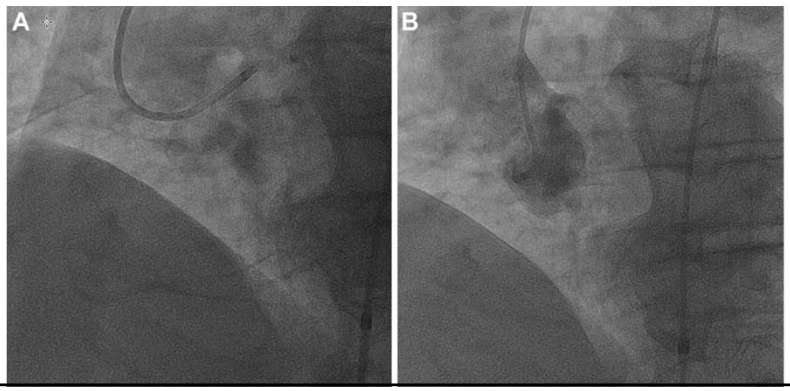


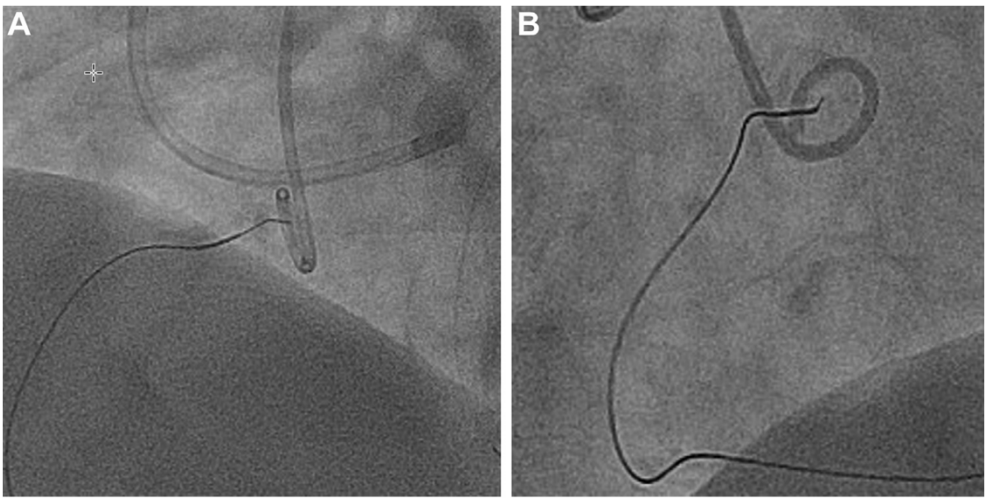
IMAGES IN INTERVENTION

E-CART (ElectroCautery-Assisted Re-enTry) of an Aorto-Ostial Right Coronary Artery Chronic Total Occlusion

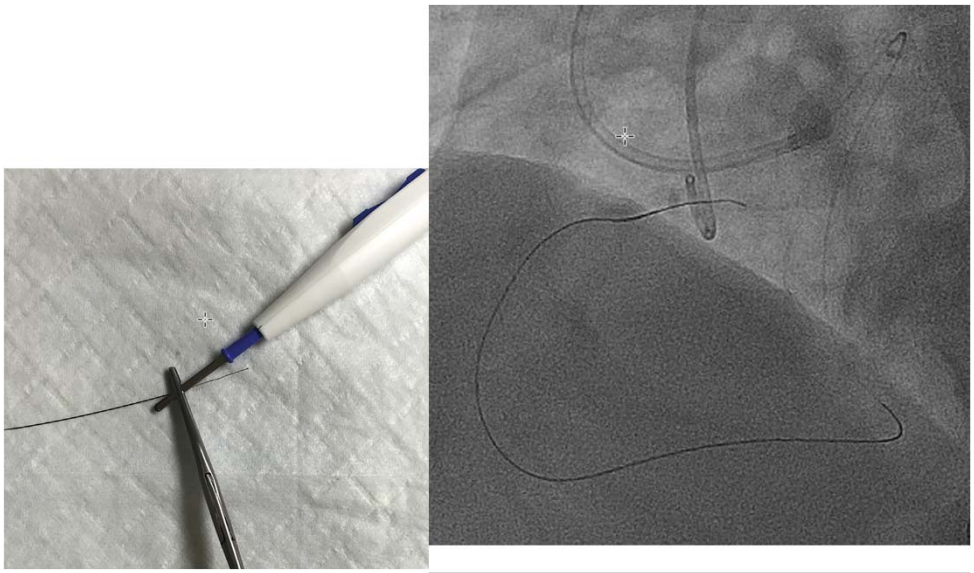
First-in-Man

William Nicholson, MD,[a,b] James Harvey, MD, MSc,[a,b] Rajiv Dhawan, MD[c]





Nicholson et al. JACC Cardiovasc Interv 2016;9:2356-8.

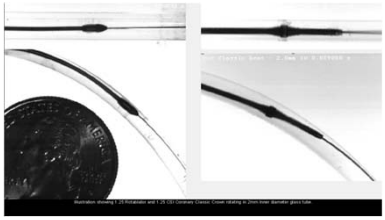


Distal crossing tip of the guidewire was energized in cutting mode at 50 W for a 1-s burst, with immediate unimpeded crossing into the lumen of the aorta.

Nicholson et al. JACC Cardiovasc Interv 2016;9:2356-8.

Coronary calcification

Orbital Atherectomy Mechanism of Action



Differential Sanding:

- 30 micron diamond coating
- Bi-directional sanding, eccentric mounted crown
- Healthy elastic tissue flexes away minimizing damage to the vessel

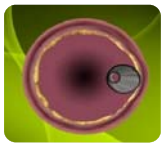
Centrifugal Force:

- 360° crown contact designed to create a smooth, concentric lumen
- Allows constant blood flow and particulate flushing during orbit
- Increasing speed increases orbital diameter
- Ability to treat multiple vessel diameters with one crown
- Treat large vessels through 6 French

Before OAS

Crown will only sand the hard components of plaque

After OAS



Soft components (plaque/tissue) flex away from crown

Primary Endpoints

Imaging **- In-stent minimal cross-sectional area as assessed at the conclusion of the procedure in the imaging cohort.**

Clinical **- 1-year TVF (defined as the composite of cardiac death, target vessel related myocardial infarction, or clinically driven target vessel revascularization).**

ECLIPSE Clinical Trial

ECLIPSE trial

Evaluation of Treatment Strategies for Severe ***C***a***L***cif***I***c Coronary Arteries: Orbital Atherectomy vs. Conventional Angioplasty ***P***rior to Implantation of Drug Eluting ***S***t***E***nts

~2000 pts with severely calcified lesions; ~60 US sites

Randomize 1:1

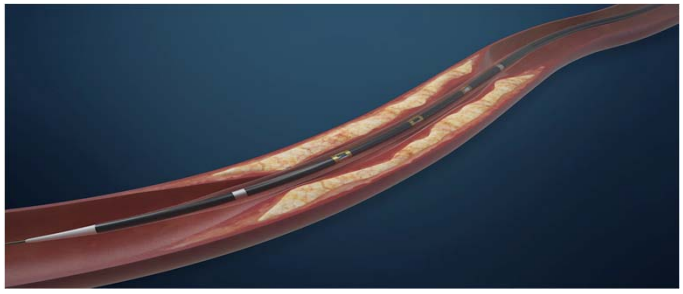
Orbital Atherectomy Strategy	Conventional Angioplasty Strategy
2nd generation DES implantation and optimization	2nd generation DES implantation and optimization

1° endpoints: 1) Post-PCI in-stent MSA by OCT (N~400 in imaging study)
2) 1-year TVF (all patients)

Principal investigators: Philippe Généreux, Ajay Kirtane; **Study chairman:** Gregg W. Stone
Sponsor: Cardiovascular Systems, Inc.

Coronary Lithoplasty: A Novel Treatment for CAC

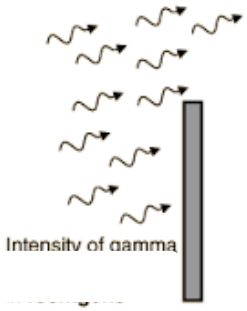
- Based on 30 years of Lithotripsy technology
- Constant, ultra-low pressure
- Sonic pressure waves emitted
  - Circumferential, unfocused
  - 1 pulse/second
  - Pulse exceeds 50 atm

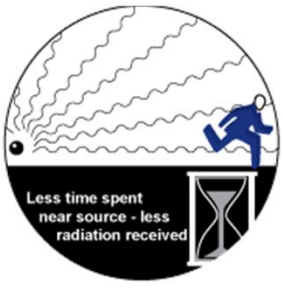


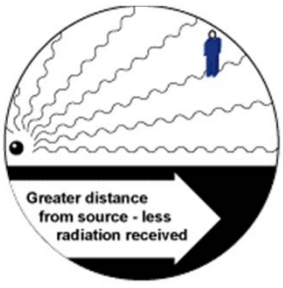
- Sonic pressure waves crack calcium

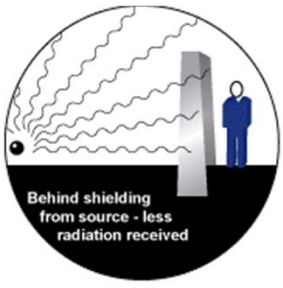
How can you reduce radiation dose?

1	2	3	4
INTENSITY	TIME	DISTANCE	SHIELDING

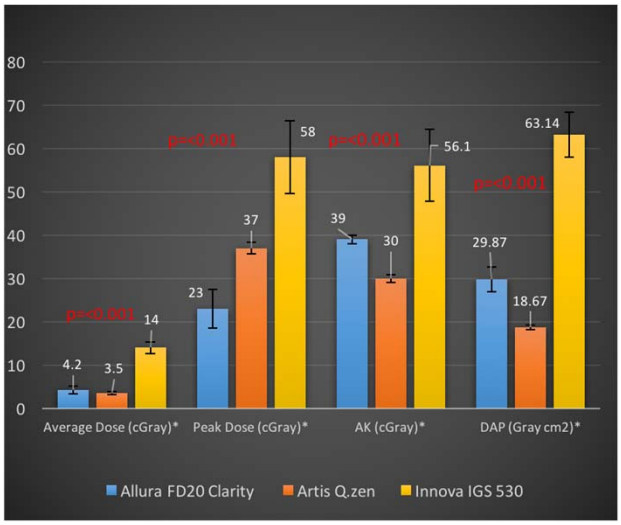








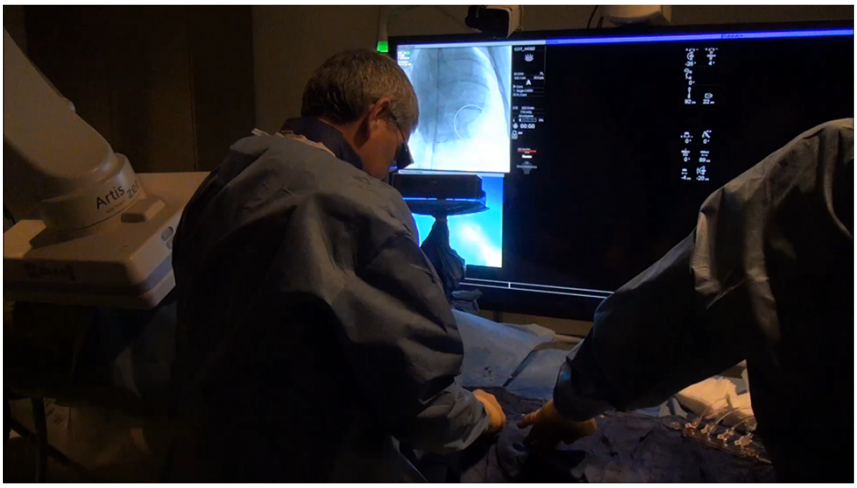
Impact of X-ray machine



Anthropomorphic phantom

Martinez-Parachini R et al. ACC 2017

ControlRad System

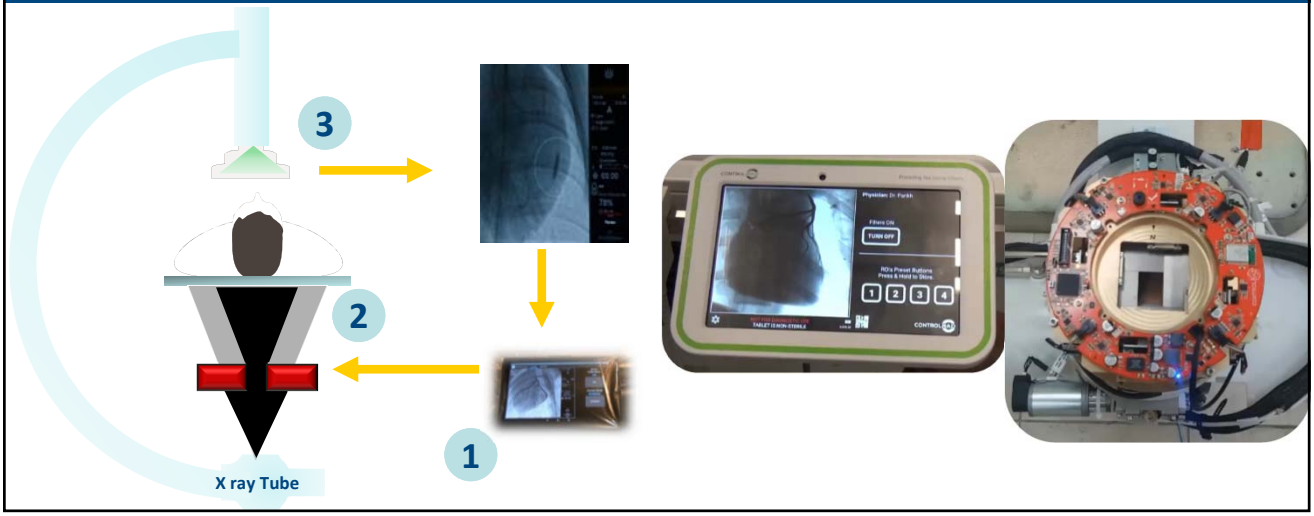


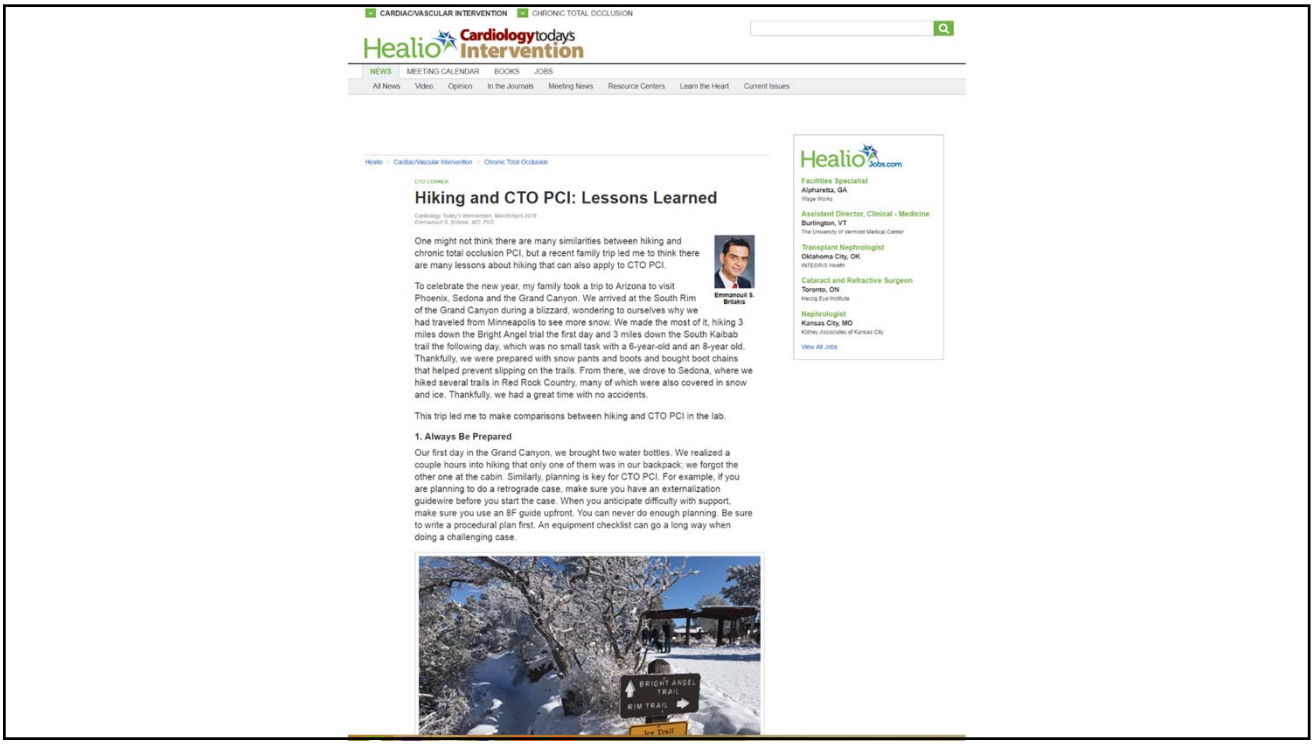
- **75% dose reduction to medical staff**
- **No impact to workflow or image quality**

Med. Phys. 43 (3), March 2016

ControlRad Eye-Tracker moves Region-of-Interest (ROI) in Real-Time

ControlRad is an integrated system that optimizes the X-ray beam to deliver the highest image quality inside the ROI while maintaining appropriate resolution in the periphery





CARDIAC/VASCULAR INTERVENTION | CHRONIC TOTAL OCCLUSION

Healio Cardiology today's Intervention

NEWS | MEETING CALENDAR | BOOKS | JOBS

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Healio > Cardiac/Vascular Intervention > Chronic Total Occlusion

CTO CORNER

Hiking and CTO PCI: Lessons Learned

Cardiology Today's Intervention, March/April 2019

Emmanouil S. Brilakis, MD, PhD

One might not think there are many similarities between hiking and chronic total occlusion PCI, but a recent family trip led me to think there are many lessons about hiking that can also apply to CTO PCI.

To celebrate the new year, my family took a trip to Arizona to visit Phoenix, Sedona and the Grand Canyon. We arrived at the South Rim of the Grand Canyon during a blizzard, wondering to ourselves why we had traveled from Minneapolis to see more snow. We made the most of it, hiking 3 miles down the Bright Angel trial the first day and 3 miles down the South Kaibab trail the following day, which was no small task with a 6-year-old and an 8-year old. Thankfully, we were prepared with snow pants and boots and bought boot chains that helped prevent slipping on the trails. From there, we drove to Sedona, where we hiked several trails in Red Rock Country, many of which were also covered in snow and ice. Thankfully, we had a great time with no accidents.

This trip led me to make comparisons between hiking and CTO PCI in the lab.

1. Always Be Prepared

Our first day in the Grand Canyon, we brought two water bottles. We realized a couple hours into hiking that only one of them was in our backpack; we forgot the other one at the cabin. Similarly, planning is key for CTO PCI. For example, if you are planning to do a retrograde case, make sure you have an externalization guidewire before you start the case. When you anticipate difficulty with support, make sure you use an 8F guide upfront. You can never do enough planning. Be sure to write a procedural plan first. An equipment checklist can go a long way when doing a challenging case.

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Burlington, VT
The University of Vermont Medical Center

Transplant Nephrologist
Oklahoma City, OK

Cataract and Refractive Surgeon
Toronto, ON

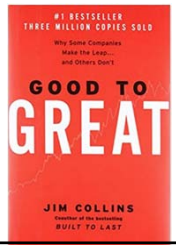
Nephrologist
Kansas City, MO

View All Jobs

Many unanswered questions….

Patient questions

1. How will I feel afterwards?
2. Will I live longer?
3. What is the likelihood of success?
4. What is the likelihood of complications?
5. Will I die during the procedure?



MD questions

1. What strategy is most likely to be successful?
2. Which strategy should be avoided?
3. How long should I try a strategy before switching?
4. When should I stop?
5. Which is the best way to learn CTO PCI?

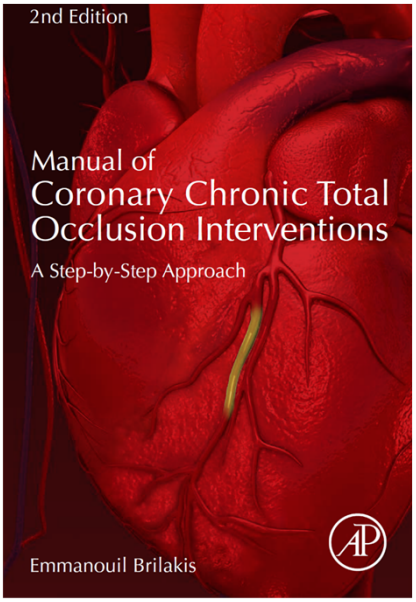
Payor/hospital questions

1. What is the cost-effectiveness of CTO PCI?
2. Which centers should be performing CTO PCI?
3. Have CTO PCI outcomes been improving over time?

Conclusions

CTO PCI

- CTO PCI: revascularization tool
- RCTs: important limitations
- Good results at experienced centers
- Poor results overall
- Key indication: Symptom Improvement
- Risk/benefit ratio key for pursuing CTO PCI
- Global consensus reached
- Need for more specialized experts and dedicated operators



www.progresscto.org
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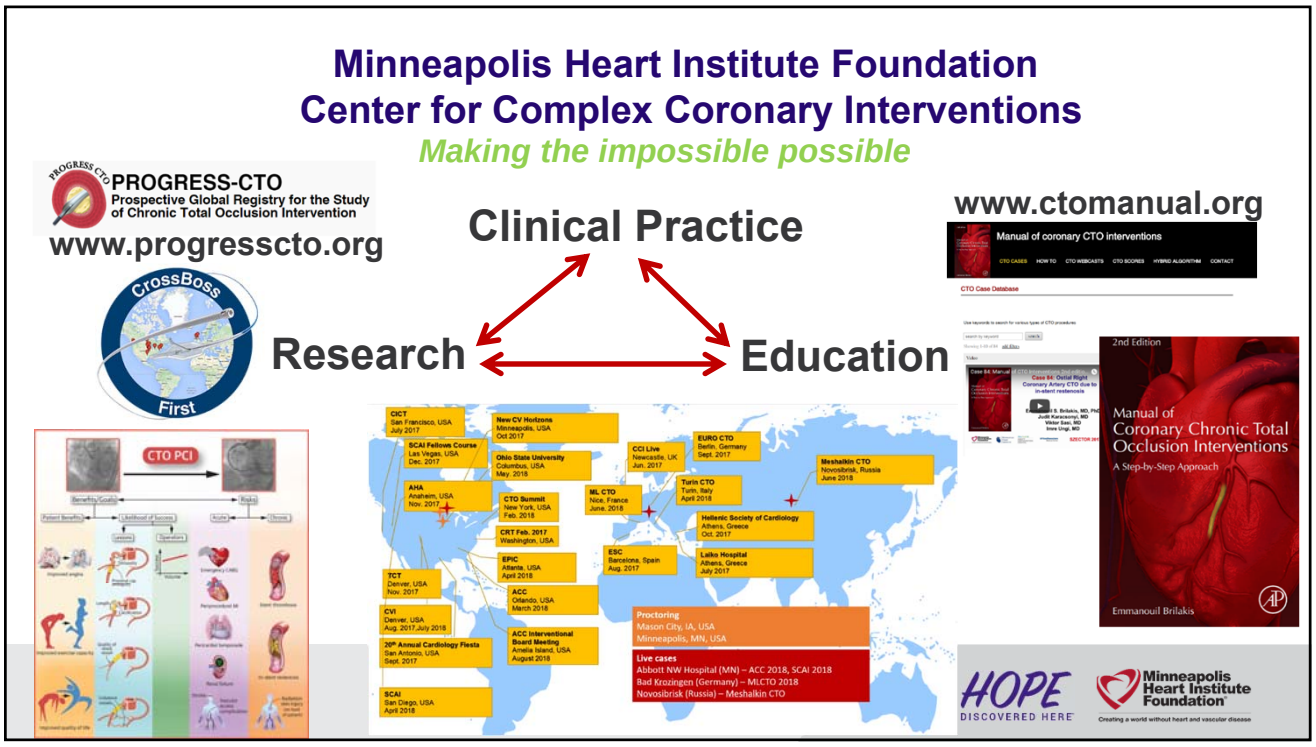
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Manual of coronary CTO interventions
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Manual of Coronary Chronic Total Occlusion Interventions
A Step-by-Step Approach
Emmanouil Brilakis
CICT San Francisco, USA July 2017
New CV Horizons Minneapolis, USA Oct 2017
SCAI Fellows Course Las Vegas, USA Dec. 2017
Ohio State University Columbus, USA May. 2018
AHA Anaheim, USA Nov. 2017
CTO Summit New York, USA Feb. 2018
CRT Feb. 2017 Washington, USA
EPIC Atlanta, USA April 2018
TCT Denver, USA Nov. 2017
ACC Orlando, USA March 2018
CVI Denver, USA Aug. 2017,July 2018
26th Annual Cardiology Fiesta San Antonio, USA Sept. 2017
ACC Interventional Board Meeting Amelia Island, USA August 2018
SCAI San Diego, USA April 2018
CCI Live Newcastle, UK Jun. 2017
EURO CTO Berlin, Germany Sept. 2017
Meshalkin CTO Novosibrisk, Russia June 2018
ML CTO Nice, France June. 2018
Turin CTO Turin, Italy April 2018
Hellenic Society of Cardiology Athens, Greece Oct. 2017
ESC Barcelona, Spain Aug. 2017
Laiko Hospital Athens, Greece July 2017
Proctoring
Mason City, IA, USA
Minneapolis, MN, USA
Live cases
Abbott NW Hospital (MN) – ACC 2018, SCAI 2018
Bad Krozingen (Germany) – MLCTO 2018
Novosibrisk (Russia) – Meshalkin CTO
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