

LUNCHEON PANEL: CARDIOPATIA ISCHEMICA

Lesioni coronariche complesse CTO: il futuro della rivascolarizzazione percutanea

Alfredo R. Galassi, MD, FACC, FSCAI, FESC

**Professore Ordinario di Malattie dell'Apparato Cardiovascolare
Direttore UOC Cardiologia, Policlinico Paolo Giaccone e
Scuola di Specializzazione in Malattie dell'Apparato Cardiovascolare
Dipartimento PROMISE, Università degli Studi di Palermo**

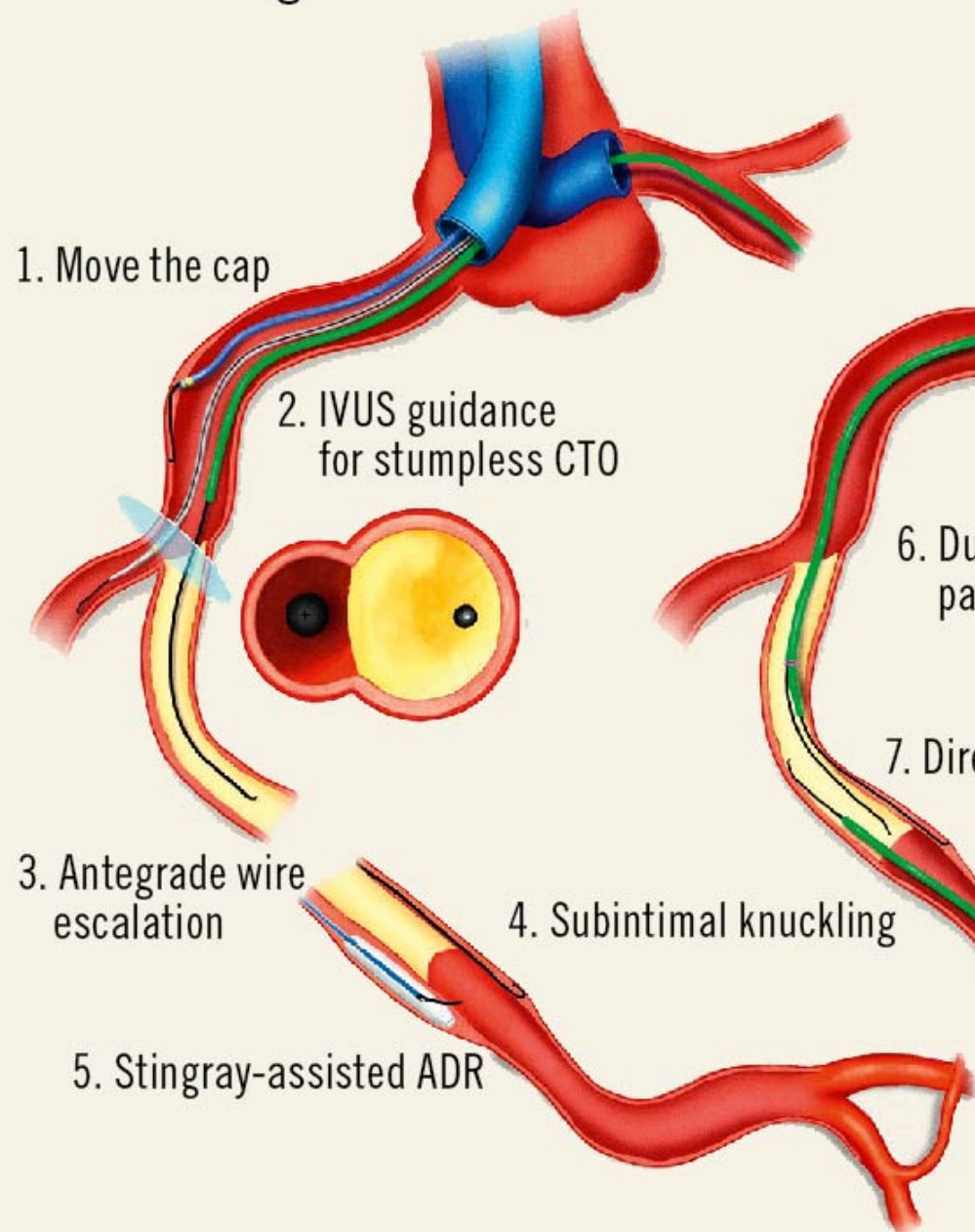


Disclosure of Relevant Financial Relationships

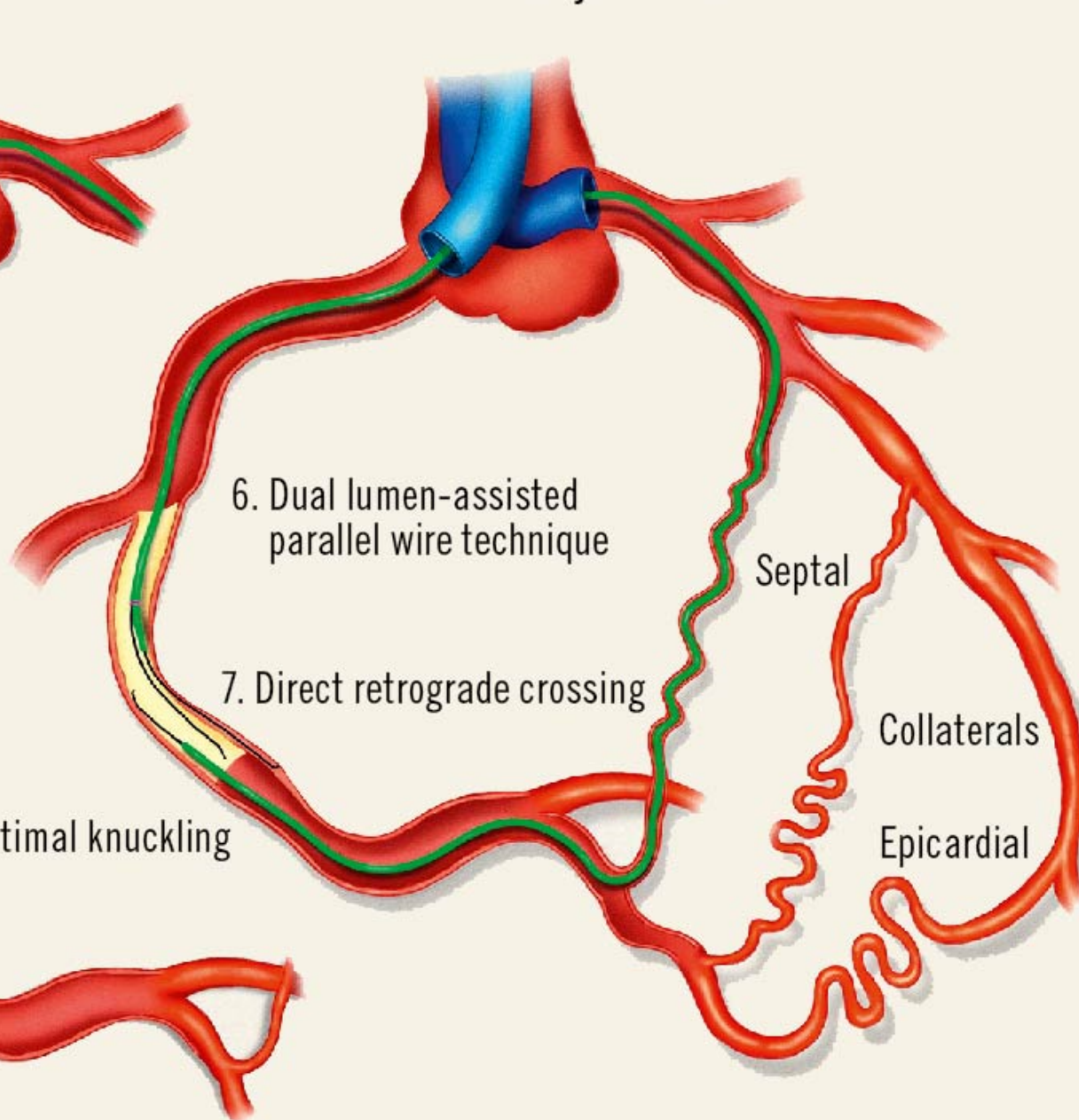
Within the prior 24 months, I have had a relevant financial relationship with a company producing, marketing, selling, re-selling, or distributing healthcare products used by or on patients:

<u>Nature of Financial Relationship</u>	<u>Ineligible Company</u>
Grant/Research Support	Asahi Intecc
Consultant Fees/Honoraria	Asahi Intecc Terumo

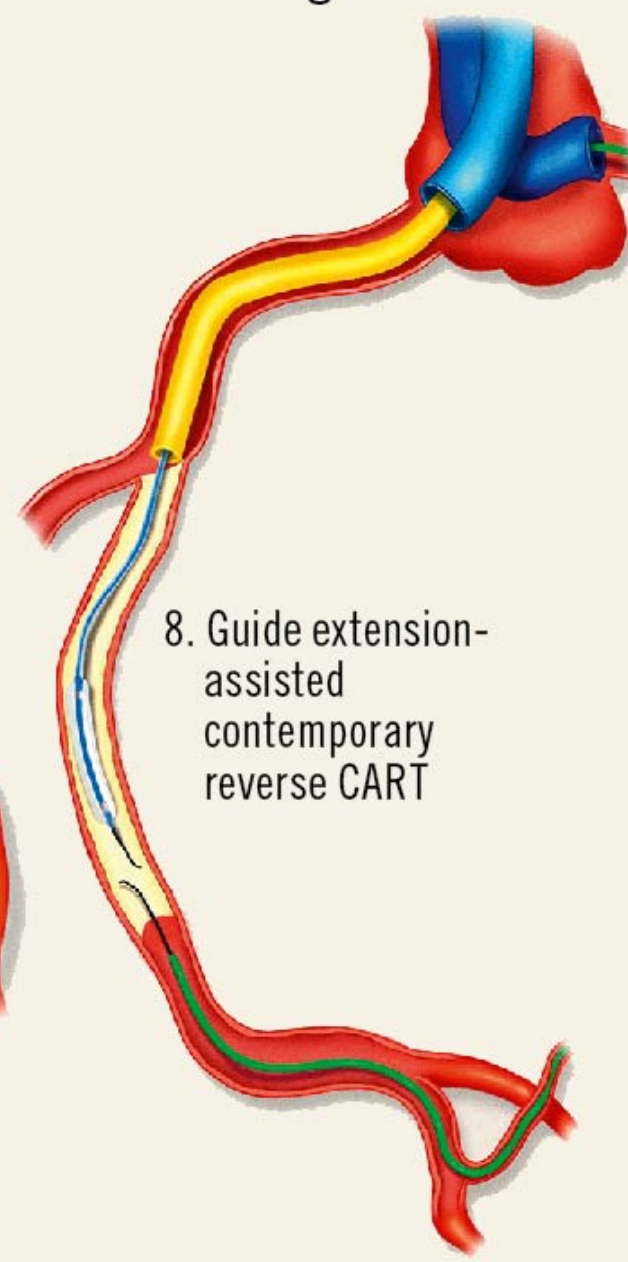
Antegrade



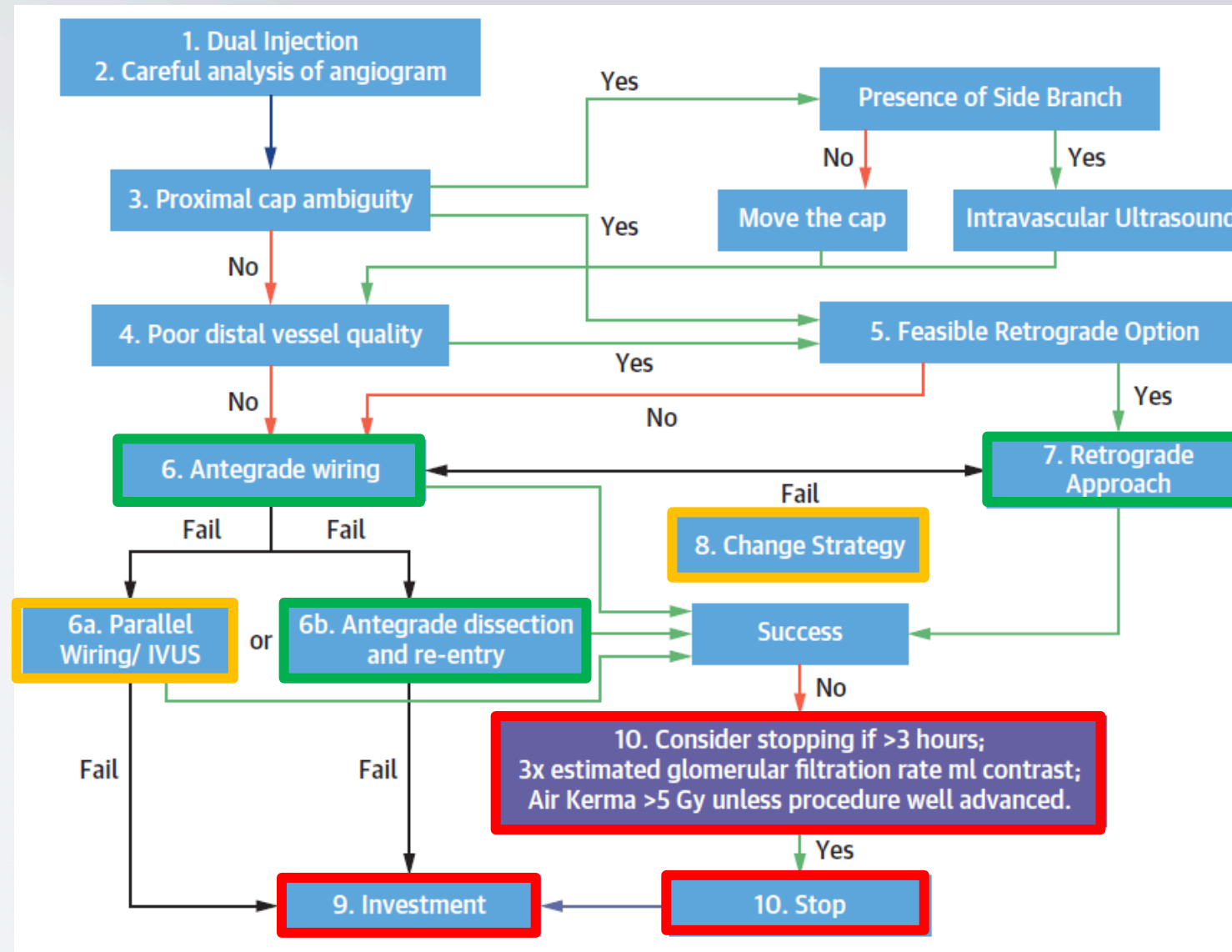
Bilateral injection



Retrograde

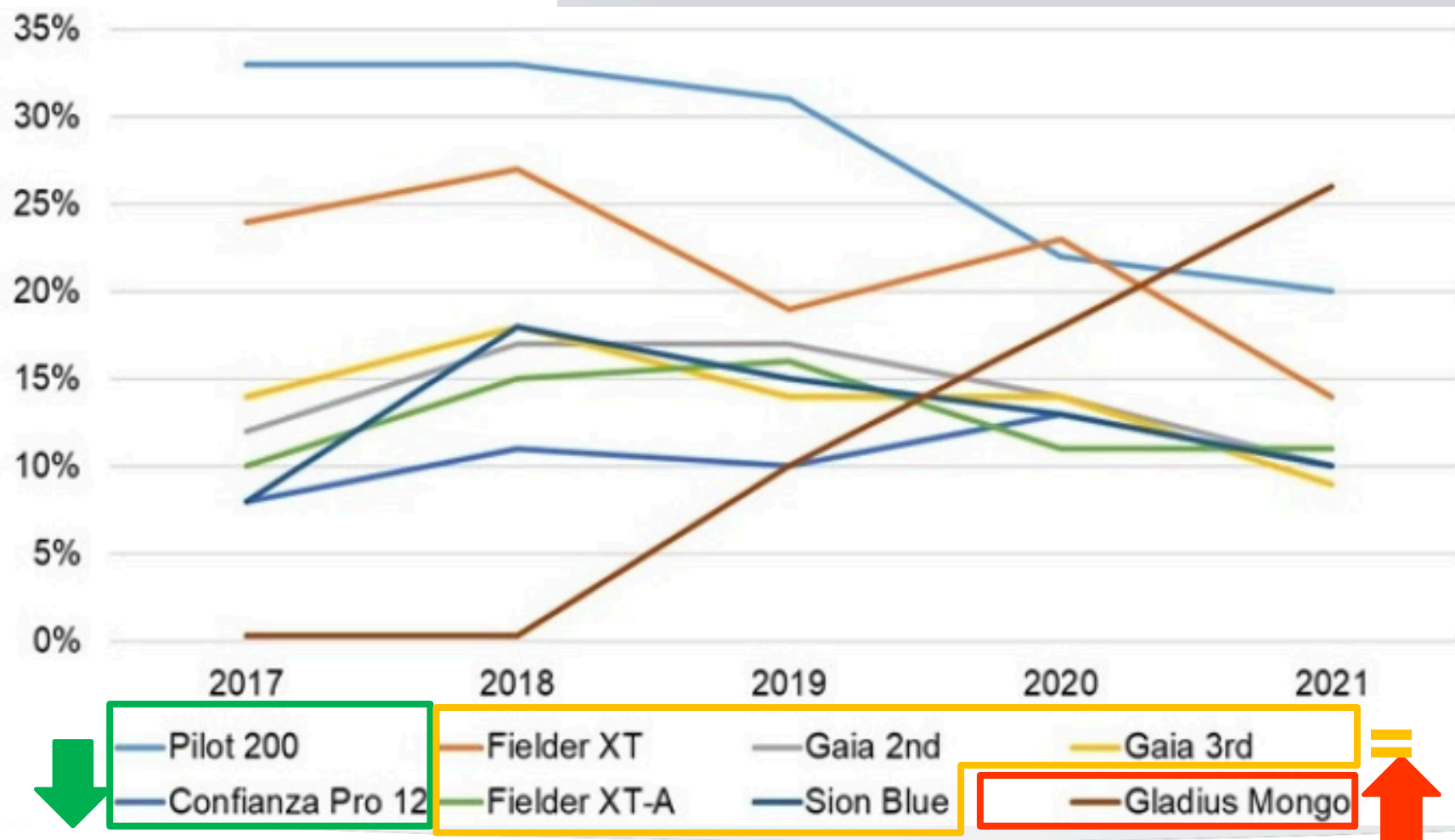


The Global CTO Crossing Algorithm



Equipment Utilization in Chronic
Total Occlusion Percutaneous
Coronary Interventions: Update
From the PROGRESS-CTO
Registry

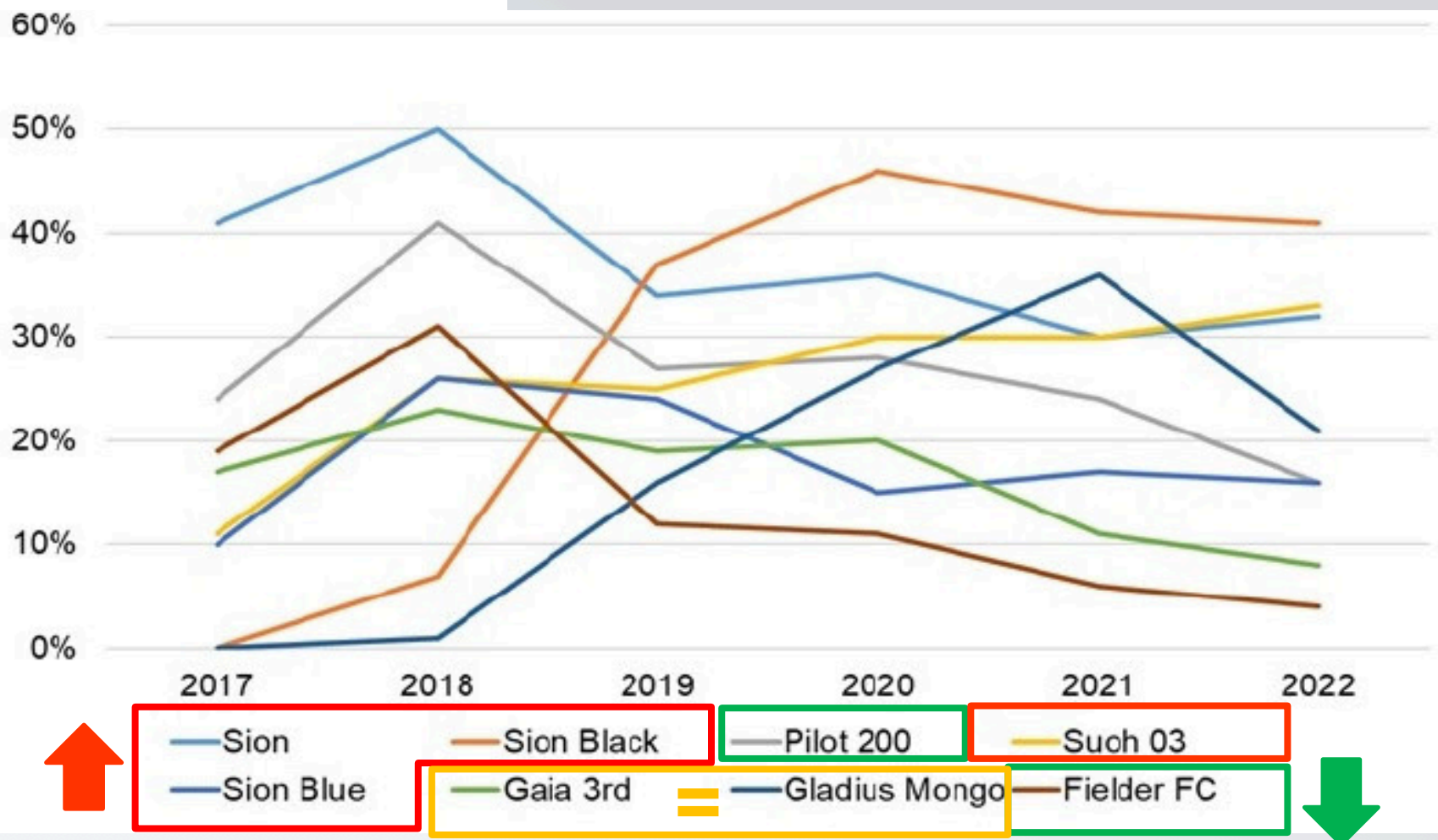
PROGRESS-CTO years 2012-2022
11,202 CTO PCIs
Antegrade Approach



Kostantinis et al, J Invas Cardiol 2023

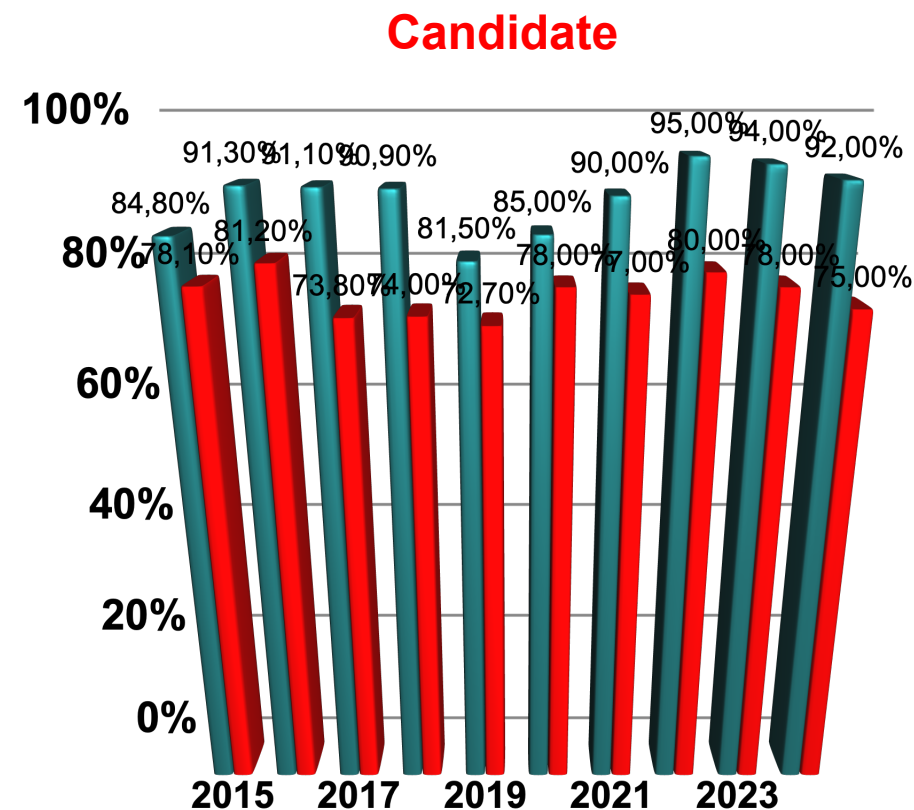
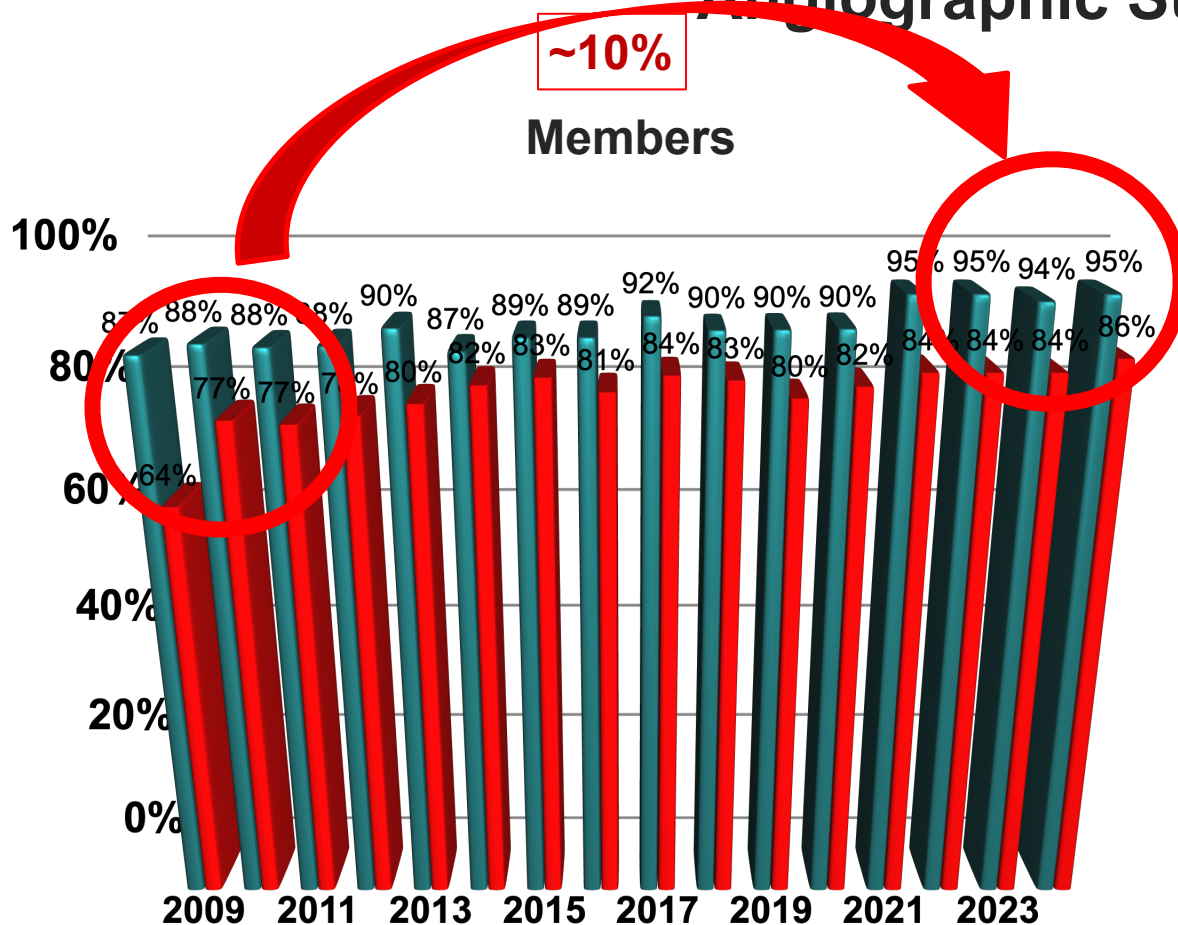
Equipment Utilization in Chronic Total Occlusion Percutaneous Coronary Interventions: Update From the PROGRESS-CTO Registry

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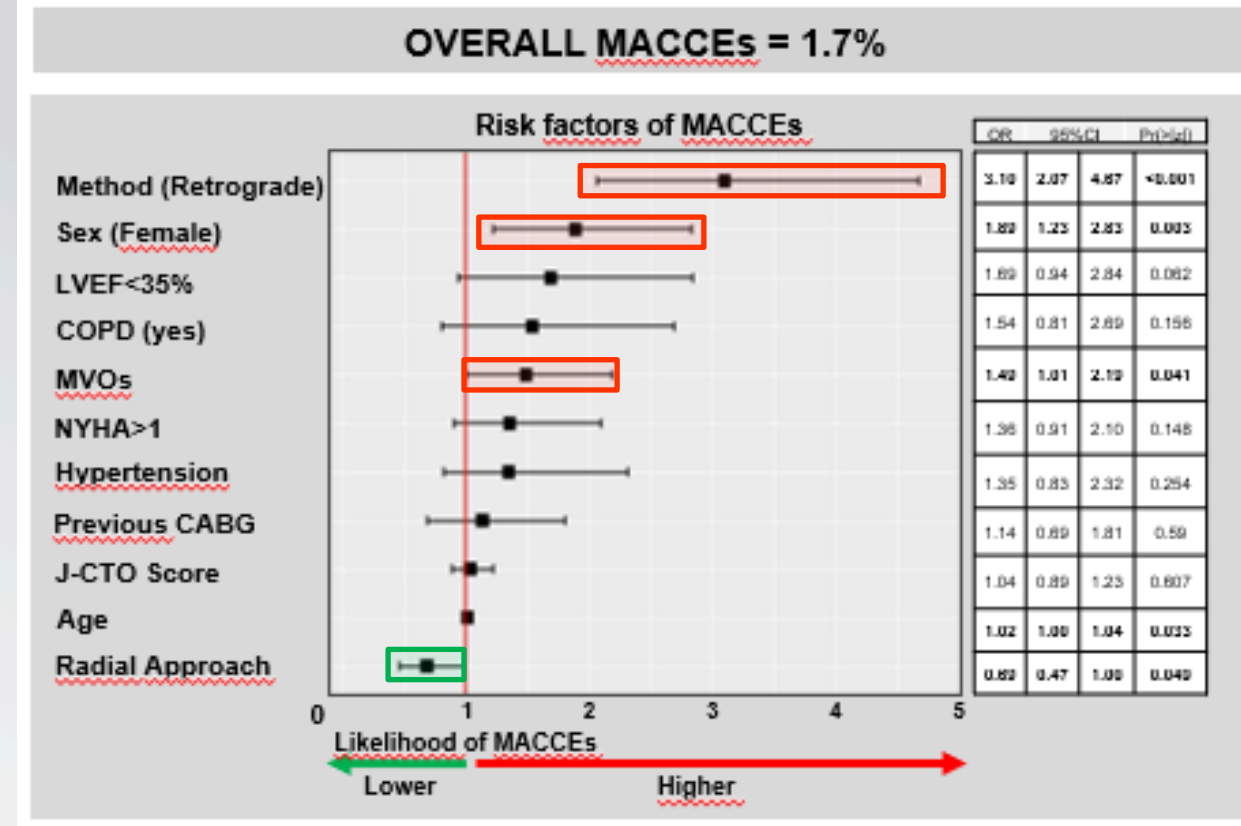
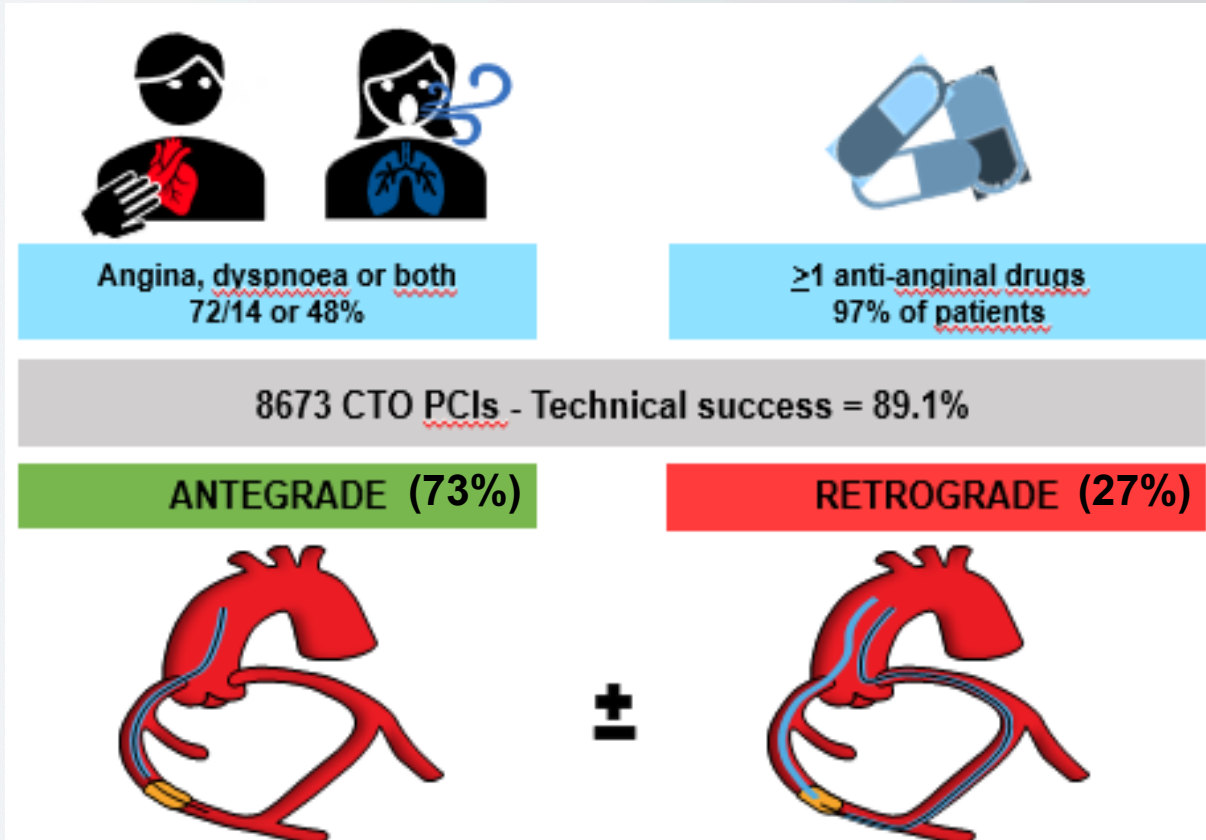
Kostantinis' et al, J Invas Cardiol 2023

Angiographic Success



Antegrade Retrograde

Contemporary Outcomes of CTO PCI in Europe: the ERCTO Registry (2021-2022)





Clinical update

Appropriateness of percutaneous revascularization of coronary chronic total occlusions: an overview

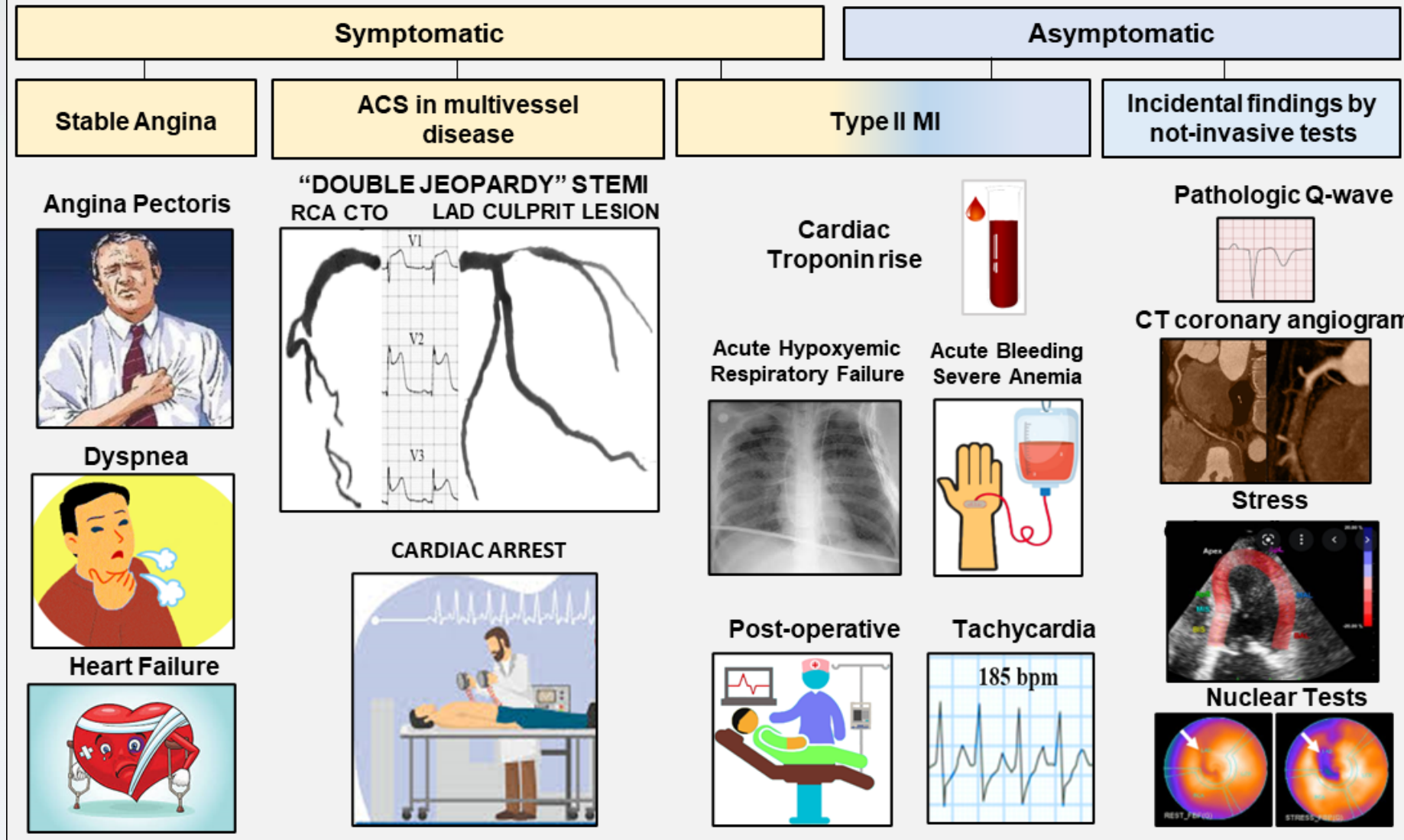
Alfredo R. Galassi^{1*}, Emmanouil S. Brilakis², Marouane Boukhris^{1,3}, Salvatore D. Tomasello¹, Georgios Sianos⁴, Dimitri Karpaliotis⁵, Carlo Di Mario⁶, Bradley H. Strauss⁷, Stephane Rinfret⁸, Masahisa Yamane⁹, Osamu Katoh¹⁰, Gerald S. Werner¹¹, and Nicolaus Reifart¹²

Evaluation and management of patients with coronary chronic total occlusions considered for revascularisation. A clinical consensus statement of the European Association of Percutaneous Cardiovascular Interventions (EAPCI) of the ESC, the European Association of Cardiovascular Imaging (EACVI) of the ESC, and the ESC Working Group on Cardiovascular Surgery

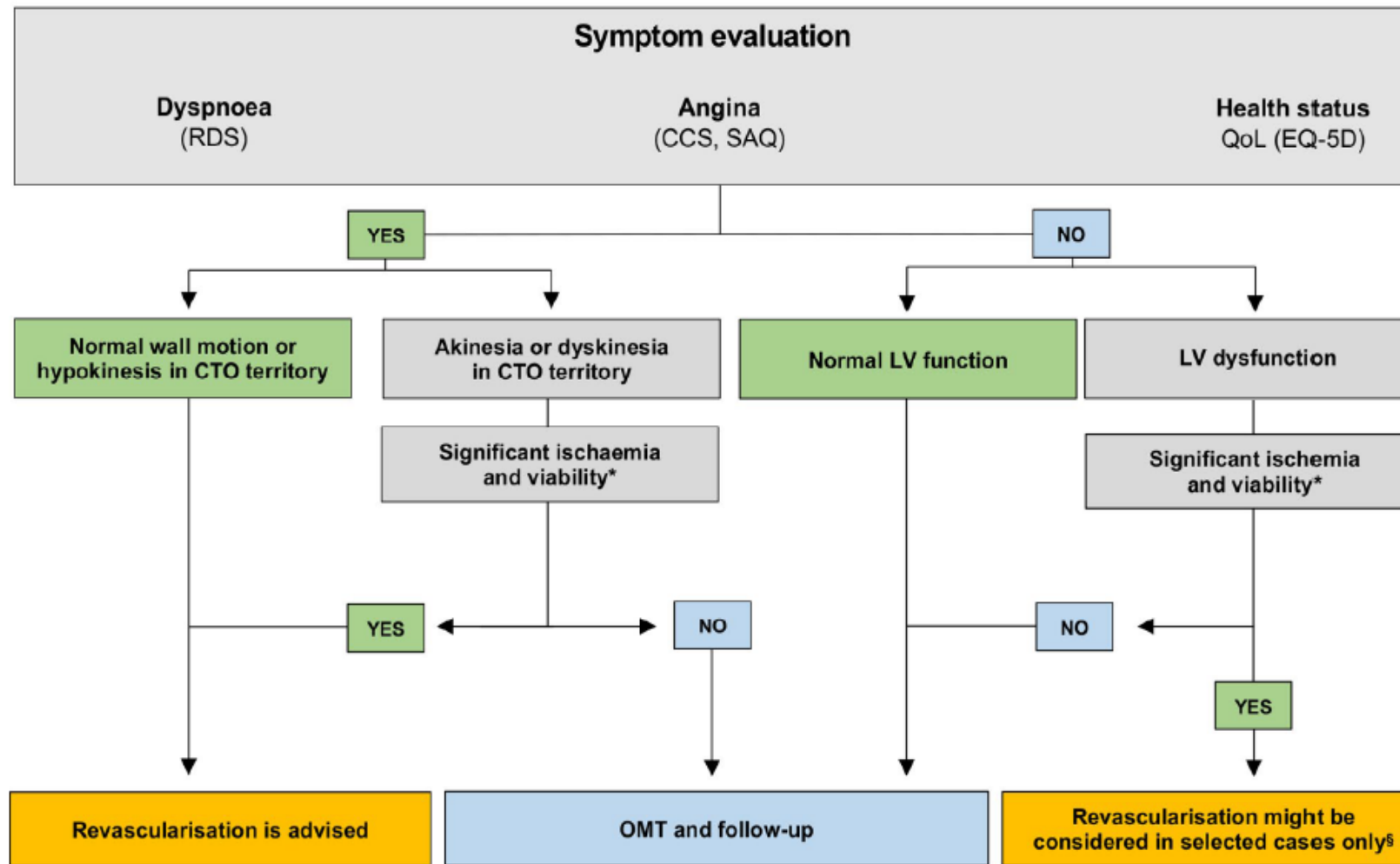
Alfredo R. Galassi^{1*}, MD, PhD, FESC; Giuseppe Vadalà¹; Gerald S. Werner²; Bernard Cosyns³; Georgios Sianos⁴; Jonathan Hill⁵; Dariusz Dudek⁶; Eugenio Picano⁷; Giuseppina Novo¹; Daniele Andreini⁸; Bernhard L.M. Gerber⁹; Ronny Buechel¹⁰; Kambis Mashayekhi¹¹; Mathias Thielmann¹²; Margaret McEntegart¹³; Beatriz Vaquerizo¹⁴; Carlo Di Mario¹⁵; Sinisa Stojkovic¹⁶; Sigrid Sandner¹⁷; Nikolaos Bonaros¹⁸; Thomas F. Lüscher^{5,19}

**Corresponding author: Via Del Vespro 129, 90100, University of Palermo, Italy. E-mail: alfredo.galassi@unipa.it
The authors' affiliations can be found at the end of this article*

Different presentation modalities of CTO patients

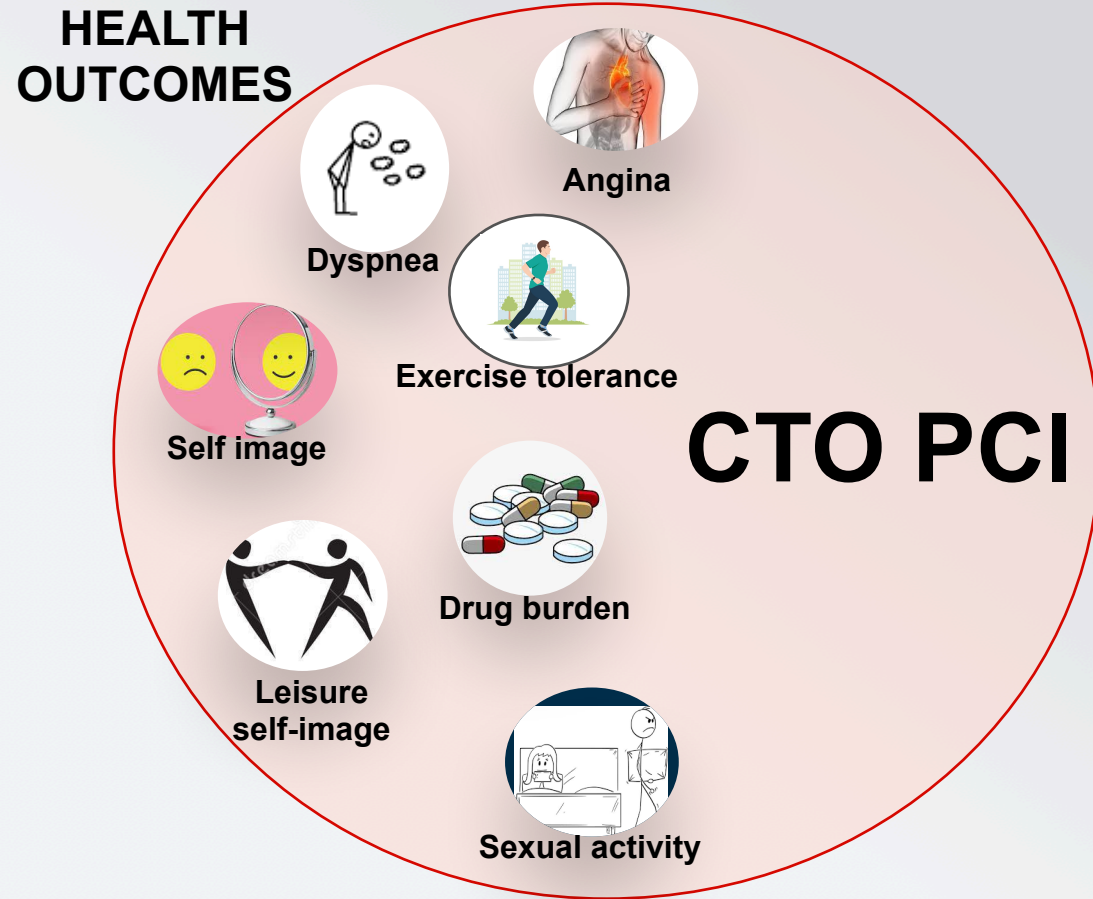


CTO detected



*see Table 2 for inducible ischaemia/viability cutoff of each imaging modality. § E.g., young patients, with proximal LAD CTO, and demonstration of significant silent inducible ischaemia and viability. CCS: Canadian Cardiovascular Society; CTO: chronic total occlusion; EQ-5D: EuroQol five-dimensional; LV: left ventricular; MRI: magnetic resonance imaging; OMT: optimal medical therapy; QoL: quality of life; RDS: Rose Dyspnea Scale; SAQ: Seattle Angina Questionnaire

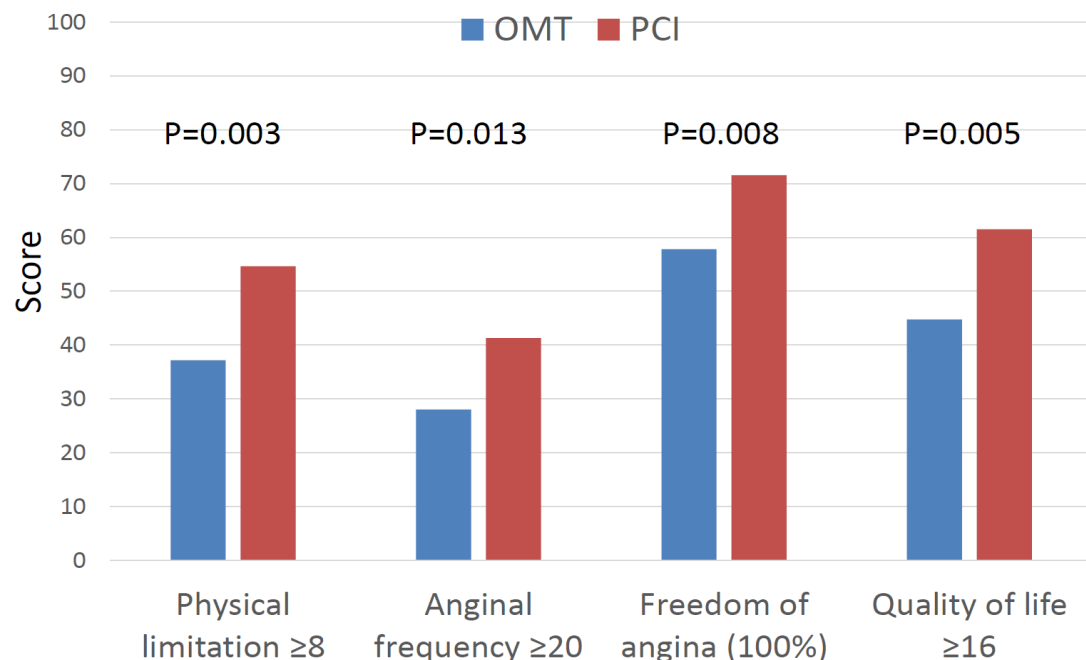
CTO Revascularization – Body of Evidences



A randomized multicentre trial to compare revascularization with optimal medical therapy for the treatment of chronic total coronary occlusions

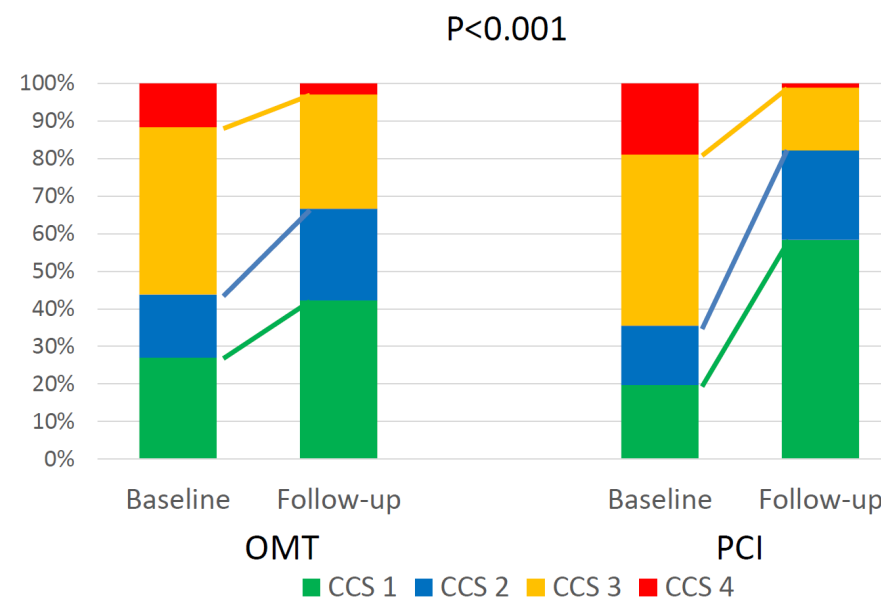
euro
PCR

Significant change in SAQ subscale scores *



euro
PCR

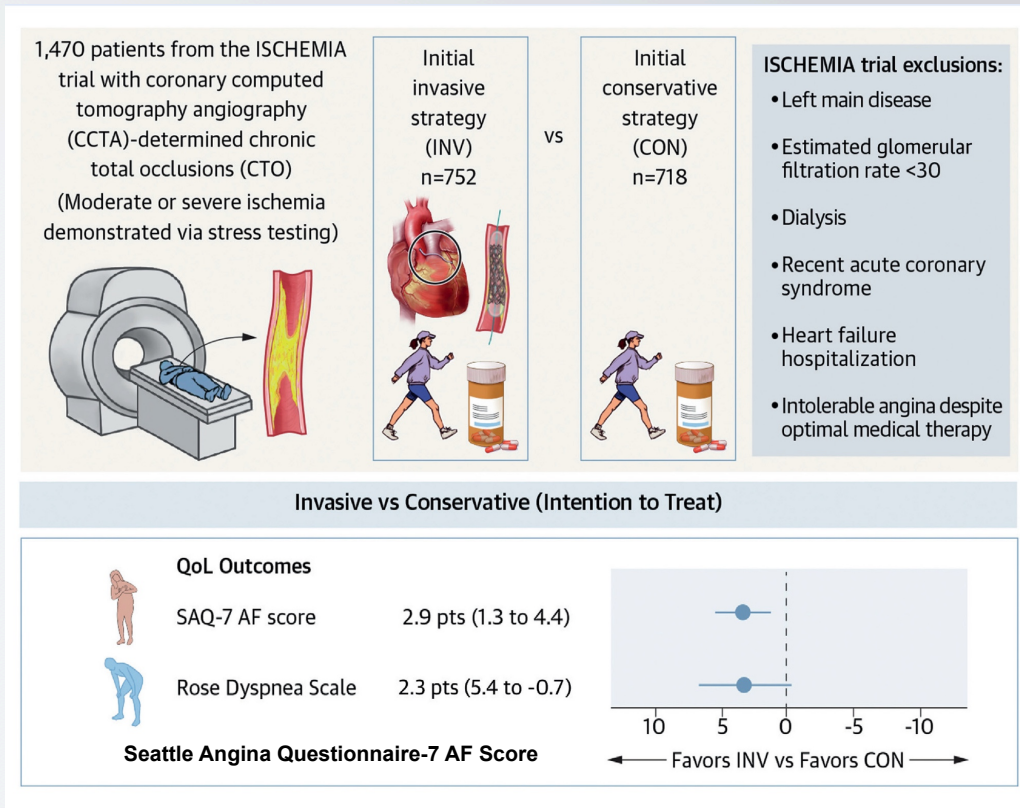
Changes in CCS class during follow-up



Higher score, better health status

*) Spertus et al. JACC 1995;25:333–

ISCHEMIA CTO Substudy



To compare outcomes of an initial invasive strategy (INV) versus an initial conservative strategy (CON) in patients with CCTA-determined chronic total occlusion (CTO) enrolled in the ISCHEMIA trial

Population

- Total ISCHEMIA randomized patients: **5,179**
- CCTA evaluable: **3,113 (60%)**
- Patients with ≥ 1 CTO: **1,470**
 - INV: **752**
 - CON: **718**

Endpoints: 5 yrs follow-up (median 3.3 yrs)

- **Secondary:** Procedural MI, Spontaneous MI, Unstable angina, Heart failure, Quality of life outcomes
- **Primary:** Cardiovascular death or myocardial infarction (MI)

ORBITA CTO

This is the first randomized, double-blind, placebo-controlled trial evaluating CTO PCI, addressing a major evidence gap in a field where procedural risks are higher and prior trials have been unblinded. It provides the first data isolating the treatment effect of CTO PCI from the substantial placebo response known to accompany revascularization procedures.



In patients with symptomatic single-vessel chronic total occlusion (CTO), percutaneous coronary intervention (PCI) **produced a measurable reduction in angina burden** compared with a placebo procedure.

50 patients with

- symptomatic, single-vessel CTO (J-CTO ≤ 3)
- evidence of ischemia and viability
- no significant non-CTO coronary disease
- optimized anti-anginal therapy before randomization

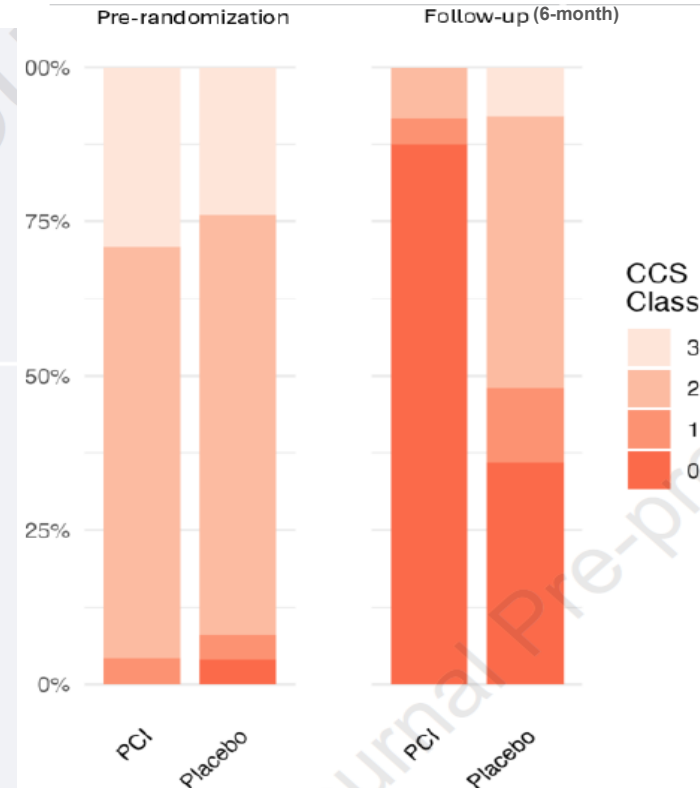
TRIAL DESIGN

-  Investigator-initiated
-  Multicenter
-  Double-blind
-  Randomized 1:1 to CTO PCI or placebo procedure
-  Blinded 24-week follow-up

64
median age

74%
men

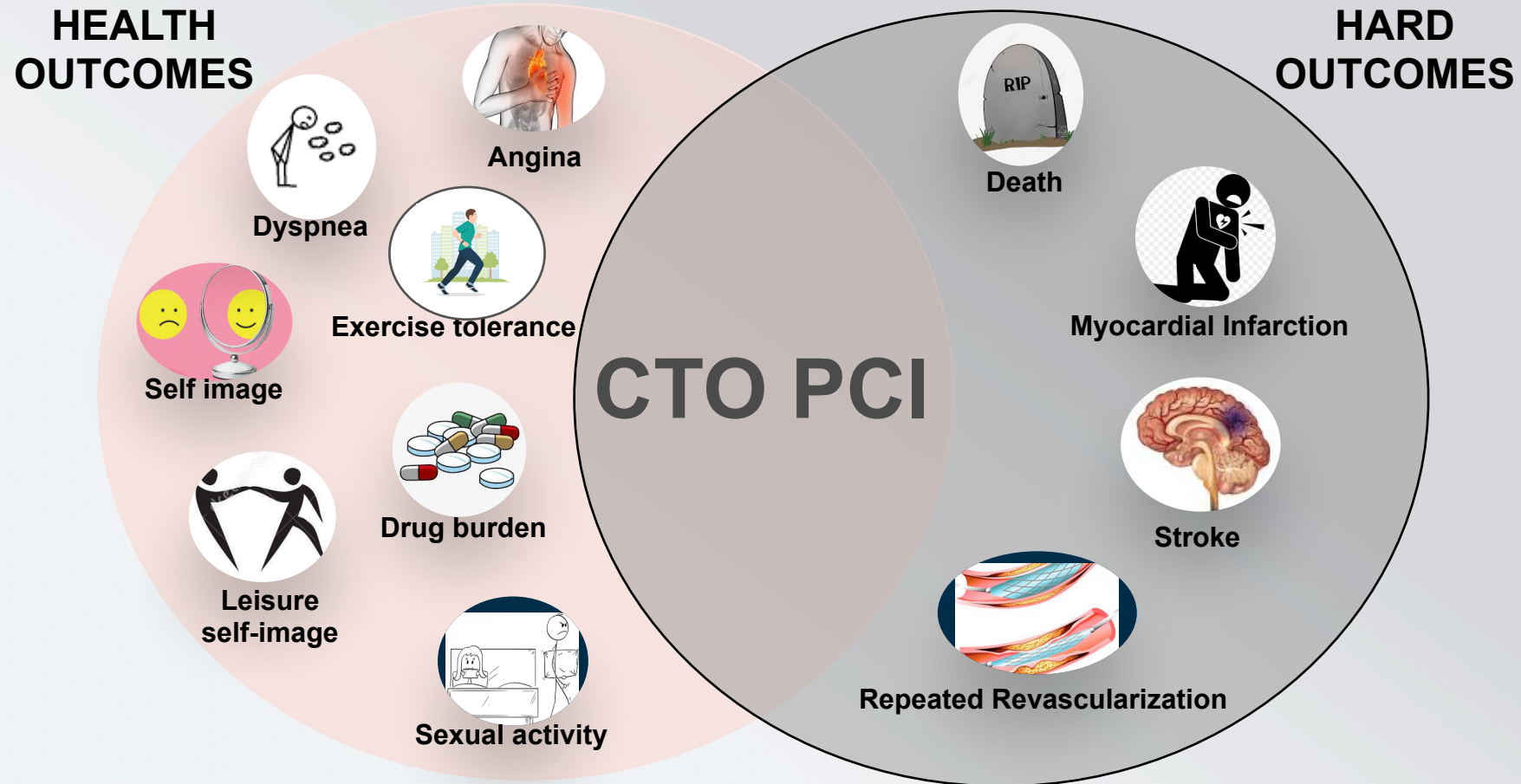
94%
CCS class II-III
at baseline



Myocardial Coronary Revascularization

Revascularization to improve symptoms		
In CCS patients with persistent angina or anginal equivalent, despite guideline-directed medical treatment, myocardial revascularization of functionally significant obstructive CAD is recommended to improve symptoms. ^{50,321,402,732,734,757}	I	A
Revascularization to improve outcomes		
In chronic coronary syndrome patients with left ventricular ejection fraction >35%		
In CCS patients with LVEF >35%, myocardial revascularization is recommended, in addition to guideline-directed medical therapy, for patients with functionally significant left main stem stenosis to improve survival. ^{718,719,859,860}	I	A
In CCS patients with LVEF >35%, myocardial revascularization is recommended, in addition to guideline-directed medical therapy, for patients with functionally significant three-vessel disease to improve long-term survival and to reduce long-term cardiovascular mortality and the risk of spontaneous myocardial infarction. ^{55,56,317,732-734}	I	A
In CCS patients with LVEF >35%, myocardial revascularization is recommended, in addition to guideline-directed medical therapy, for patients with functionally significant single- or two-vessel disease involving the proximal LAD, to reduce long-term cardiovascular mortality and the risk of spontaneous myocardial infarction. ^{55,56,317,719,732-734}	I	B
In chronic coronary syndrome patients with left ventricular ejection fraction ≤35%		
In CCS patients with LVEF ≤35%, it is recommended to choose between revascularization or medical therapy alone, after careful evaluation, preferably by the Heart Team, of coronary anatomy, correlation between coronary artery disease and LV dysfunction, comorbidities, life expectancy, individual risk-to-benefit ratio, and patient perspectives.	I	C
In surgically eligible CCS patients with multivessel CAD and LVEF ≤35%, myocardial revascularization with CABG is recommended over medical therapy alone to improve long-term survival. ^{53,54,749,861}	I	B
In selected CCS patients with functionally significant MVD and LVEF ≤35% who are at high surgical risk or not operable, PCI may be considered as an alternative to CABG. ^{526,729}	IIb	B

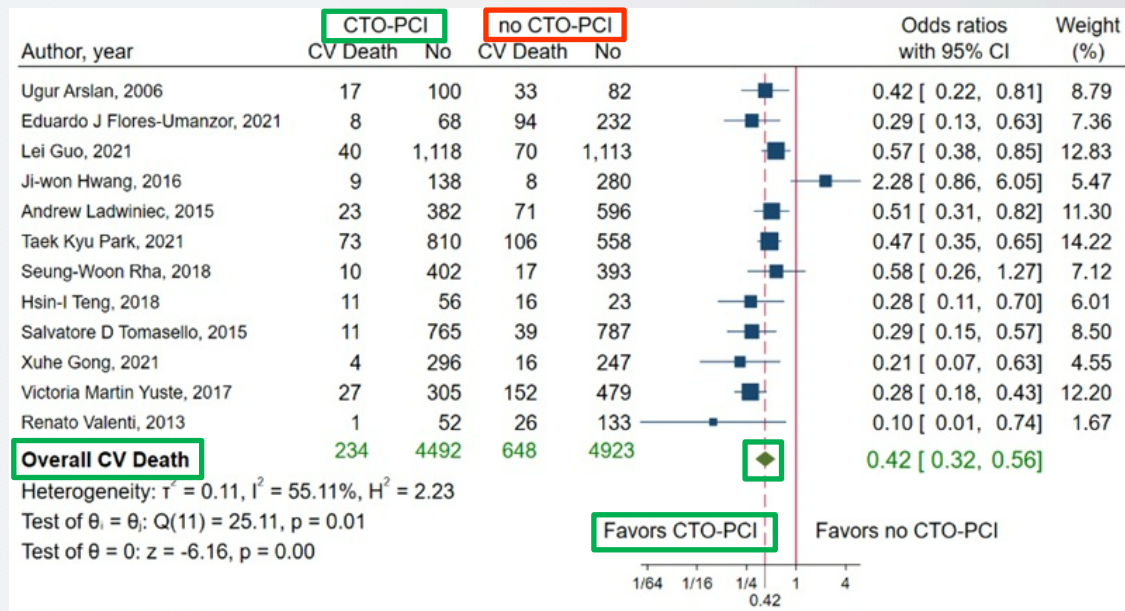
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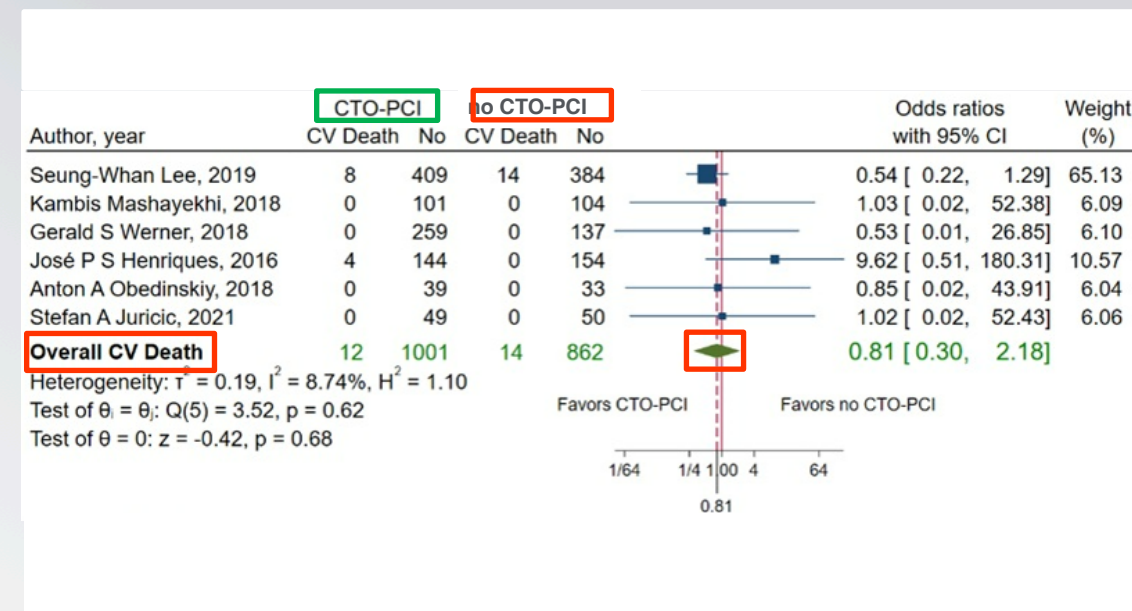
A Systematic Review and Meta-Analysis Undergoing Chronic Total Occlusion Percutaneous Coronary Intervention of Clinical Outcomes of Patients



CTO-PCI vs no CTO-PCI (observational)

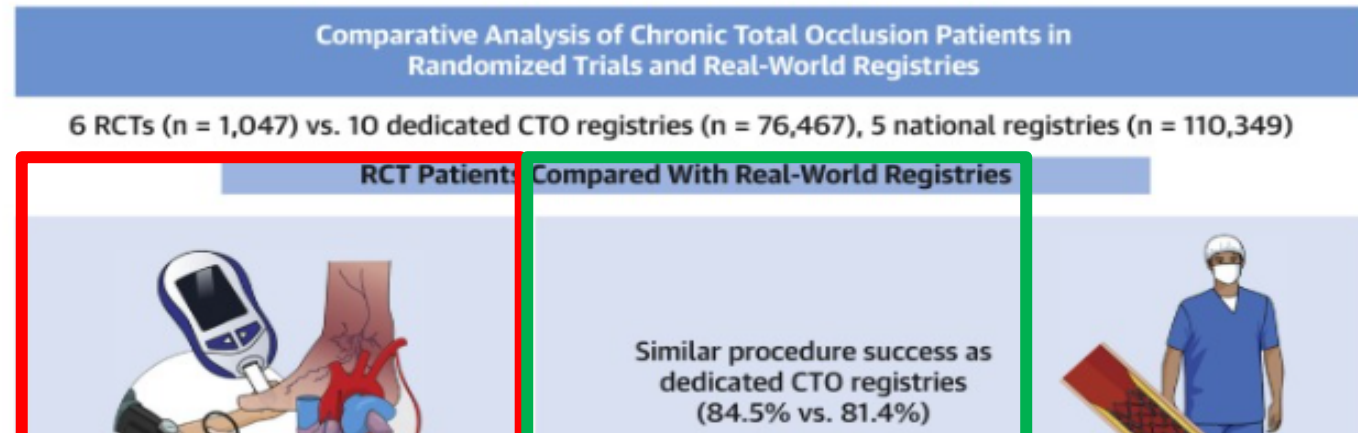


CTO-PCI vs no CTO-PCI (randomized)

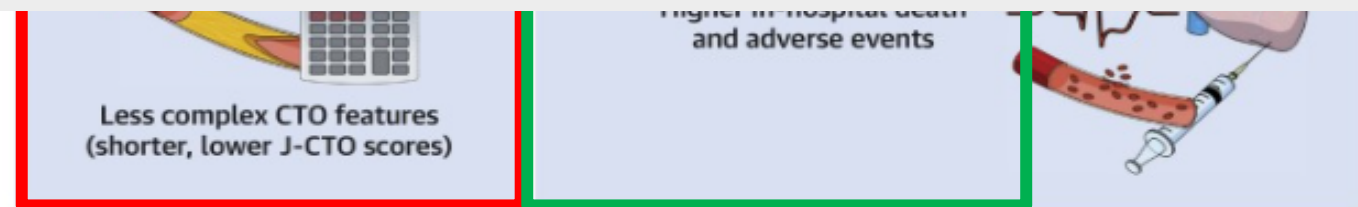


Comparative Analysis of Patient Characteristics in Chronic Total Occlusion Revascularization Studies

Trials vs Real-World Registries



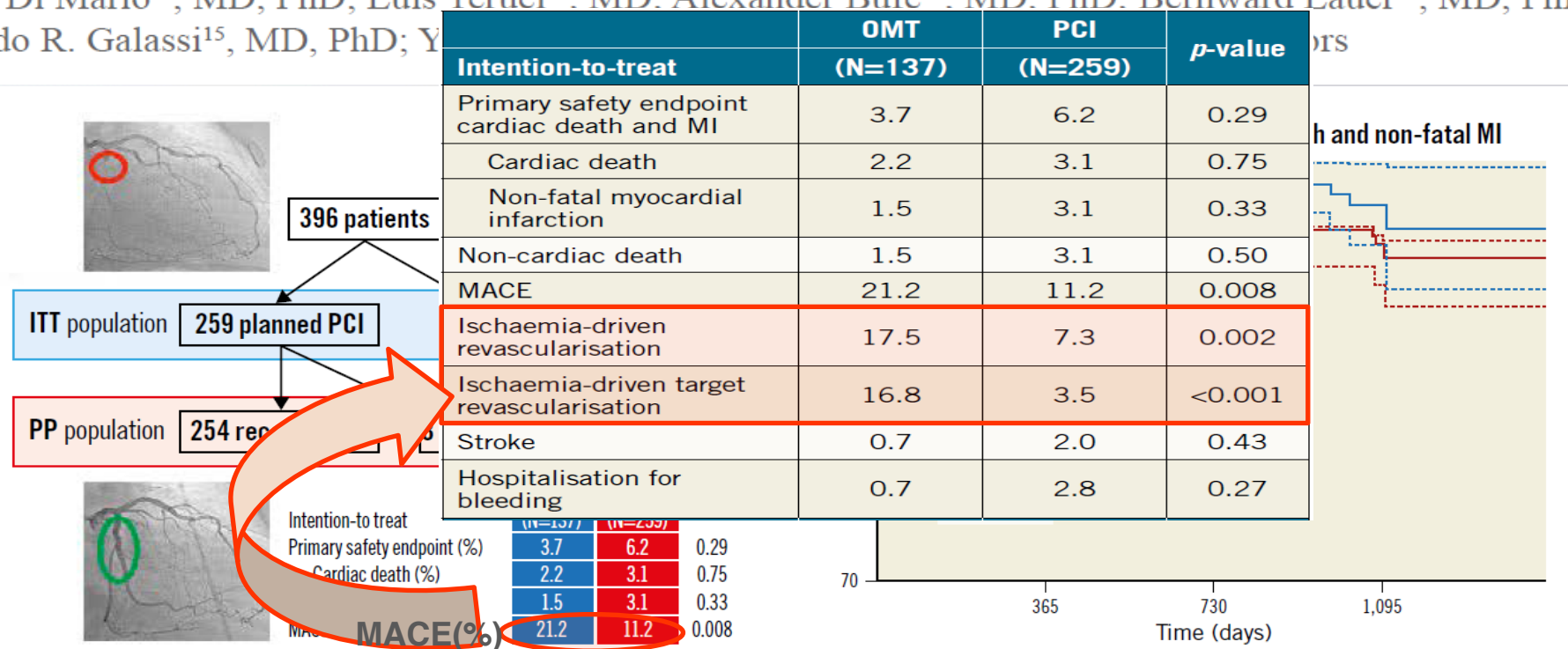
Current evidence from RCTs may not be representative of real-world patients and should be interpreted within its limitation



Megaly et al. JACC Intv 2022

Three-year outcomes of A Randomized Multicentre Trial Comparing Revascularization and Optimal Medical Therapy for Chronic Total Coronary Occlusions (EuroCTO)

Gerald S. Werner^{1*}, MD, PhD; David Hildick-Smith², MD, PhD; Victoria Martin Yuste³, MD, PhD; Nicolas Boudou⁴, MD; Georgios Sianos⁵, MD, PhD; Valery Gelev⁶, MD, PhD; Jose Ramon Rumoroso⁷, MD; Andrejs Erglis⁸, MD, PhD; Evald Høj Christiansen⁹, MD, PhD; Javier Escaned¹⁰, MD, PhD; Carlo Di Mario¹¹, MD, PhD; Luis Teruel¹², MD; Alexander Bufe¹³, MD, PhD; Bernward Lauer¹⁴, MD, PhD; Alfredo R. Galassi¹⁵, MD, PhD; Y



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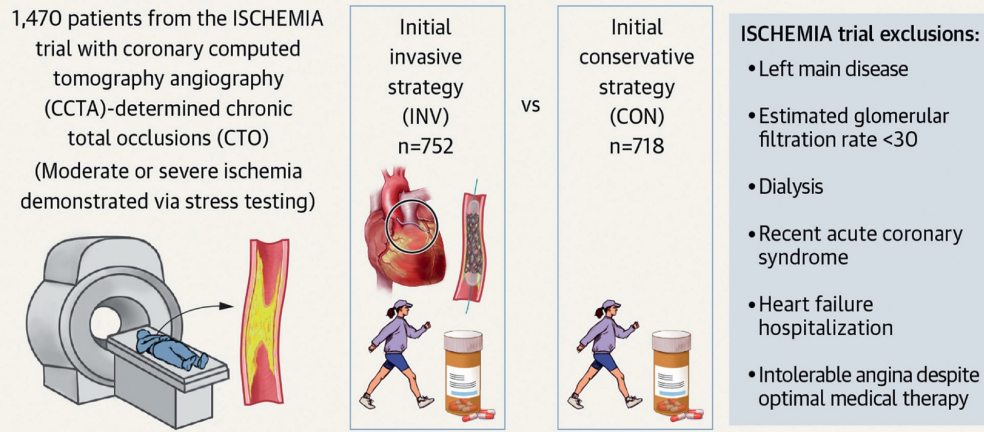
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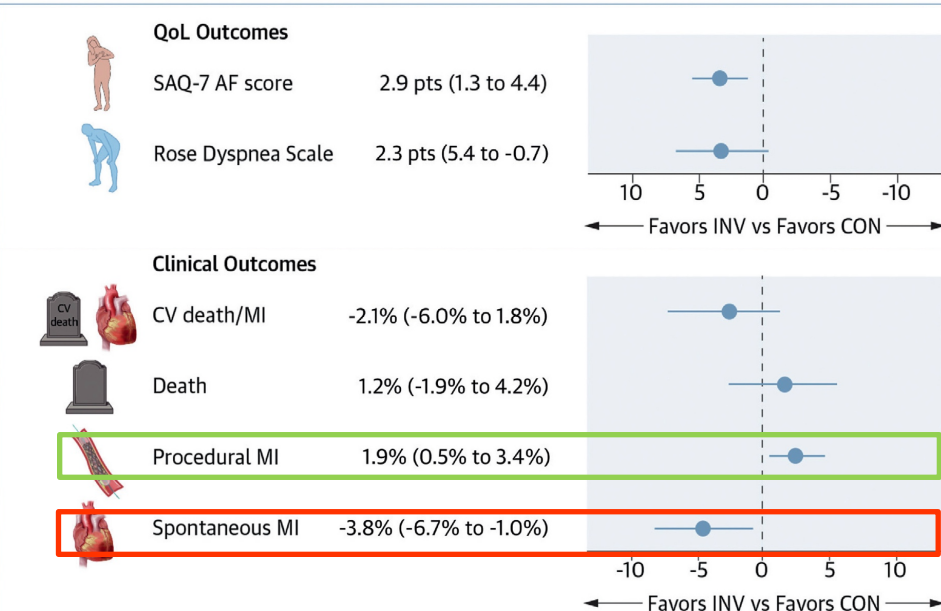
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Invasive vs Conservative (Intention to Treat)



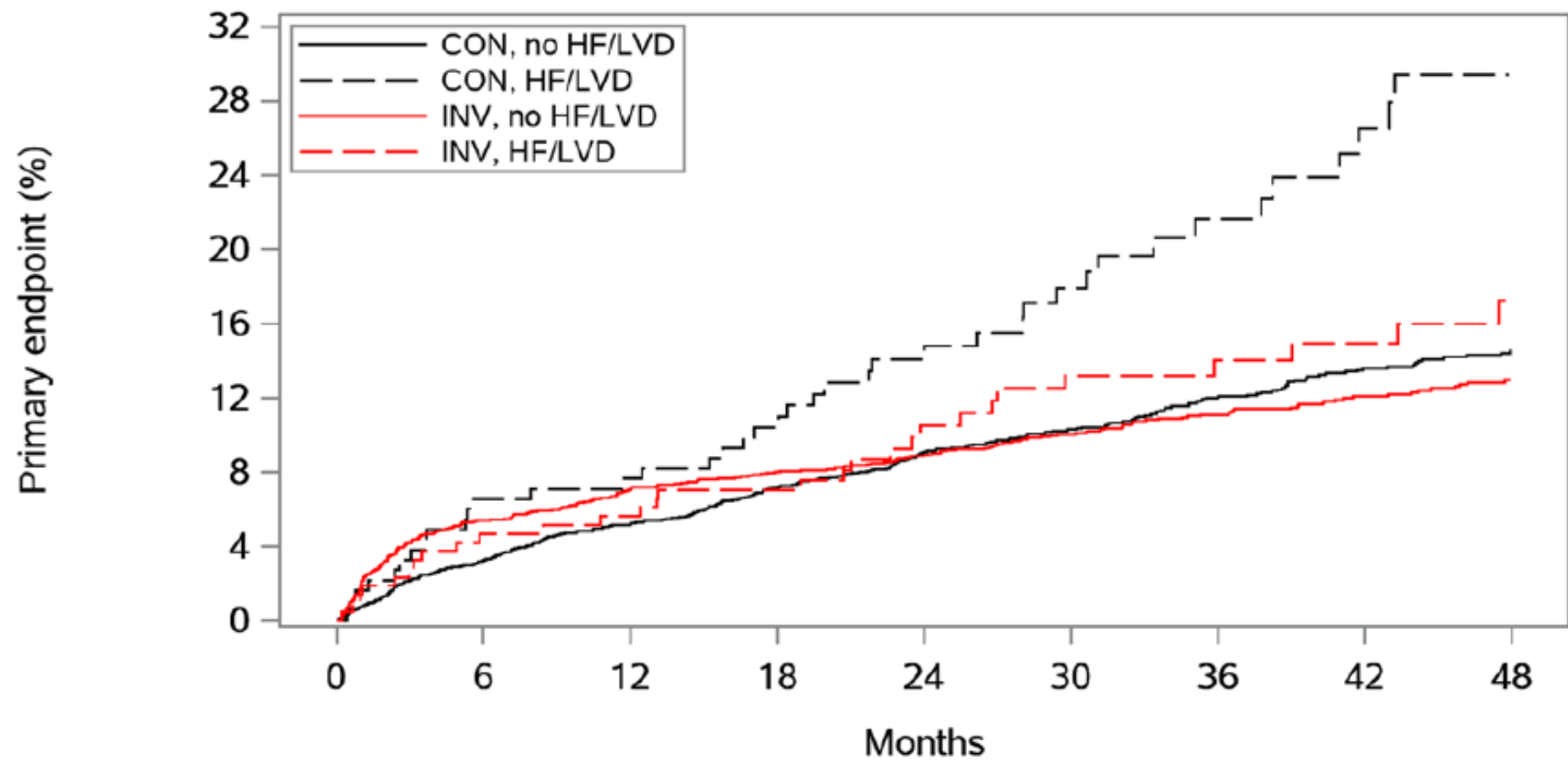


Initial Invasive Versus Conservative Management of Stable Ischemic Heart Disease in Patients With a History of Heart Failure or Left Ventricular Dysfunction

Insights From the ISCHEMIA Trial

CONCLUSIONS: ISCHEMIA participants with stable ischemic heart disease and at least moderate ischemia with a history of HF or LVD were at increased risk for the primary outcome. In the small, high-risk subgroup with HF and LVEF 35% to 45%, an initial invasive approach was associated with better event-free survival. This result should be considered hypothesis-generating.

Renato D. Lopes^{ID}, MD
:
David J. Maron, MD



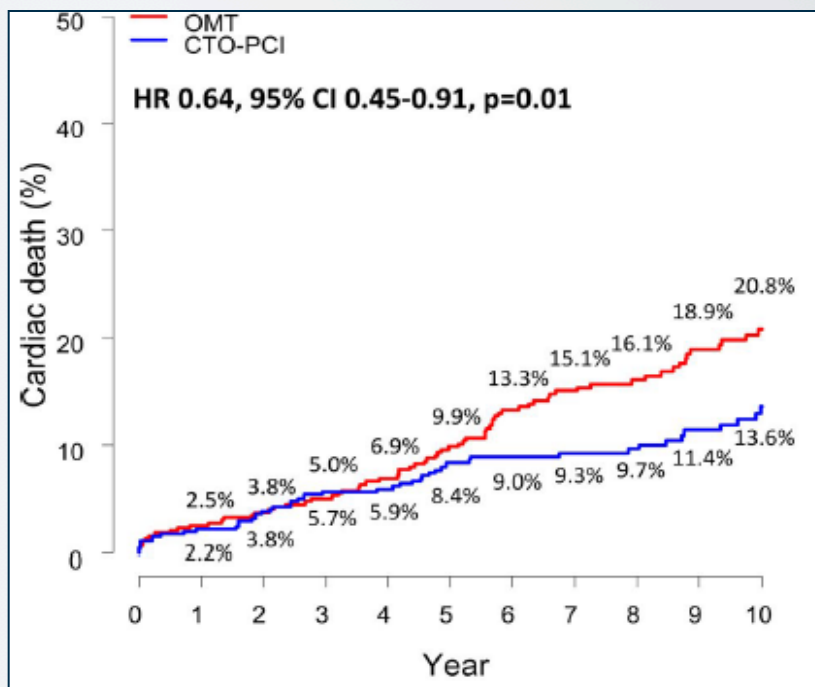
	Subjects at Risk								
CON, no HF/LVD	2404	2311	2260	2114	1781	1469	1222	947	690
CON, HF/LVD	184	172	169	156	124	98	77	56	43
INV, no HF/LVD	2372	2218	2164	2040	1764	1455	1189	913	670
INV, HF/LVD	214	203	199	185	143	121	103	84	63

CTO Revascularization – body of evidences

Journal of the American Heart Association

ORIGINAL RESEARCH

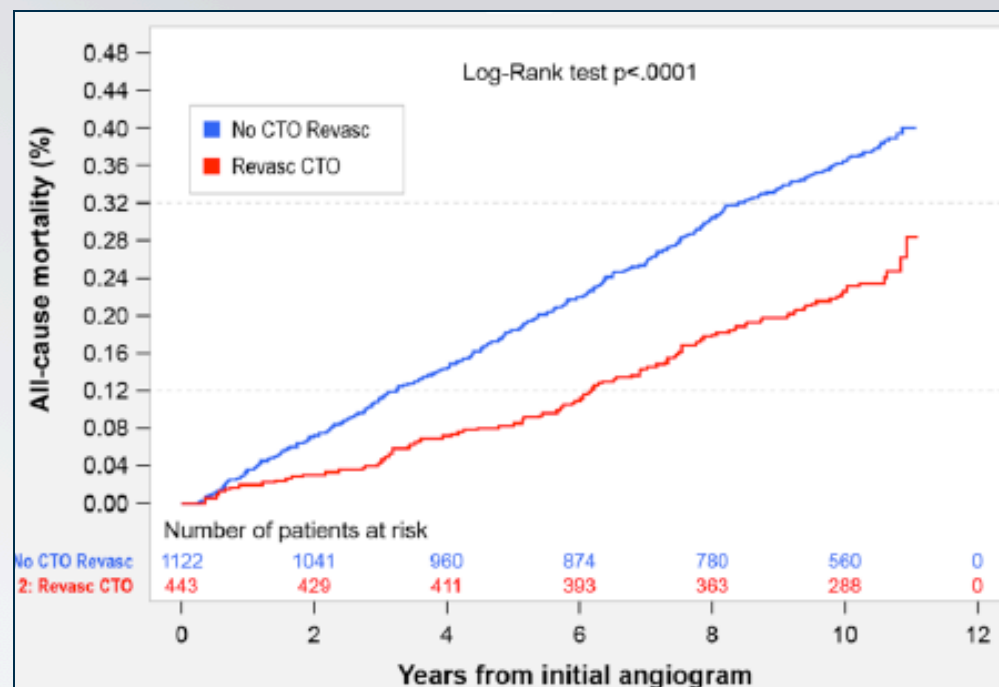
Late Survival Benefit of Percutaneous Coronary Intervention Compared With Medical Therapy in Patients With Coronary Chronic Total Occlusion: A 10-Year Follow-Up Study



Circulation: Cardiovascular Interventions

ORIGINAL ARTICLE

Canadian Multicenter Chronic Total Occlusion Registry: Ten-Year Follow-Up Results of Chronic Total Occlusion Revascularization



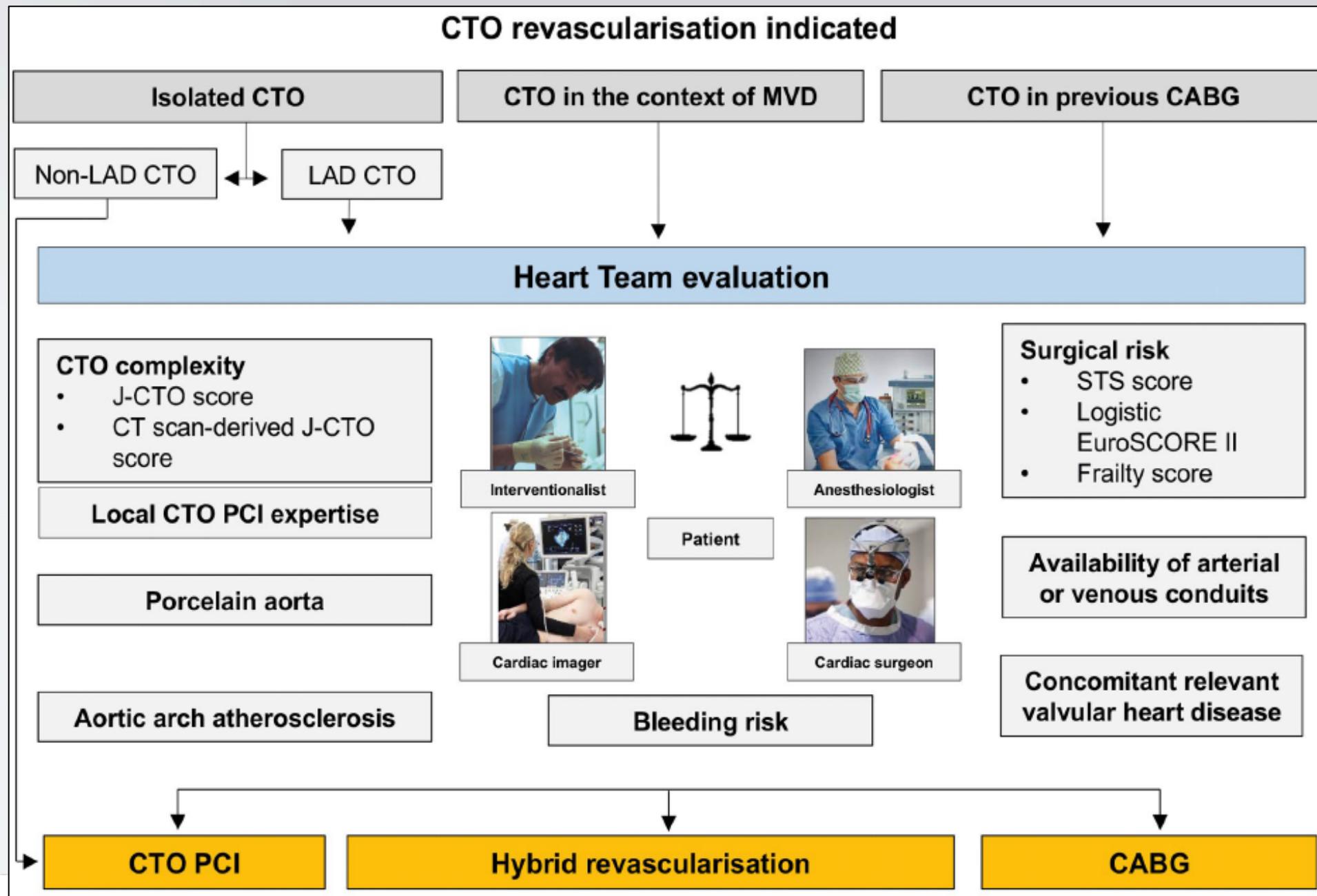
Park et al, Am Heart Assoc 2021

Strauss et al, Circ Cardiovasc Interv 2021

Myocardial Coronary Revascularization

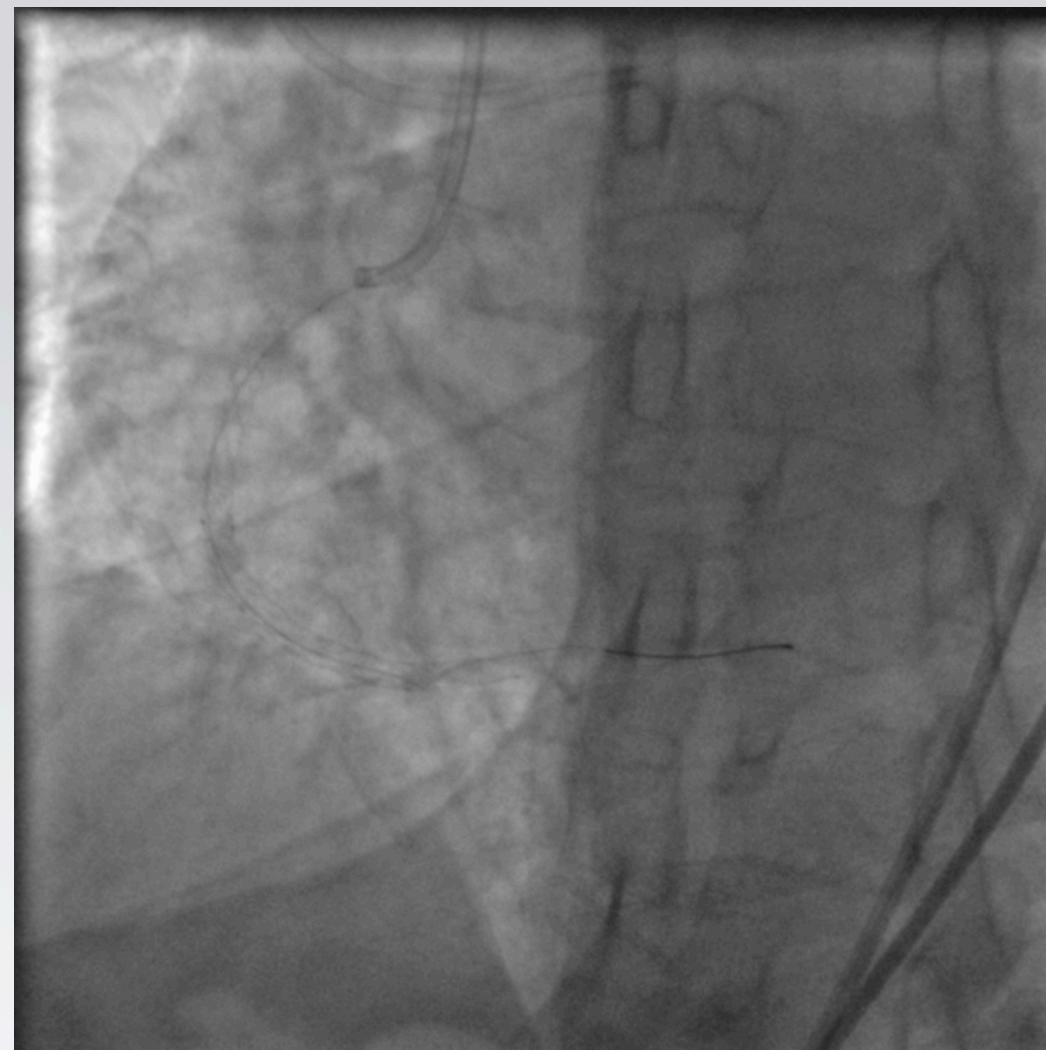
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What Next?

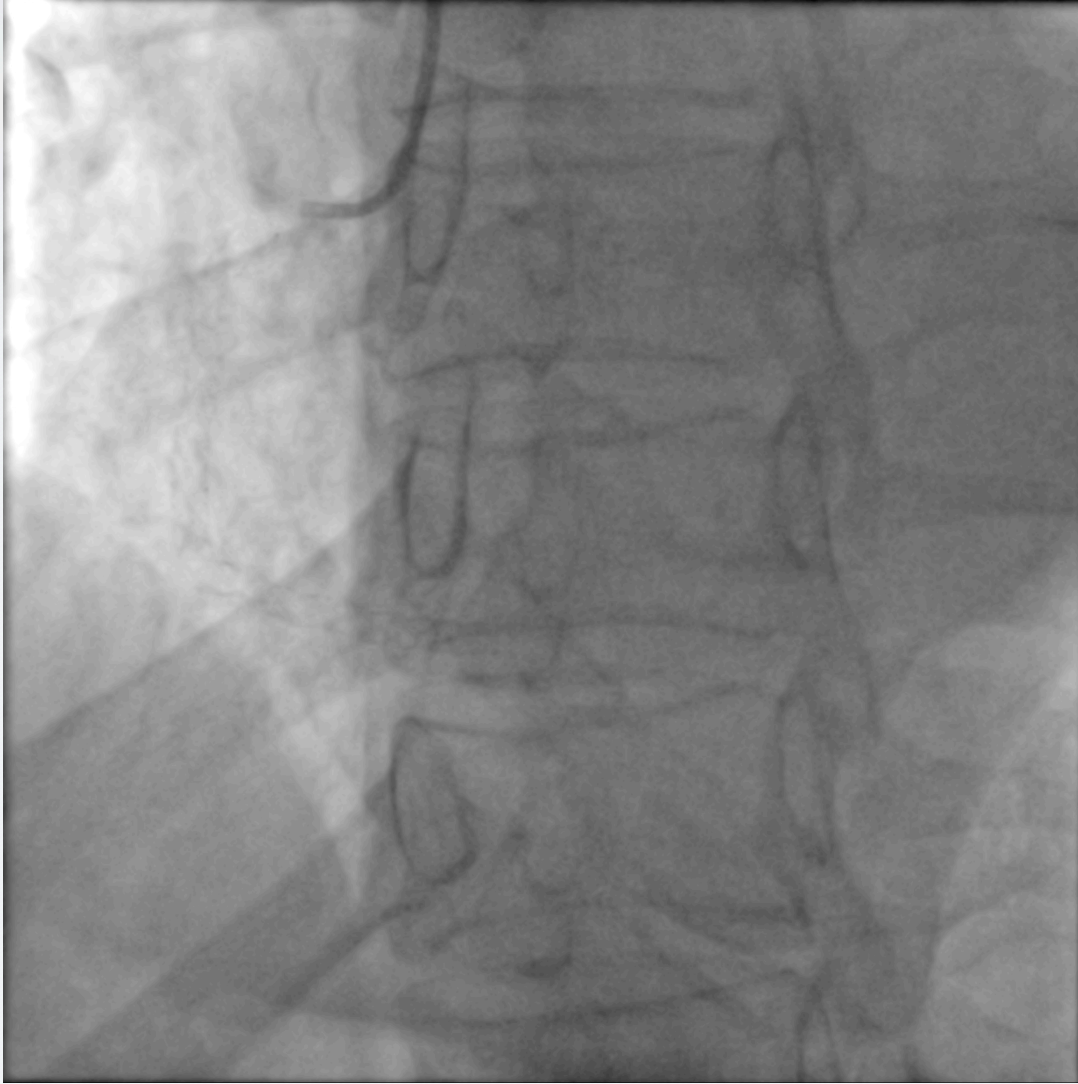


Excellent CTO FU results

RCA-CTO PCI by retrograde approach 2018

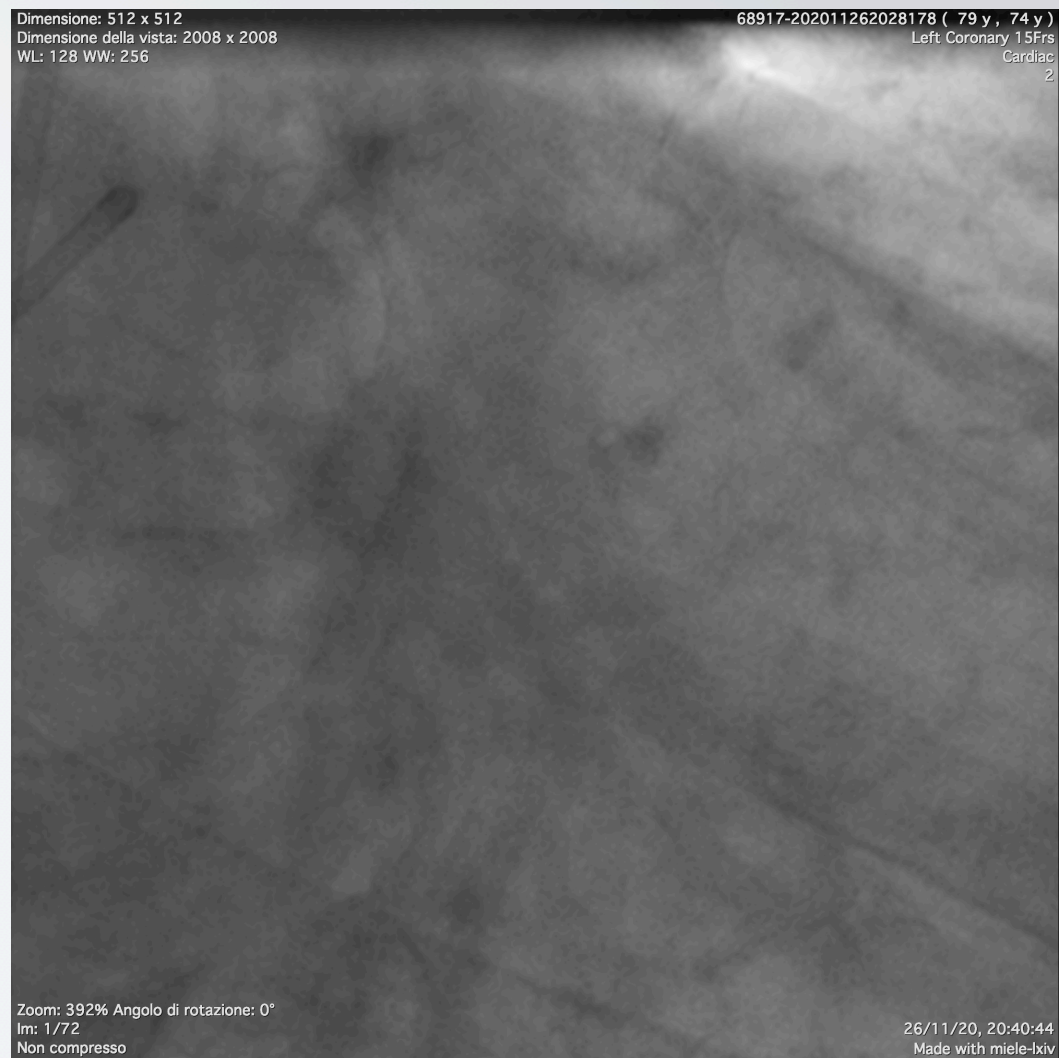


Follow-up Coronary Angiography 2026 (8 years later)

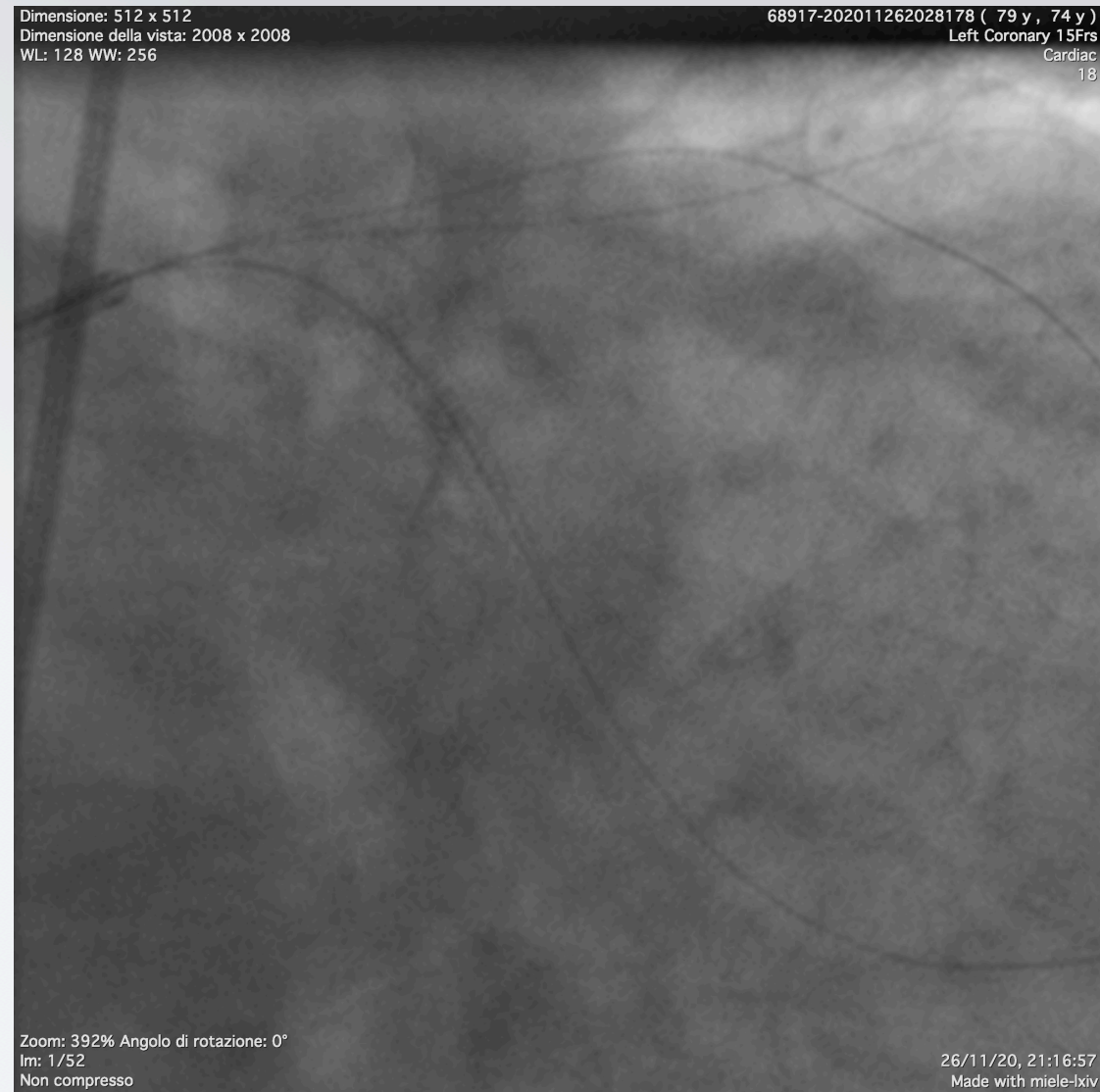


CTO in MVD

3 Vessel diseased including 1 CTO



CX-CTO PCI



After treatment

Bifurcation LAD-D1 and LM PCI by DKMC



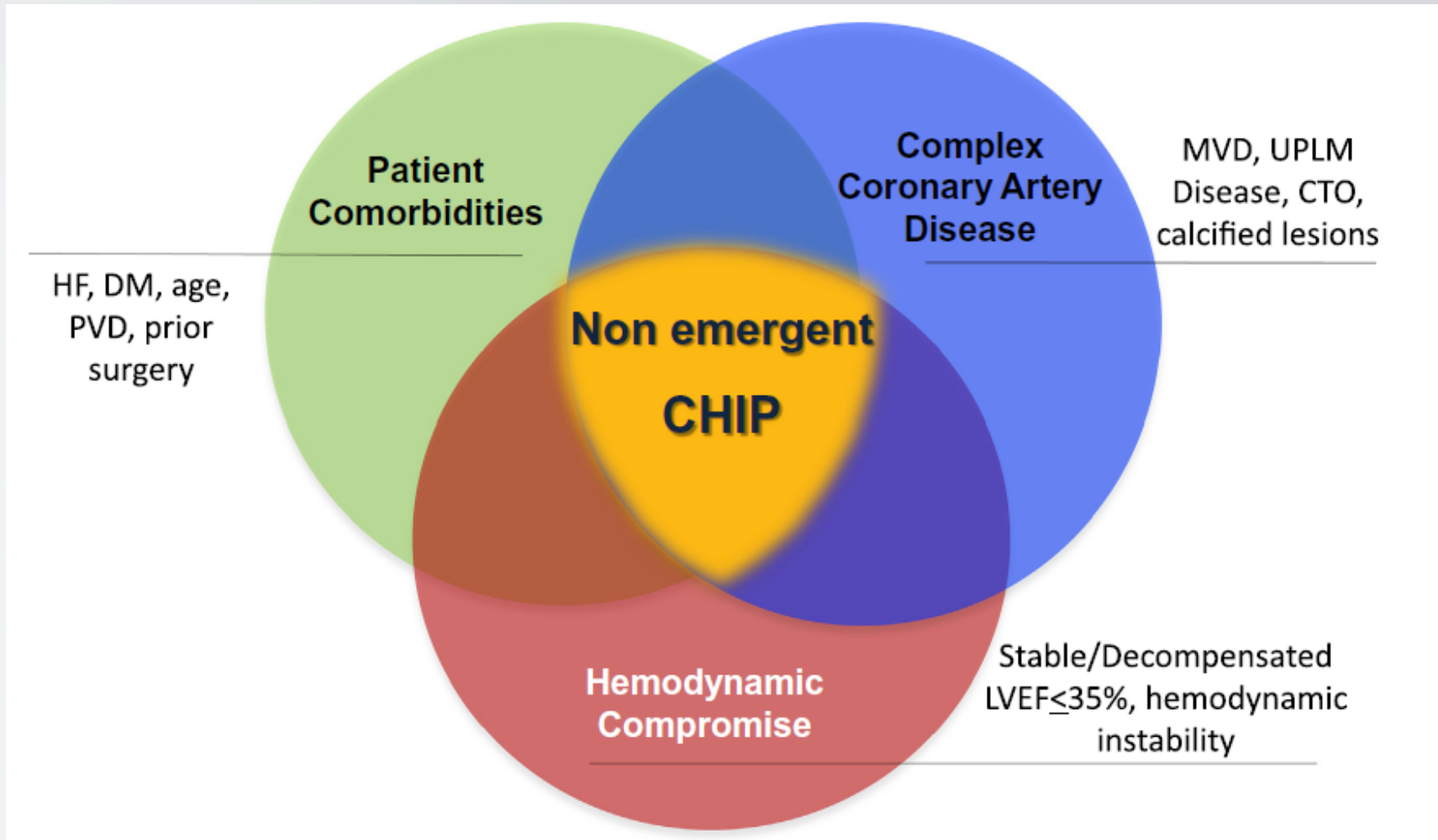
After treatment

RCA PCI



After treatment

CTO and Complex High-Risk Indicated (CHIP) Percutaneous Coronary Intervention (PCI)



**Grazie per
la vostra attenzione**

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