



# **CTO Recanalization - Effect of the Retrograde Approach**

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**ACIBADEM CITYCLINIC**

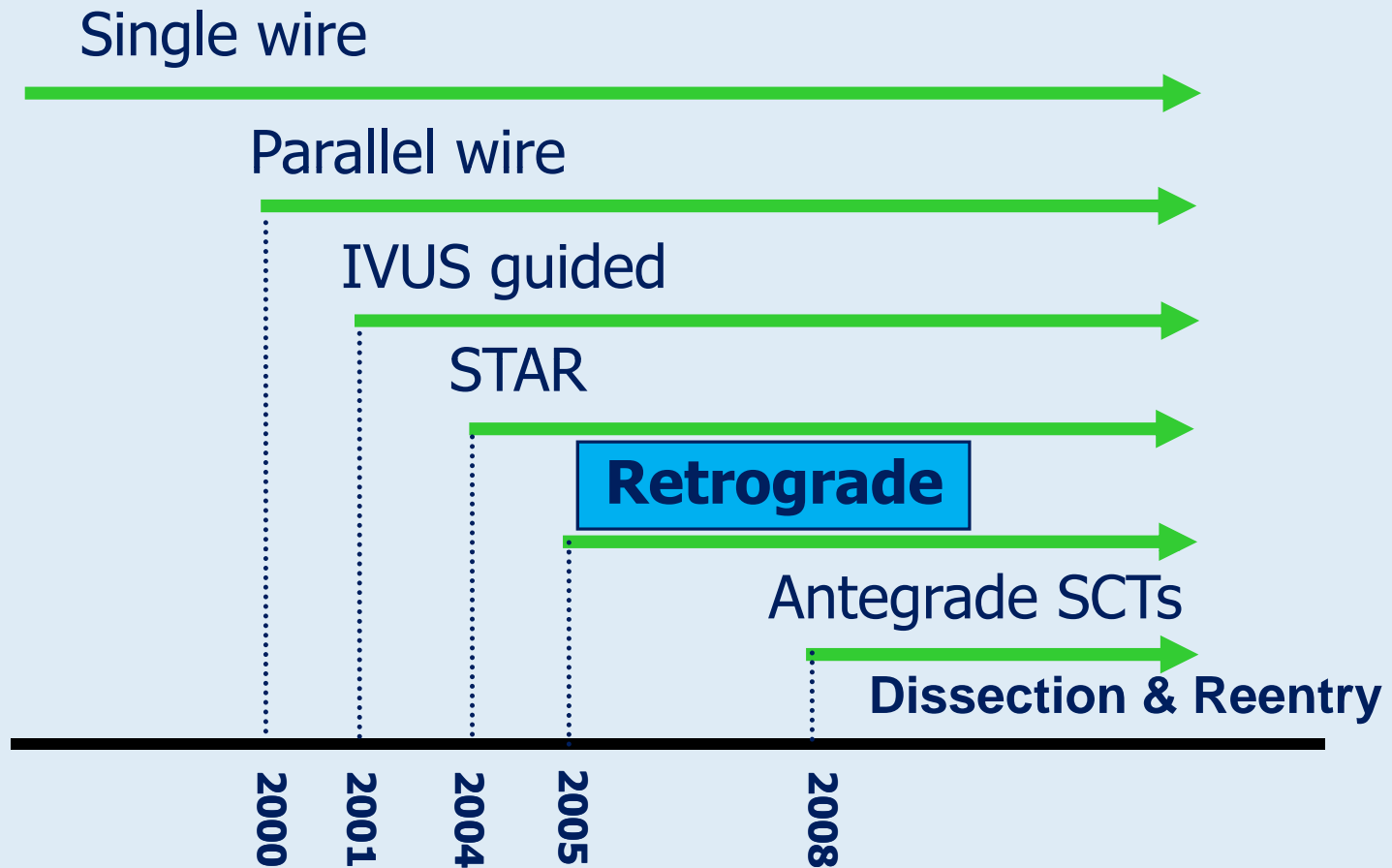
TOKUDA HOSPITAL

No conflict of interest regarding this presentation.

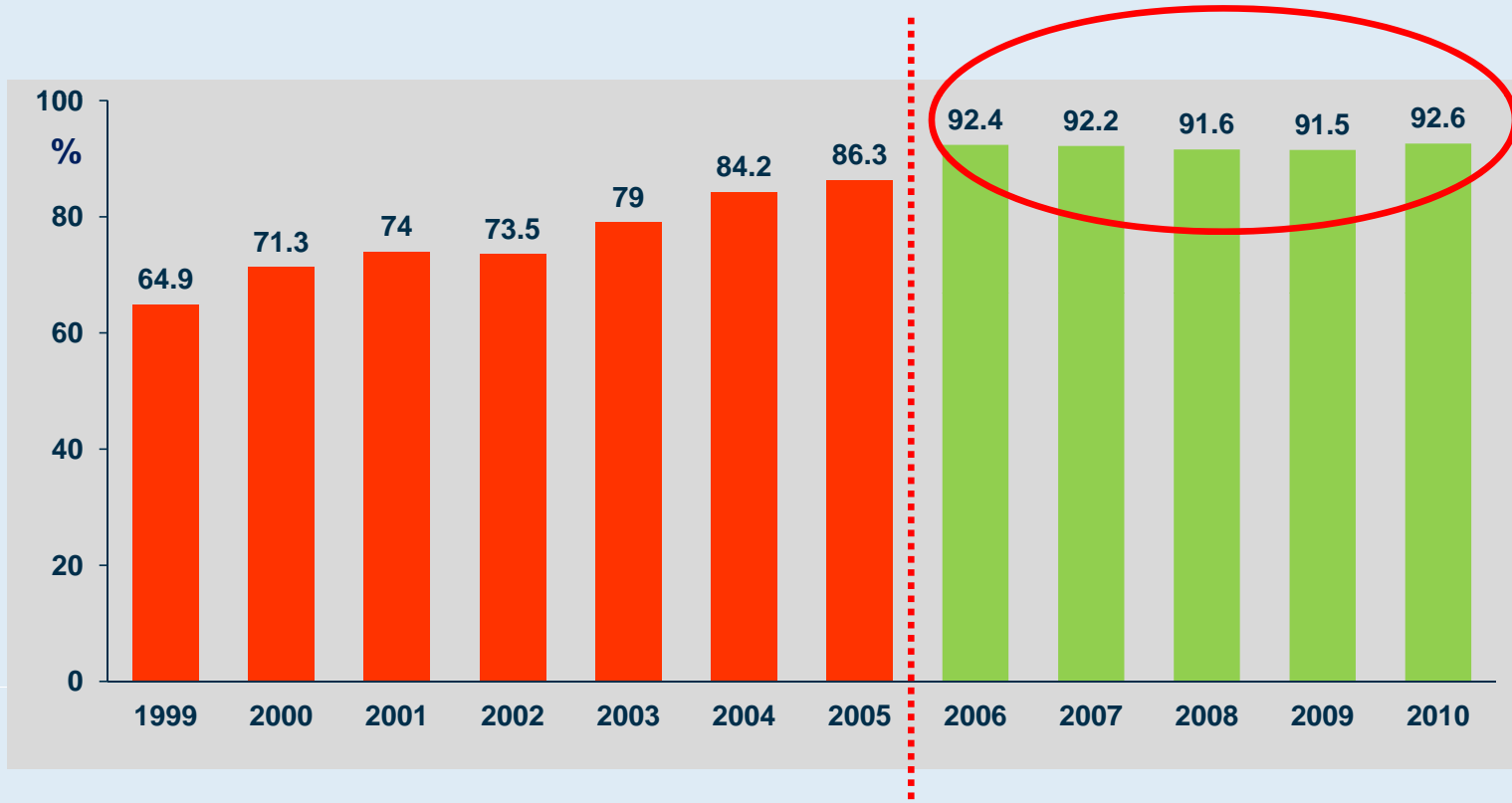
## Rational for CTO Recanalization

- Symptom control
  - Angina
  - CHF
  - Fatigue
- Improve LV function
  - Regional
  - Global
- Survival
  - Improved tolerance of AMI
  - Complete revascularization
  - Ischemic Risk

# Development of CTO Techniques

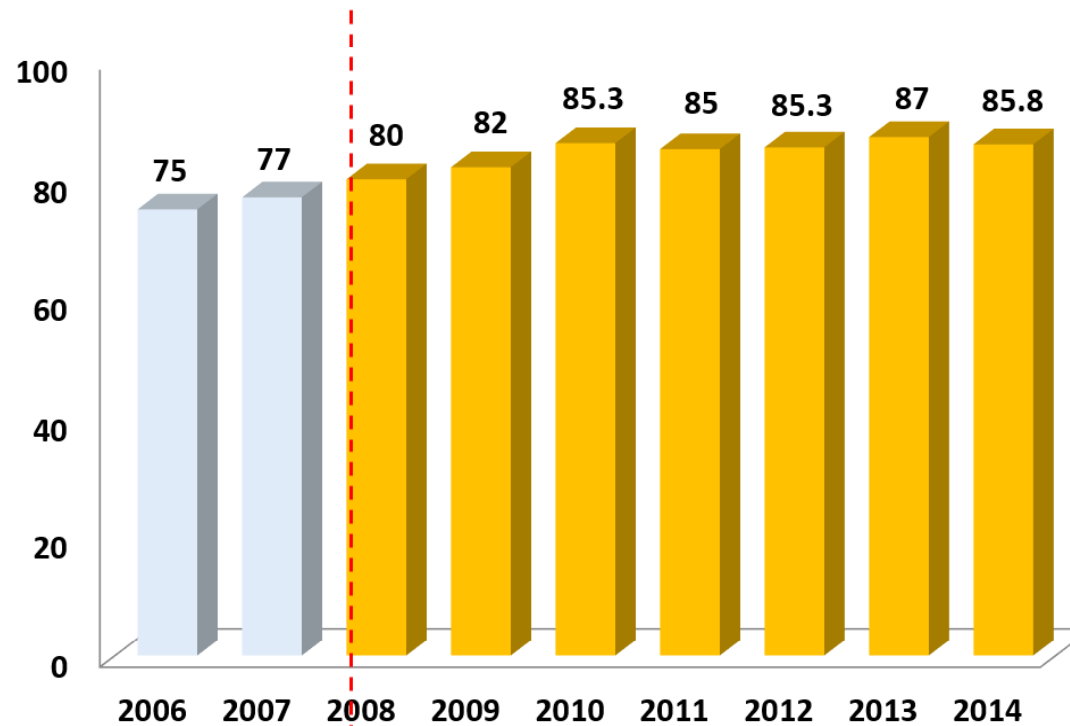


# CTO-PCI Success Rate in Toyohashi Heart Center



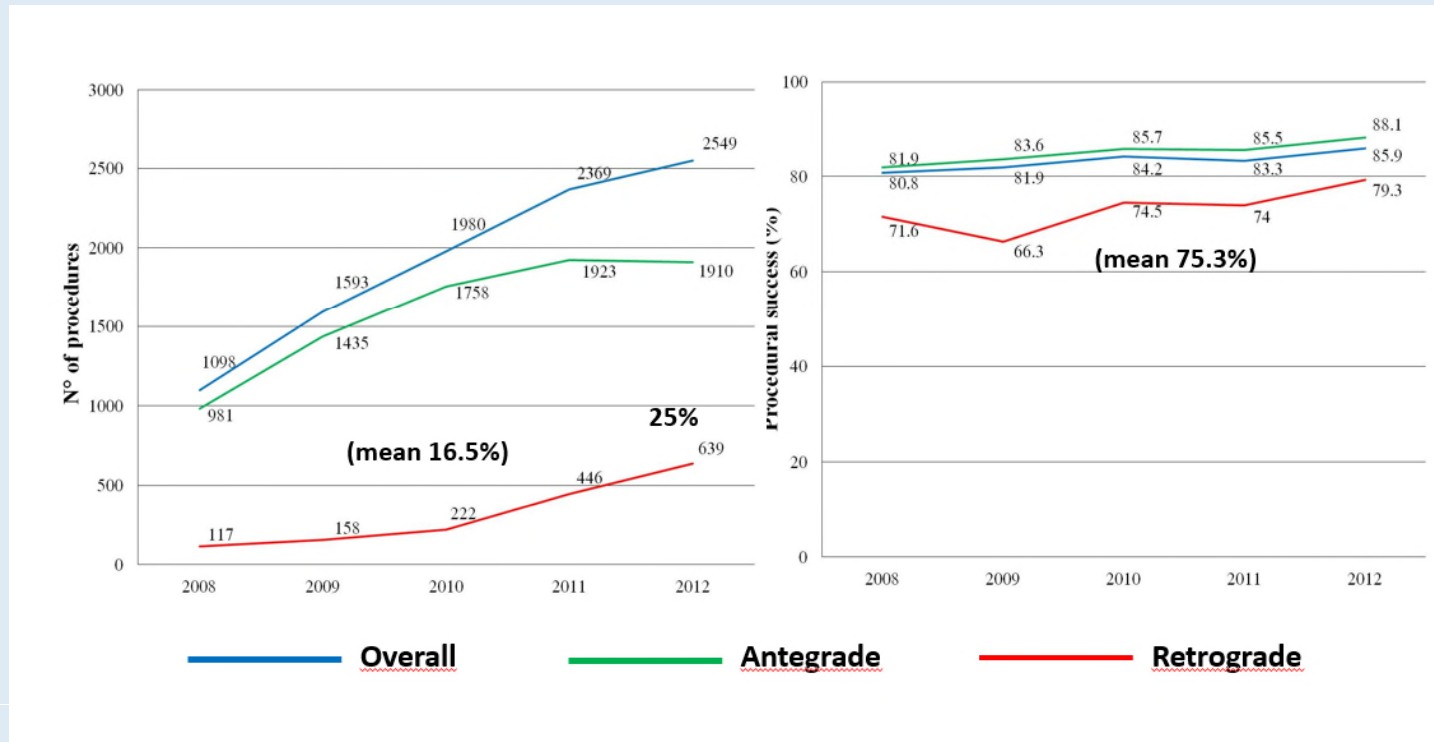
# Retrograde approach improve success rate of CTO PCI

European Registry Update



Sianos G, CTO Summit, NY, 2015

# Numbers of Retrograde Procedures Success Rate Europe



# Japanese CTO PCI Expert Registry

## Summary

- Japanese experts frequently chose the bidirectional approach as the primary strategy (27.9%), especially for more complex CTO lesions, with a technical success rate of about 90%.
- For intermediate CTO lesions (J-CTO score < 2), experts mainly performed the antegrade approach alone, with a very high success rate (more than 95%).
- However, for RBA, the success rate decreased to less than 80%.
- The experts frequently used the parallel wiring and IVUS-guided penetration in antegrade approach, with high technical success (75.0%–88.9%).
- Severe lesion calcification was a strong predictor of failure.





# PROspective Global REgiStry for the Study of CTO interventions

[www.progresscto.org](http://www.progresscto.org)



- Appleton Cardiology, WI
- Baylor Heart and Vascular Hospital, TX
- Columbia University, NY
- Central Arkansas VAMC, AR
- Dallas VAMC/UTSW, TX
- Henry Ford Hospital, MI
- Massachusetts General Hospital, MA
- Medical Center of the Rockies, CO
- Minneapolis VAMC, MN
- Minneapolis Heart Institute, MN
- PeaceHealth St. Joseph MC, WA
- Piedmont Heart Institute, GA
- San Diego VAMC and UCSD, CA
- St Luke's Mid America Heart Institute, MO
- Torrance Medical Center, CA
- UPMC Medical Center, PA

5/2012 to 2/2017

**16 centers, 2,102 lesions**

Technical success **88%**

Major complications: **2.6%**

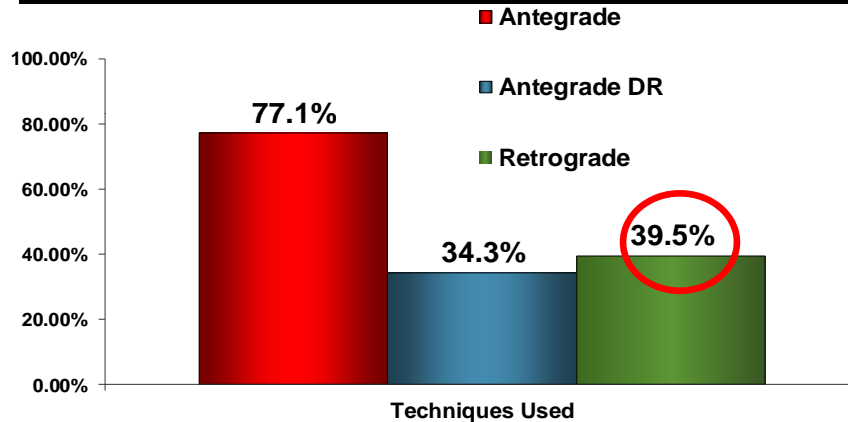
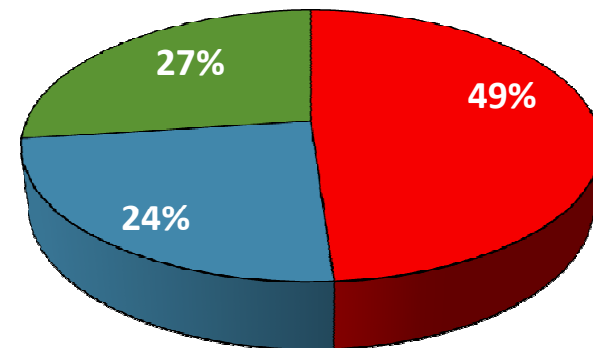
0.6% mortality, 0.9% MI

0.9% pericardiocentesis, 0.2% stroke

0.1% CABG, 0.3% re-PCI

## Successful technique

- Antegrade wiring
- Antegrade dissection/re-entry
- Retrograde



Emmanouil S. Brilakis CTO Summit New York 2017



January 2010  
Starting our experience with  
Retrograde Approach

George Sianos  
and

Alexander Doganov

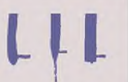

During  
Second Retrograde CTO  
Workshop

- **When to Consider Retrograde Approach**
  - In difficult anatomy
  - To achieve fast and predictable result in not that complex cases with good retrograde options, while preserving the anatomy of the vessel

# CTO Complexity – J CTO score

**J-CTO SCORE SHEET** Version 1.0

**Variables and definitions**

<b>Tapered</b>	<b>Blunt</b>	Entry with any tapered tip or dimple indicating direction of true lumen is categorized as "tapered".	<b>Entry shape</b>
			<input type="checkbox"/> Tapered (0) <input type="checkbox"/> Blunt (1)
			point

**Calcification**

Presence (1)  
 Absence (0)

**Bending\***

Presence (1)  
 Absence (0)

**Occlusion length**

<20mm (0)  
 ≥20mm (1)

**Re-try lesion**

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

No (0)  
 Yes (1)

point

**Category of difficulty (total point)**

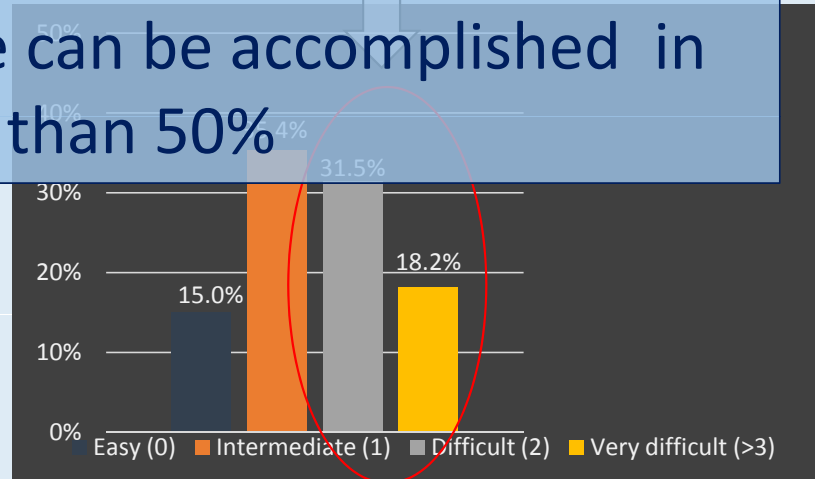
easy (0)    Intermediate (1)  
 difficult (2)    very difficult (≥3)

**Total**

points

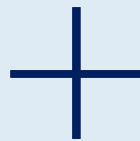
- Blunt tip/none or unclear tip: 53.7%
- Calcification\*: 33.7%
- Bending\*: 8.5%
- Occlusion length>20mm: 61.7%

In difficult CTOs (J-CTO score  $\geq 2$ ), successful antegrade wiring of the CTO within 30 minutes of fluoroscopy time can be accomplished in less than 50%



## When to Consider Retrograde Approach

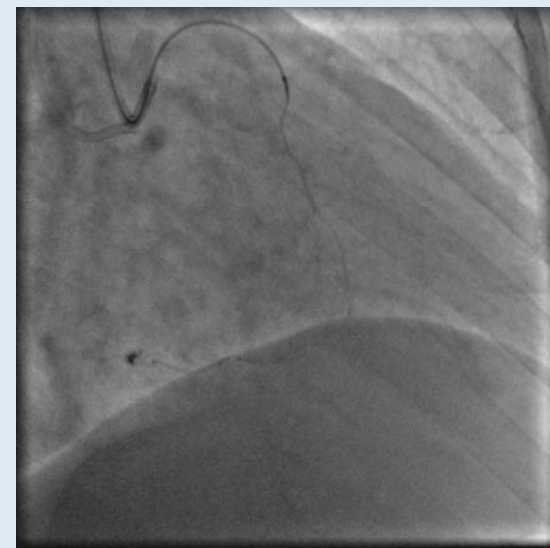
- Abrupt occlusion with a large side branch
- Ambiguous anatomy of proximal cap and vessel course.
- Length of CTO  $\geq$  20mm
- Bending in the CTO body
- Severe Calcifications
- Poor distal landing zone or bifurcation
- Previous failed attempt



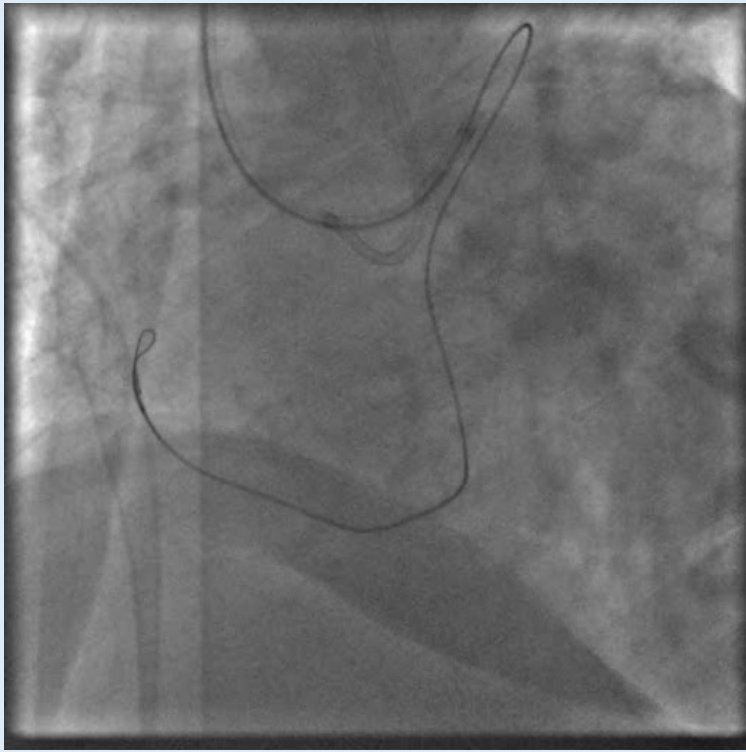
### Interventional collaterals present

- Dependent on the experience of the operator
- Absent in 20-30 % of cases

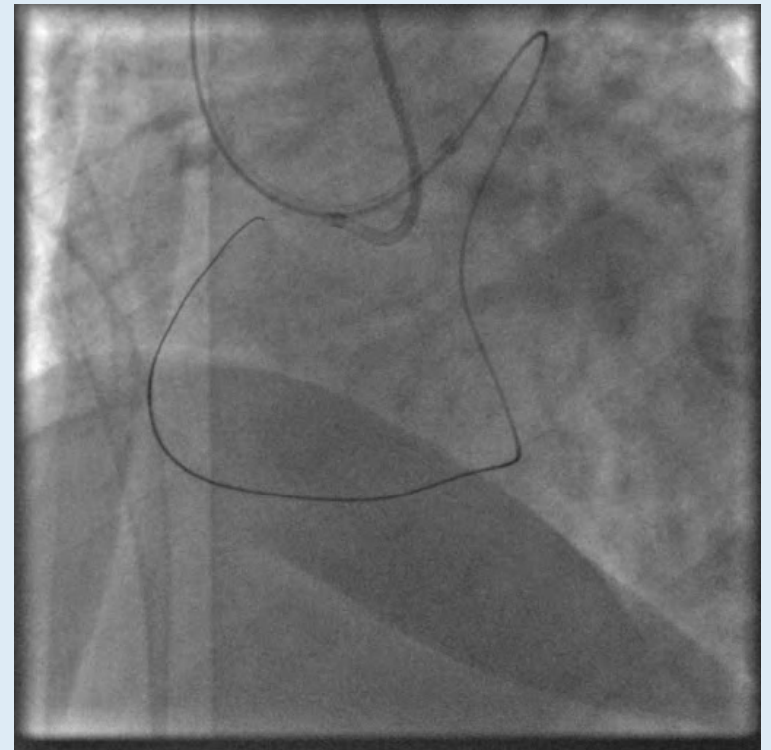
## RCA CTO – J CTO score 0-1 Primary Retrograde Approach



## RCA CTO

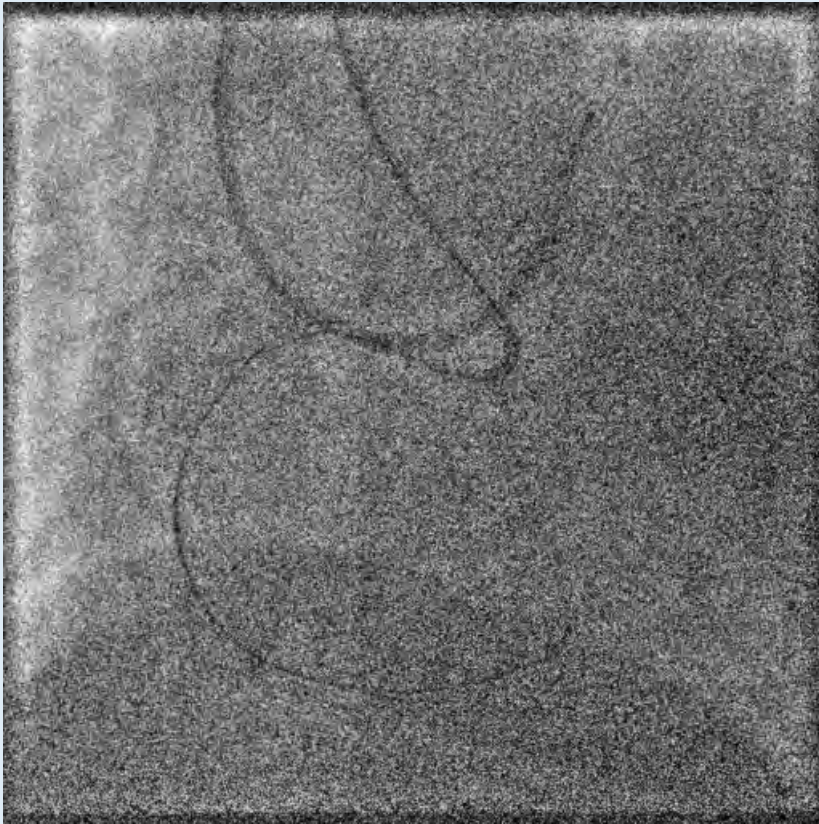


Retrograde crossing with Sion over Corsair



Ultimate through distal cap

## RCA CTO



Antegrade wiring with Ultimate

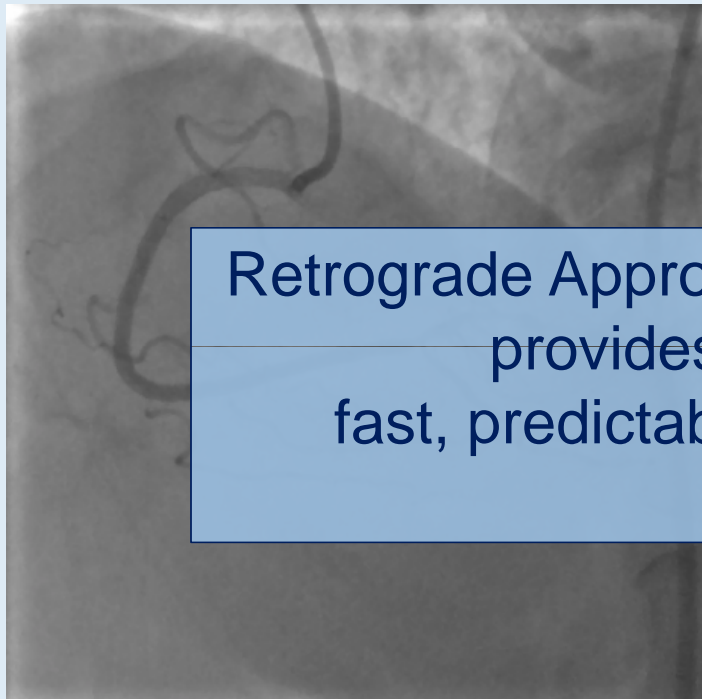


Reverse CART with 2,5/15 balloon  
Ultimate wire exchanged with Pilot 150



## RCA CTO Final result and Procedural Details

Final result after 3DES



	Antegrade Attempt	Retrograde Attempt
Procedural time	118 min.	90 min.
X ray time	57 min	35 min
Contrast volume	430 ml	330 ml
# of CTO wires	4	4
	<b>Failure</b>	<b>Success</b>

Retrograde Approach, even in not that complex cases, provides the opportunity to achieve fast, predictable success, sparing the anatomy of the vessel.

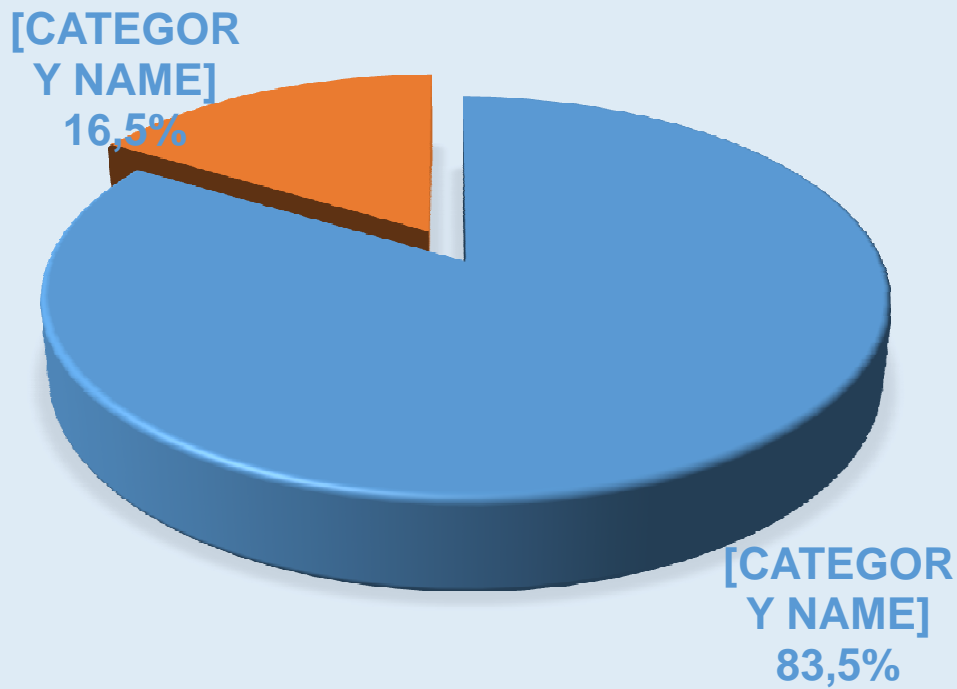
## CTO Experience

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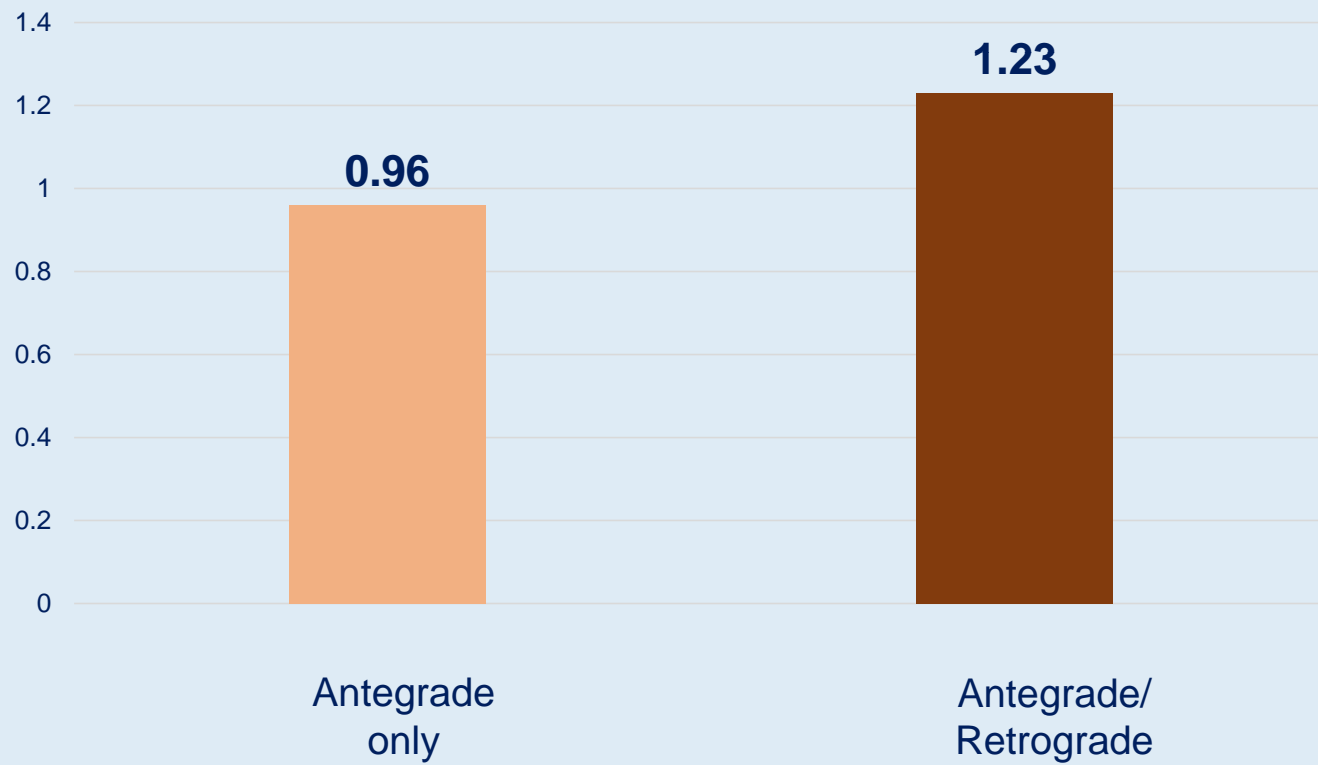
<b>National Heat Hospital</b>	2002 - 2005	
	2006	117
	2007	159
<b>National Heat Hospital</b>	2008	154
	2009	81
<b>Emergency Center "Pirogov"</b>	2010 - March2013	164
<b>Tokuda Hospital</b>	March2013-2016	238

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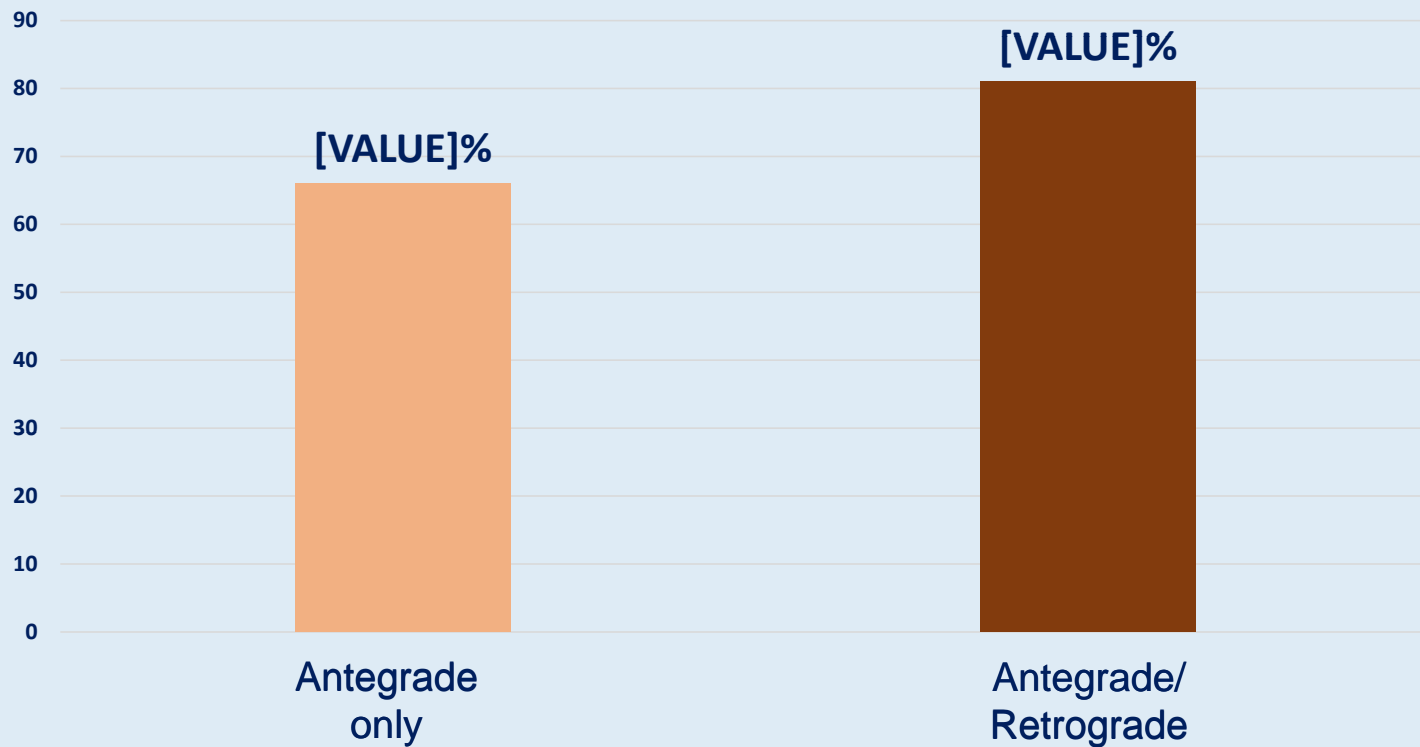
National Heat Hospital	2008	154	Antegrade only
	2009	81	
Emergency Center "Pirogov"	2010 - March2013	164	Antegrade/ Retrograde
Tokuda Hospital	March2013-2016	238	



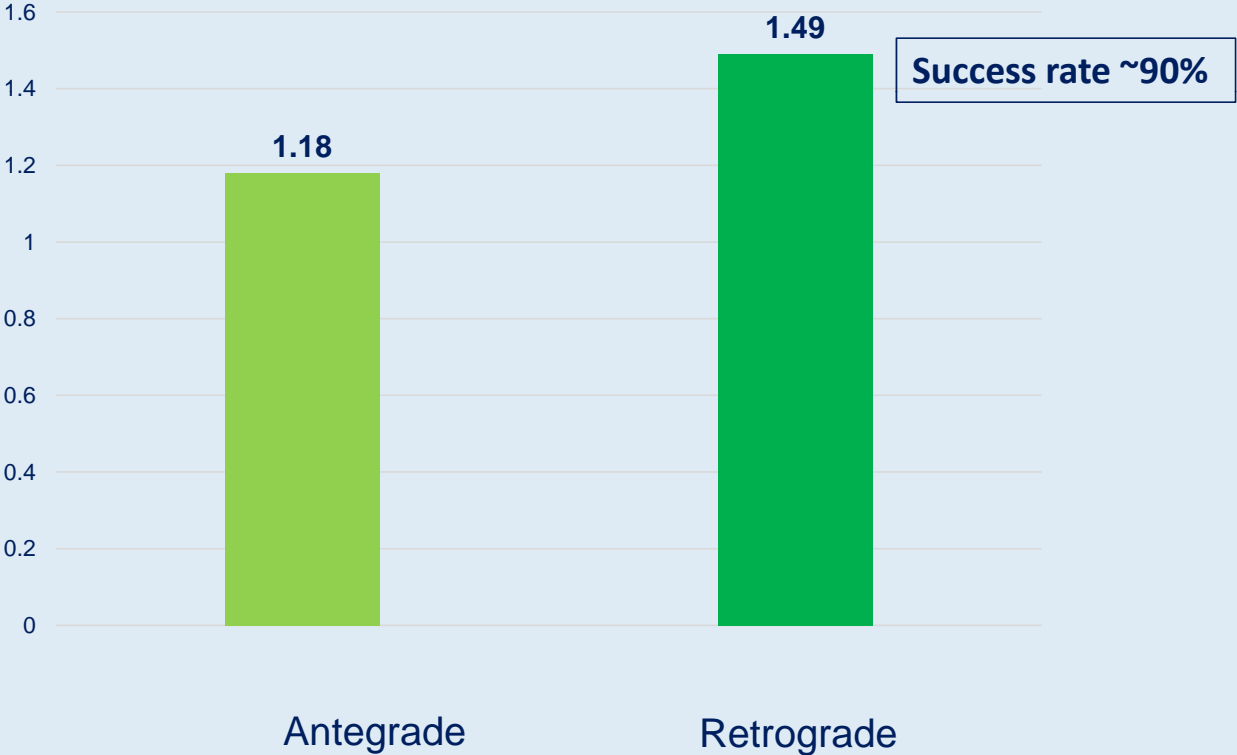
## JCTO Score



## Success Rates for CTO Recanalization



# J-CTO scores in Antegrade and Retrograde Patients



## The Impact of the Retrograde Approach

Gives you the opportunity:  
To treat more complex CTO cases  
In a more predictable manner  
With higher success rates

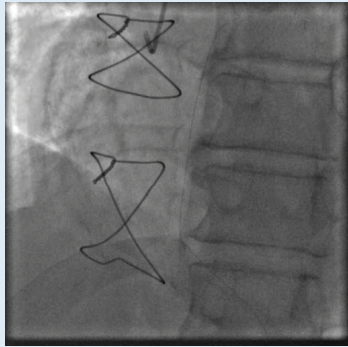
Additionally (something which is not measurable):

- Increases your knowledge: anatomy, pathology, technology and devices...
- Improving your skills – retrograde procedures are very demanding
- Acquire new techniques – trapping, wire externalization, tip in tip, rendezvous...
- Developing a new mind-set, useful not only in CTO recanalizations.

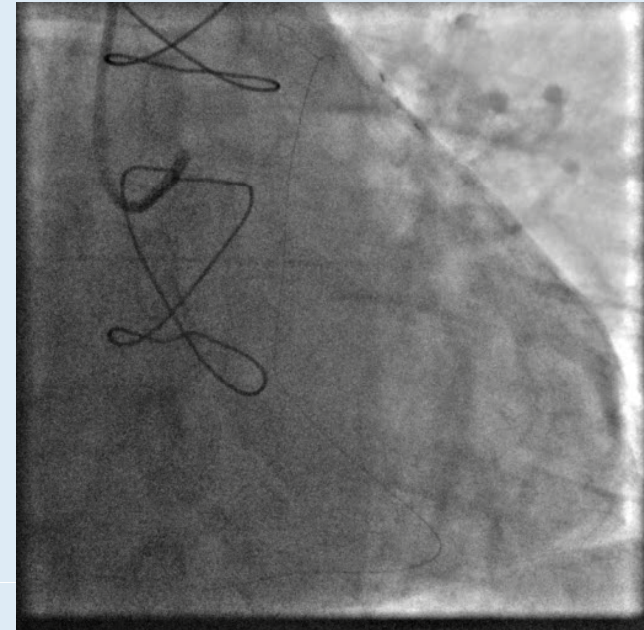
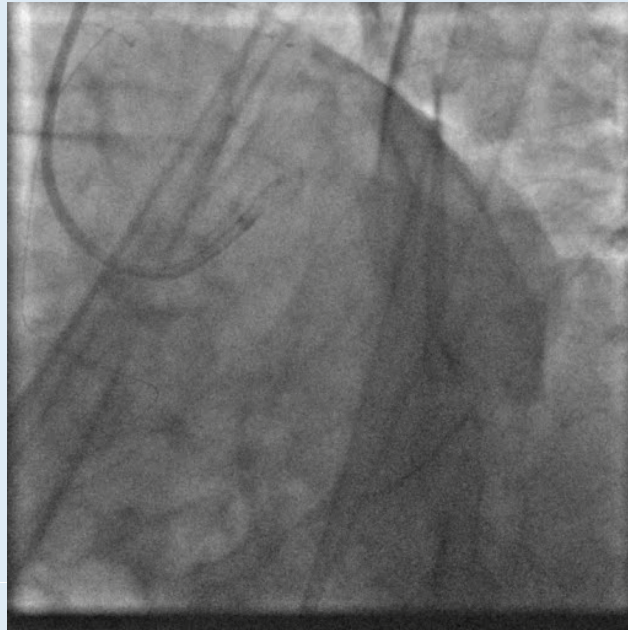
Male 47y; Admitted with ACS w/o ST elevation

Aug. 2007 – ACS – Severe ostial LAD stenosis - dedicated bifurcation stent

Nov. 2007 – instent restenosis - ACB x 2 LIMA –LAD; SVG - RIM



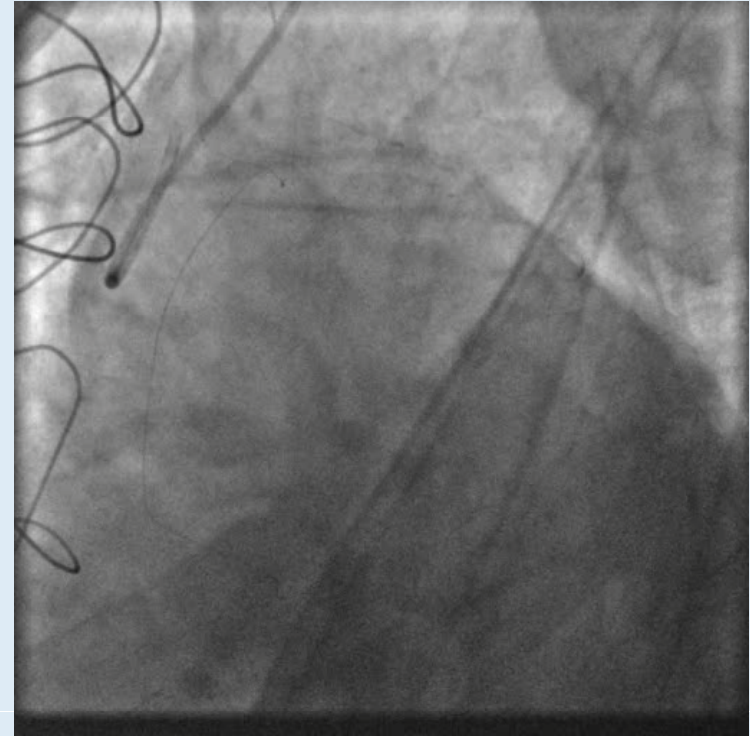
Normal non dominant RCA



High grade stenosis of LCx after the origin of RIM



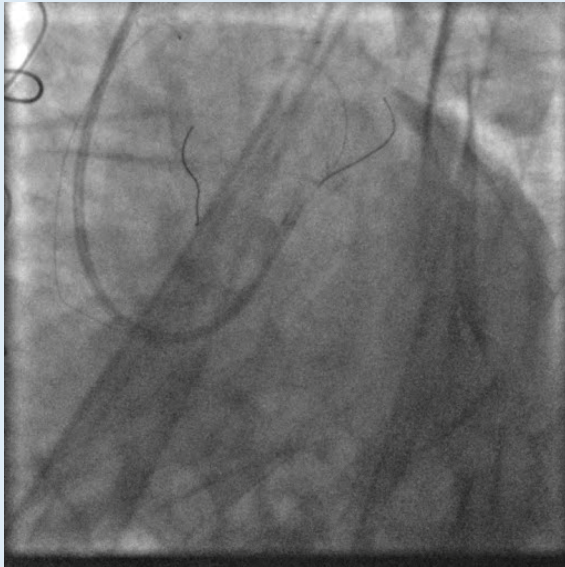
## Patent LIMA – LAD and SVG - RIM



# PCI Procedure

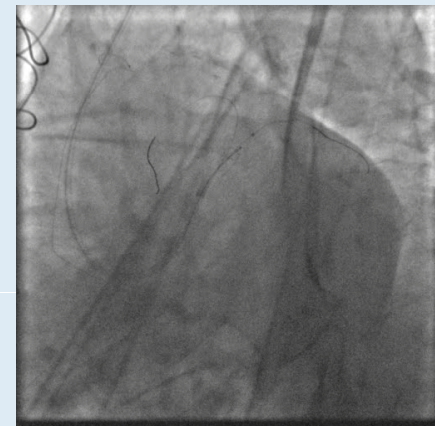
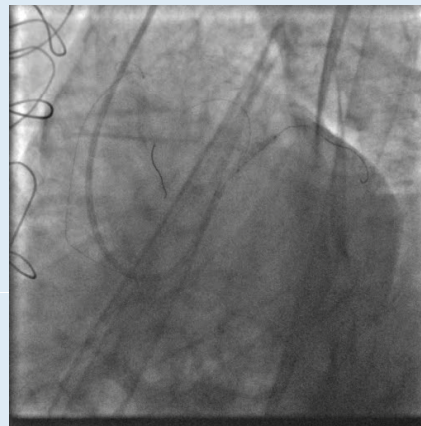
Right radial access  
6F EBU

Wires in LAD and RIM

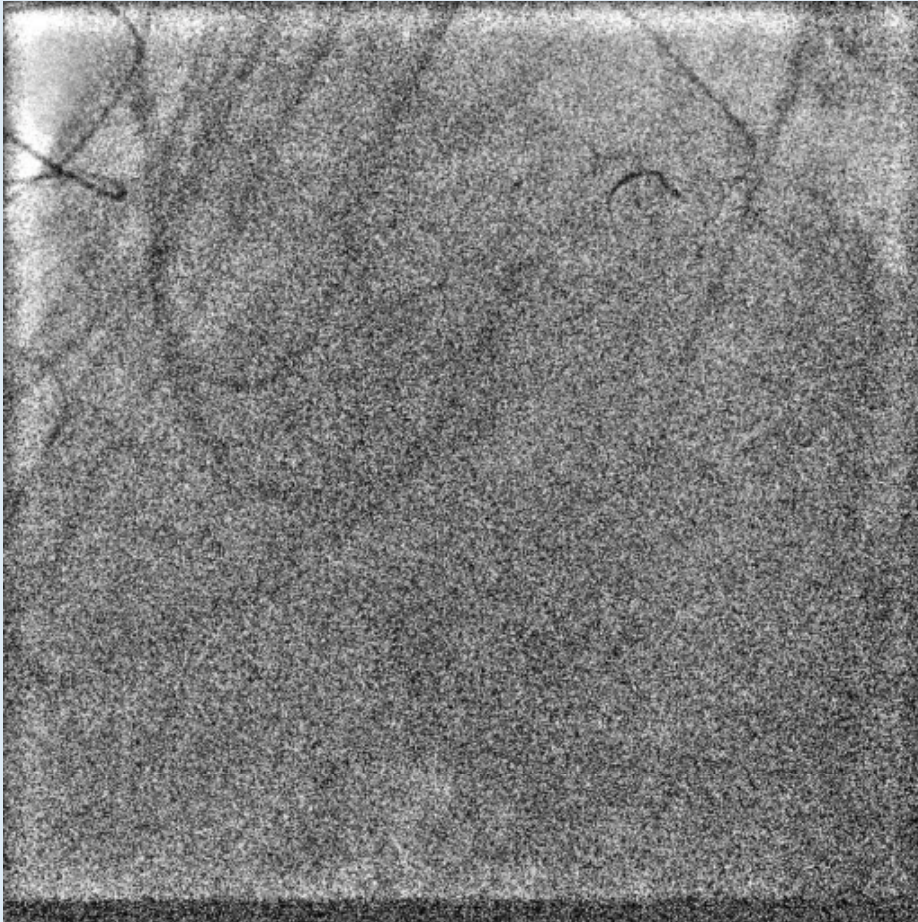


Impossible to wire the LCx because of unfavorable angle

- any type of wires ( 4 different types)
- after predilatations at the carina site 2,5/15
- using a double lumen catheter – “Crusade”



## PCI Procedure



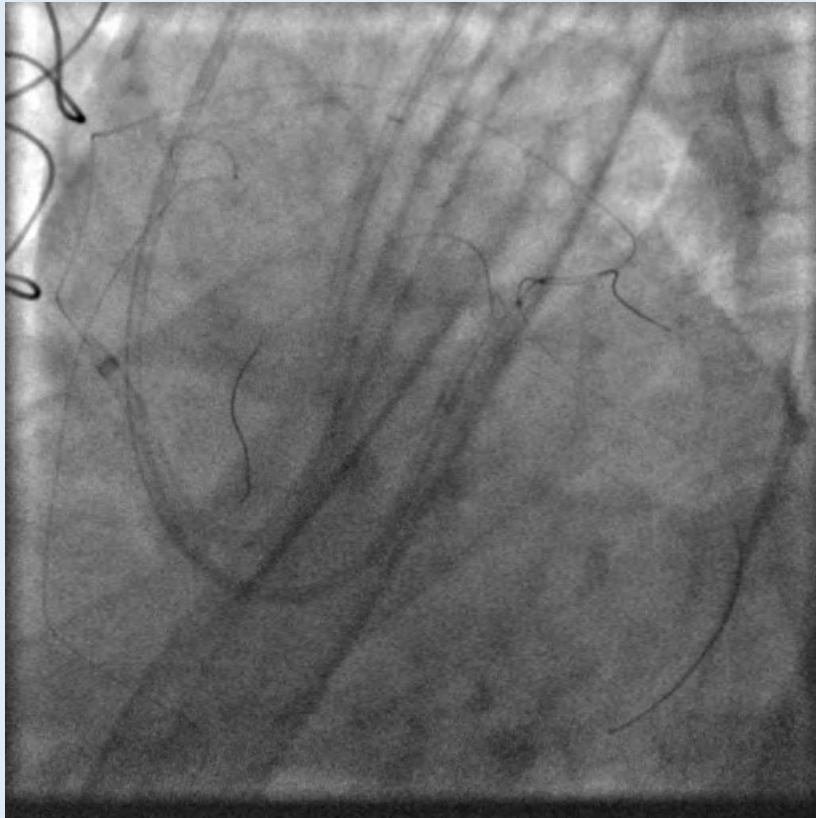
### Retrograde approach

Additional left radial access 7F AL 1,5 for SVG

Corsair 150 cm

Runthrough wire retrograde successfully  
passed

## PCI Procedure



Corsair couldn't follow the wire

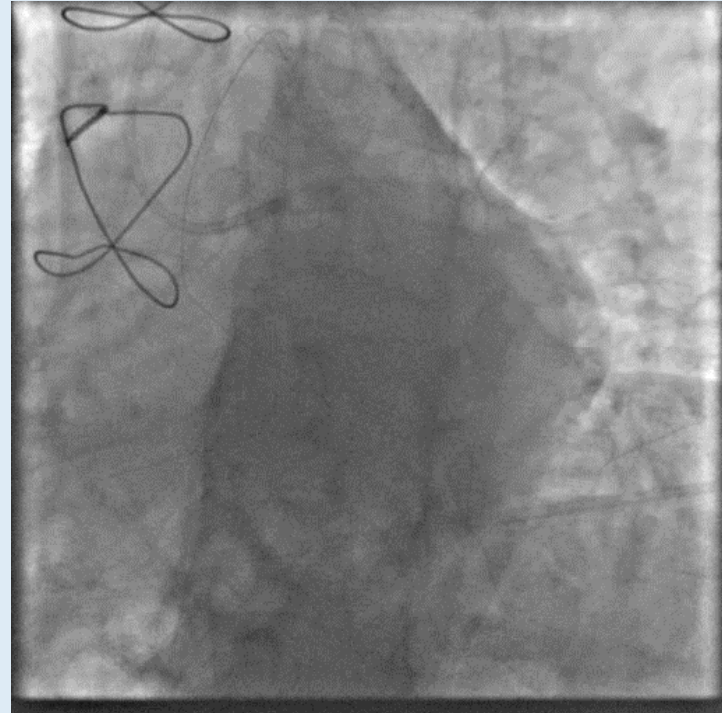
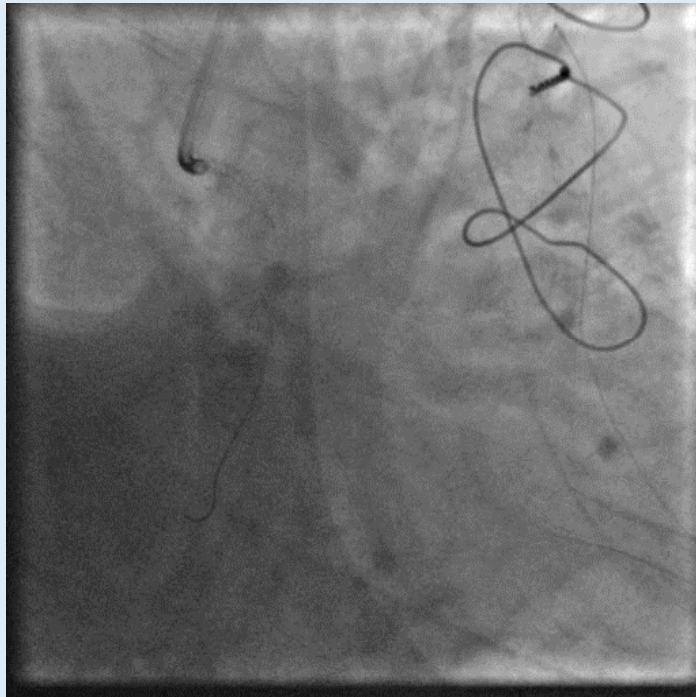
Exchange with OTW 1,5/15

Retrograde dilatation at the ostium  
of Cx

Successful antegrade wiring of Cx

# PCI Procedure

## Final Result



### Procedural Details

X-ray time - 70 min

Antegrade attempt - 49 min

Retrograde pass - 2 min

Procedural time - 110 min

Contrast amount - 450 ml

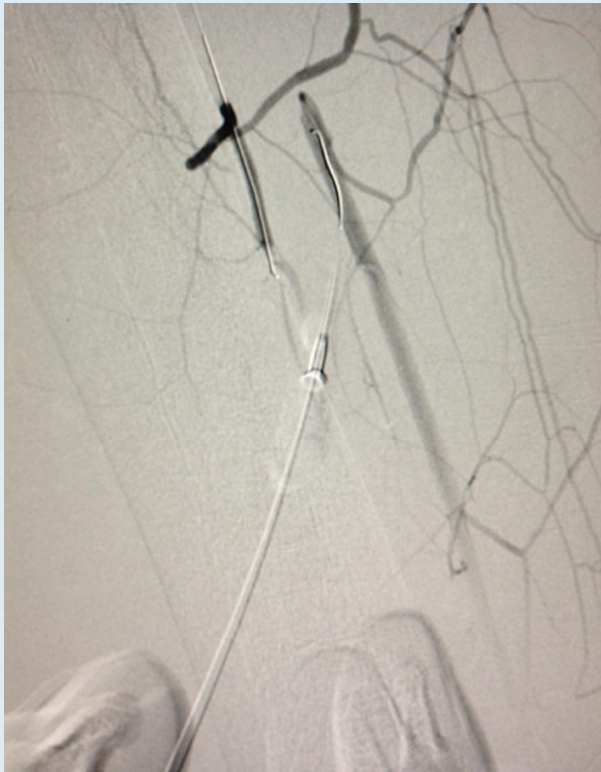
**Another example.....**

## Another example.....

### Peripheral Angio of Right Leg



After failed antegrade attempt, no clear vessel course.  
Retrograde attempt - unable to get in the true lumen retrogradly,  
probably due to aneurysmatic changes at the proximal cup.





### **Retrograde attempt - Stent Facilitated Reverse CART**

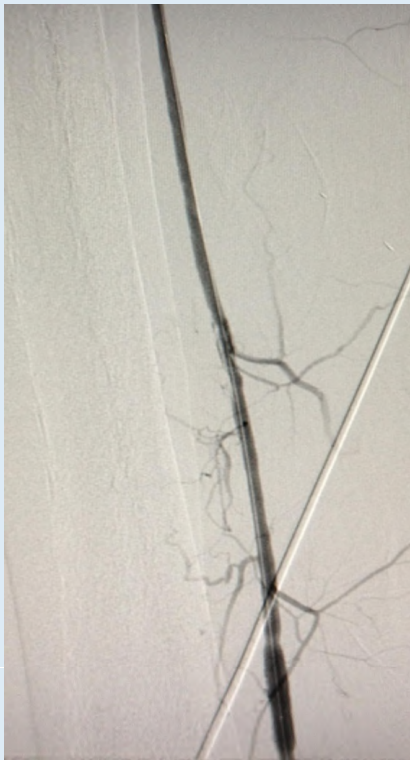
Over the antegrade wire, a balloon expandable coronary stent was implanted with the proximal part of the stent deployed in the popliteal artery while distal part expanded in the subintimal space.



Verification of the proper passage of the retrograde wire through the stent



Final result after externalization and balloon angioplasty, achieving a “straight line” to the foot with rapid recovery of the patient.



Retrograde approach is vital component of a CTO program, increasing the success rates even in very complex anatomy.

The retrograde concept creates a different mind-set and skills-set which improves the overall performance of the interventional cardiologist.

