

# **The Difficult Reverse CART**

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# Disclosure Statement of Financial Interest

Within the past 12 months, I or my spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below.

## Affiliation/Financial Relationship

- Grant/Research Support
- Consulting Fees/Honoraria
- Major Stock Shareholder/Equity
- Royalty Income
- Ownership/Founder
- Intellectual Property Rights
- Other Financial Benefit

## Company

- Company Names
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# Potential CTO PCI Market

- **600,000-1,800,000**
  - **Americans with Refractory Angina (RA) <sup>1</sup>**
- **>500,000 <sup>1</sup>**
  - **Canadians with RA**
- **30%**
  - **Patients under primary care in Australia with daily or weekly angina <sup>2</sup>**

1. *Can J Cardiol* 2012;28:S20-41    2. *Arch Intern Med.* 2009;169(16):1491-1499

# Refractory Angina

- A persistent, painful condition characterized by the presence of angina caused by coronary insufficiency in the presence of coronary artery disease which cannot be controlled by a combination of medical therapy, angioplasty, and CABG. *McGillion et al. Can J Cardiol 2012;28:S20-41*

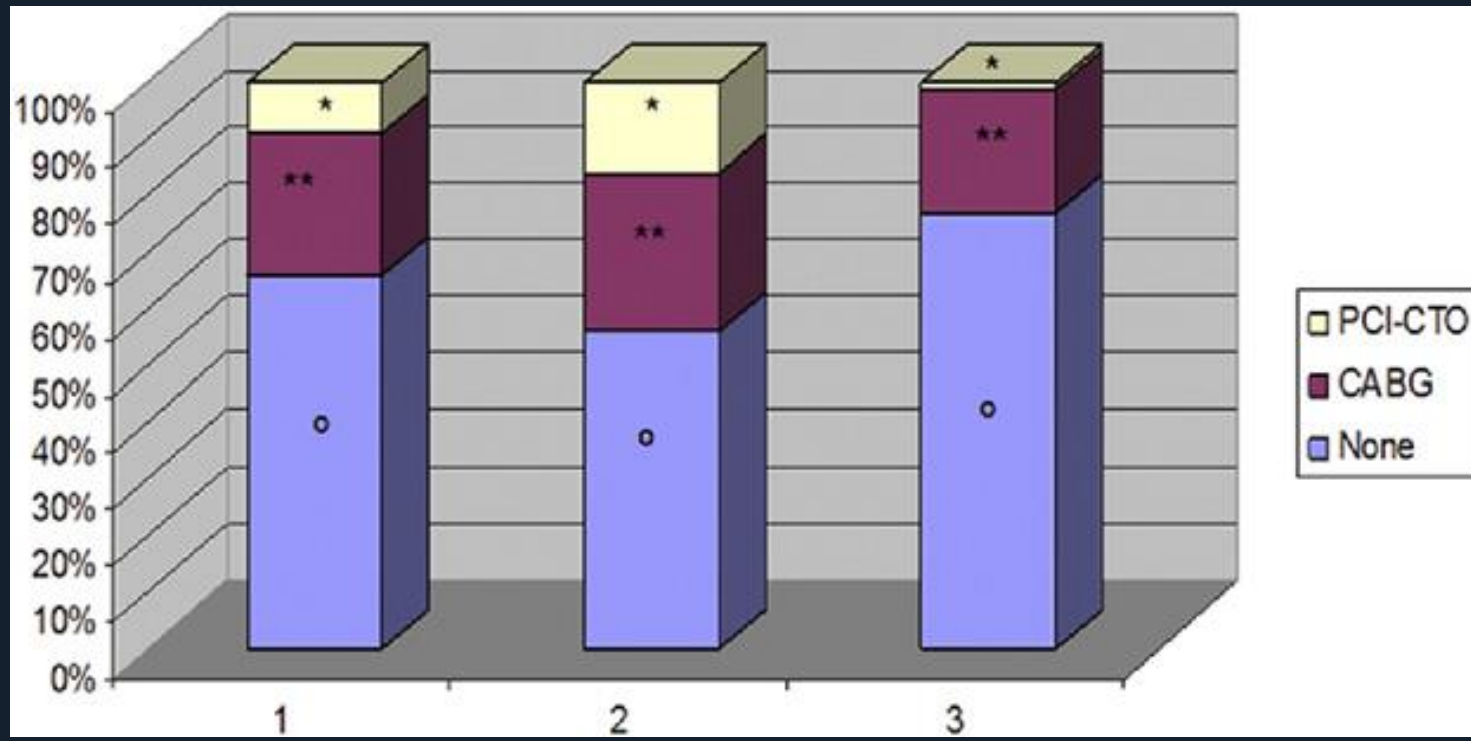
TABLE III. Reasons Precluding Revascularization in Group 6

Reason for no revascularization <sup>a</sup>	Number	% (n = 33)
Chronic total occlusion	23	69.7%
Diffuse disease	15	45.5%
Collateral dependent perfusion	14	42.2%
Comorbidities	4	12.1%
Multiple restenoses	2	6.1%
Poor distal targets	1	3.0%

<sup>a</sup>Patients could have more than one reason precluding revascularization.

# Chronic Total Occlusion

- Complete coronary occlusion > 3 months duration



# Barriers to CTO-PCI

- Long Procedures
- Technically difficult
- Poorly reimbursed
- Poorly taught
- Safety concerns

# The Hybrid Approach to CTO-PCI

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## STATE-OF-THE-ART PAPER

# A Percutaneous Treatment Algorithm for Crossing Coronary Chronic Total Occlusions

CME

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Phoenix, Arizona; Quebec City, Quebec and Toronto, Ontario, Canada; Springfield, Illinois;  
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# The Hybrid Algorithm for CTO PCI

## Dual Catheter Angiography

yes

1. Clear proximal cap
2. Good Distal Target

no

**Antegrade**

**Retrograde**

yes

3. Length < 20mm

no

yes

3. Length < 20mm

no

**Wire escalation**

**Dissection Reentry  
(crossboss-stingray)**

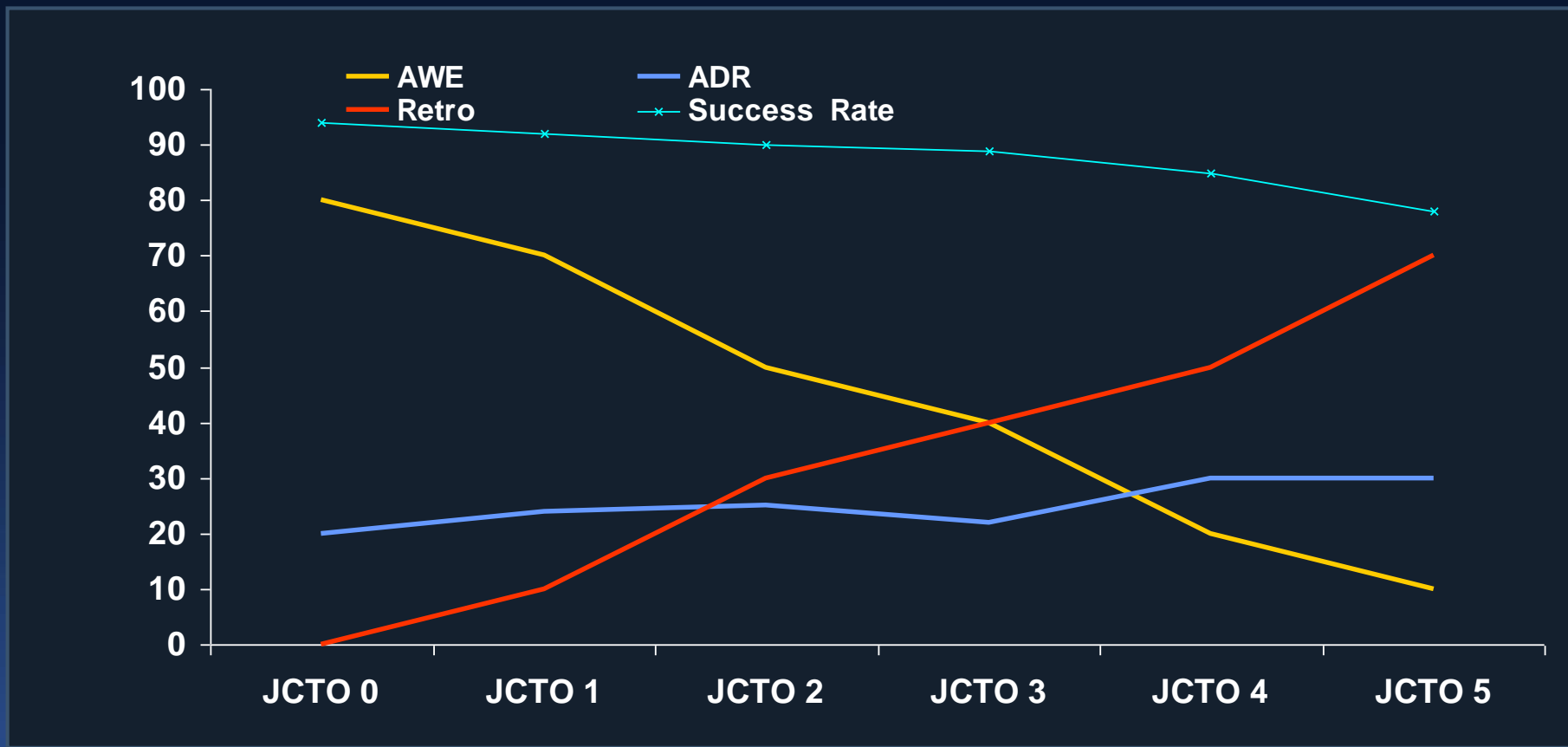
**Wire escalation**

**Dissection Reentry  
(reverse CART)**

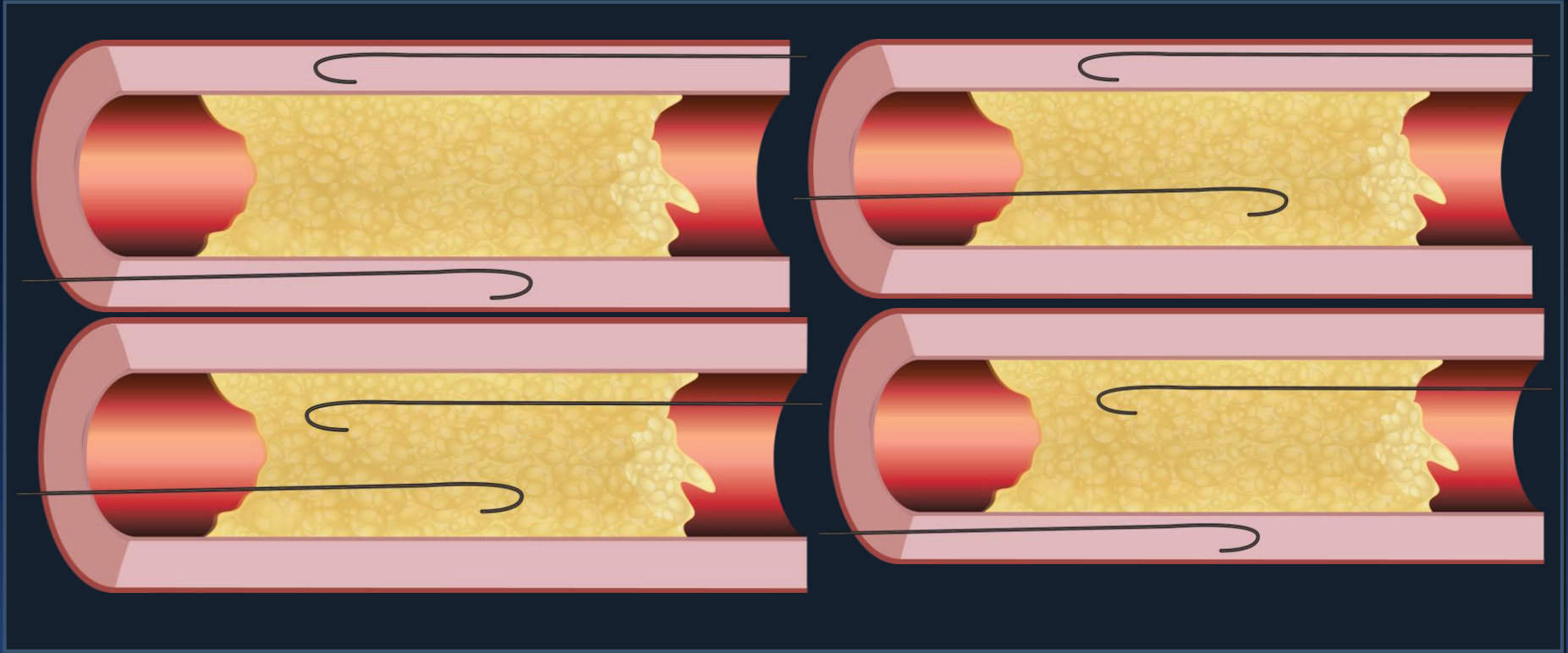
**Switch**

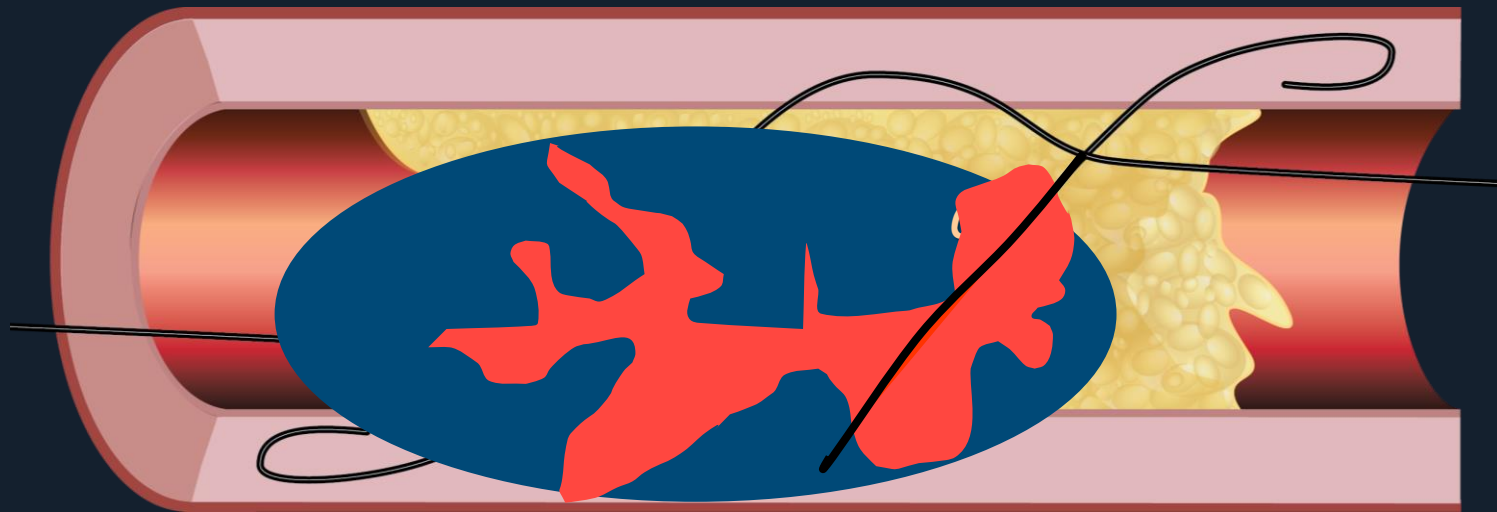


# The Hybrid Approach to CTO-PCI



# Reverse CART





# Coronary Laser

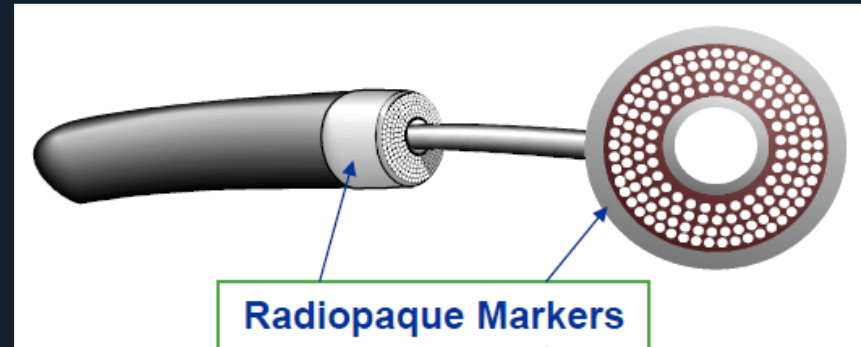
- **Ultraviolet 308nm wavelength laser.**
- **Works by the use of photoablation:**
- **Photoablation- light to vaporize and break down matter**
- **Three distinct mechanisms**
  1. **Photochemical**
  2. **Photothermal**
  3. **Photomechanical**



# New Laser Technology

## Improved Catheter Design

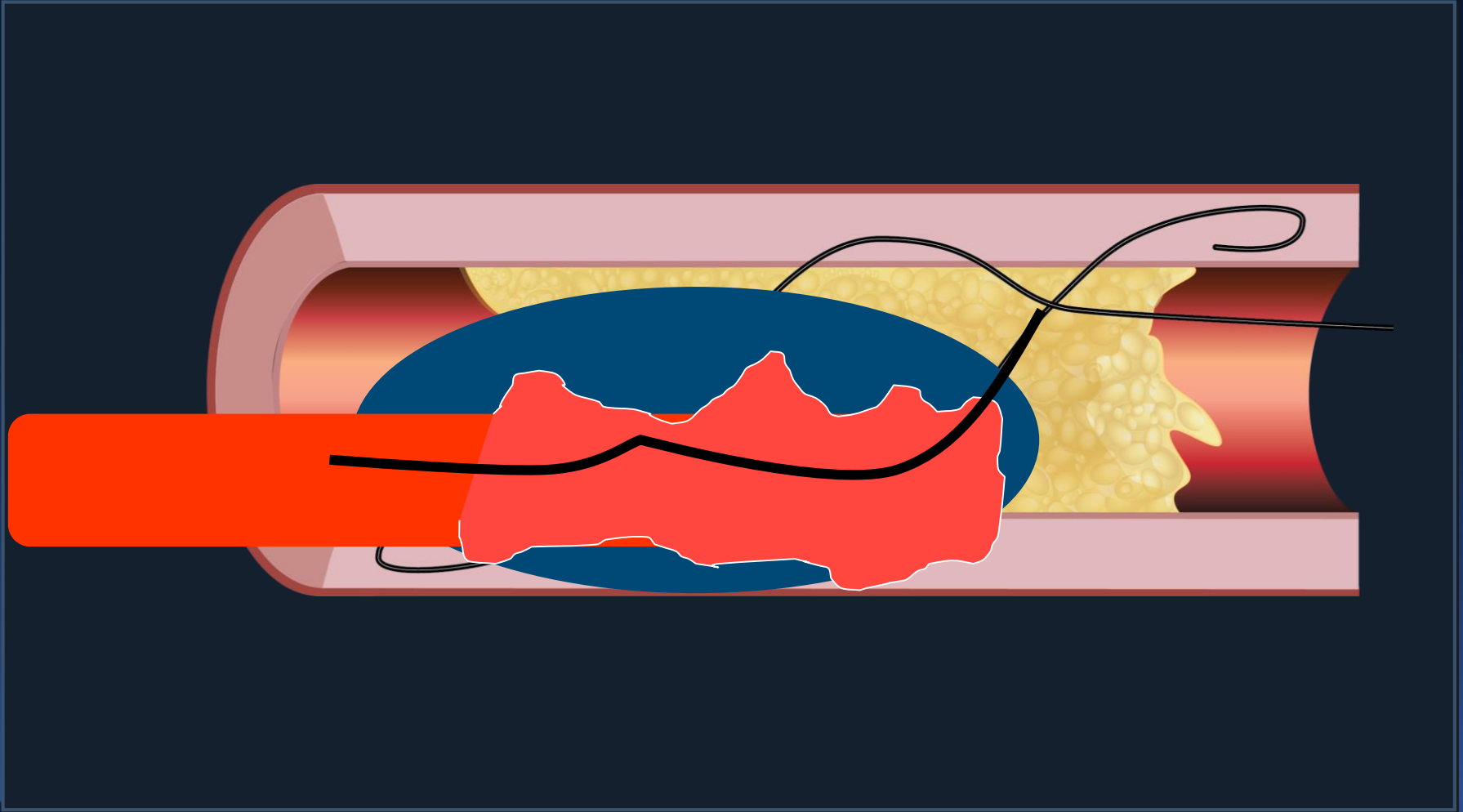
- ↑fibers, optimally spaced
- Improved flexibility
- Hydrophilic Coating
- Improved tracking and pushability
- 0.9 mm smaller catheter



# Use of Laser in CTO-PCI

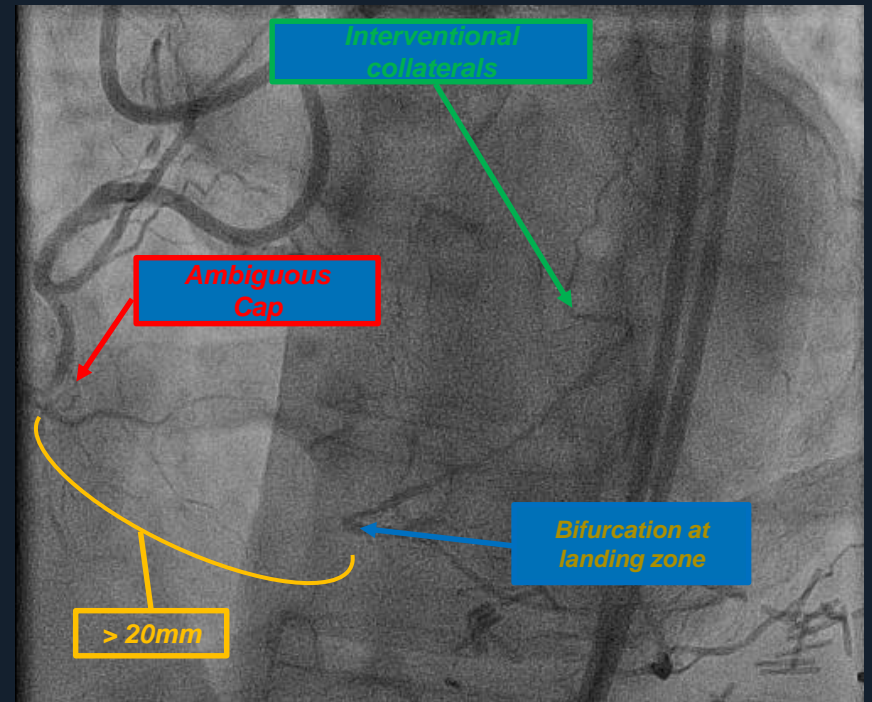
- **Originally used in standard methods**
  - **Device resistant lesions**
  - **In-stent re-stenosis.**
- **Used in more novel methods specific to CTO**
  - **Resistant proximal caps**
  - **Completing the reverse CART**

# Laser Reverse CART



# Completing the rev CART

- 56 year old male
- CCS II despite OMT
- HTN and Chol
- Inferior isch on DSE
- Found to have CTO RCA
- Hybrid algorithm:
  - **Ambiguous proximal cap**
  - **Occlusion > 20 mm**
  - **Landing zone bifurcation**
  - **Good interventional collaterals**



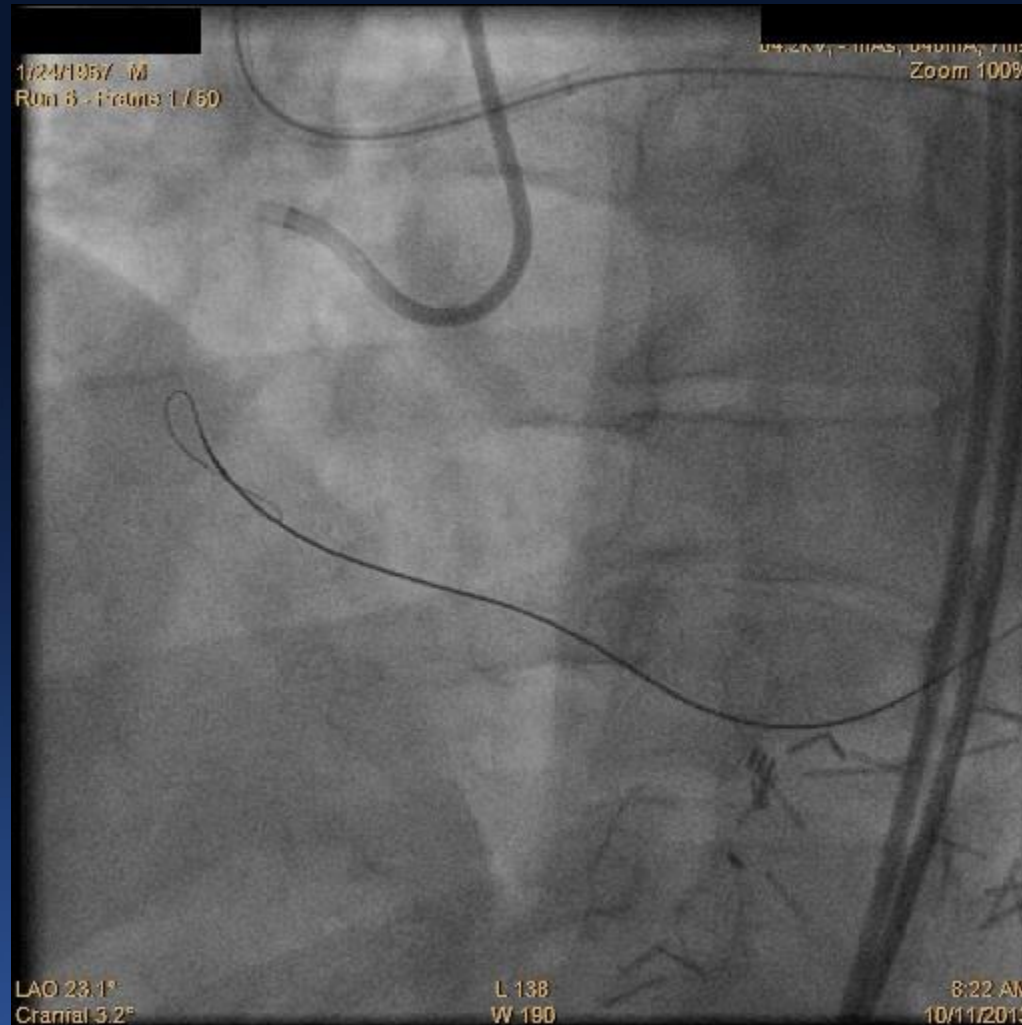
*Retrograde as initial strategy with ADR bail out*



# Septal Surfing



# Retrograde Knuckle Wire



# 0.9 mm Laser



# X CART ballooning



# Guideliner XCART



# After Ballooning



# Final Result



# Conclusion

- **Large population of patients with unmet need for angina relief**
- **Variability in use of PCI suggesting underutilization**
- **Technical barriers to efficient CTO PCI**
- **Laser debulking may improve reproducibility, efficiency, teachability of CTO-PCI**
- **Safety studied in OPEN CTO**





# OPEN CTO

**Outcomes, Patient health status, and Efficiency  
in Chronic Total Occlusion hybrid procedures**

<b>Primary Investigators</b>	<ul style="list-style-type: none"> <li>• J. Aaron Grantham (PI)</li> <li>• William L. Lombardi (Co-PI)</li> </ul>
<b>Overview</b>	<ul style="list-style-type: none"> <li>• 10 US sites</li> <li>• 1000 patients</li> <li>• Multi-center, prospective, single arm observational registry</li> </ul>
<b>Aims</b>	<ul style="list-style-type: none"> <li>• Safety, success, efficiency of hybrid approach</li> <li>• Health status effects of CTO-PCI</li> <li>• Indications and appropriateness of CTO-PCI</li> <li>• Economic analysis</li> </ul>
<b>Status</b>	<ul style="list-style-type: none"> <li>• Enrolling 2014</li> </ul>
<b>Sponsors</b>	<ul style="list-style-type: none"> <li>• Boston Scientific</li> <li>• Saint Luke's Mid-America Heart Institute</li> </ul>

*Angiographic core lab, Events adjudication, NCDR auditing*