Practical Approach to Chronic Total Occlusions Step-by-Step Techniques – The Antegrade and Retrograde Approach

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Which patient with a CTO should we be treating in 2019?

- Stable CAD patients with angina and on optimal medical therapy
- Randomized control trial (highest level of evidence)
- Risk of PCI is not higher (death and MI occurring with equal frequency in both groups)

**EUROCTO**

**Trial design:** Stable angina patients with a chronic total occlusion (CTO) were randomized to PCI with a biolimus-eluting stent plus optimal medical therapy (OMT) (n = 259) vs. OMT alone (n = 137).

**Results**
- Angina frequency score (p = 0.003) and the quality-of-life score (p = 0.007) improved for PCI compared with OMT (intention to treat)
- Major cardiovascular and cerebrovascular events: 5.2% for PCI vs. 6.7% for OMT (p = 0.55)
- Ischemia-driven revascularization: 2.0% for PCI vs. 6.7% for OMT (p = 0.04)

**Conclusions**
- Among patients with stable angina due to CTO, PCI improved some, but not all measures of health status (angina frequency and quality of life)
- Ischemia-driven revascularization was less frequent in the PCI group

*Werner GS, et al. Eur Heart J 2018;May 2;[Epub]*
Other scenarios for CTO PCI—where there may be benefit—Pending results of the ISCHEMIA trial

- For Complete Revascularization in MVD group of patients with STEMI—RCT LOE 1
- Complete Revascularization in Stable CAD patients Syntax 1 vs 2—Observational Comparison
How to Approach CTO’s Practically?
4 questions about the Cap

Proximal cap
- Ambiguous or unambiguous?
- Blunt or tapered?
- Side-branch at pCap?
- Calcified?

Distal cap
- Ambiguous or unambiguous?
- Blunt or tapered?
- dCap at bifurcation?
- Size of distal vessel/disease beyond dCap?
Tools for the Trade - Wires and MC’s
WIRE TASKS:

Wiring CTO with Tapered Cap

Wiring CTO with Blunt Proximal Cap

Wiring CTO + Navigating Calcium

Wiring Collaterals
Tapered Proximal Cap

Wire tip to find loose tissue track

Wire to track soft tissue to distal vessel

Required Wire Properties

- Tapered 0.010" Tip + Polymer Jacket
- Low Tip load
- Lubricity
- Flexibility in shaft
Blunt Proximal Cap

Puncture proximal cap

Wire CTO if short + good distal visibility

Required Wire Properties

- Penetrative
- Heavy Tip Load
- Tapered Wire
Visible CTO Navigation

- Wire to penetrate CTO body
- High torque control
- Flexibility in the shaft

**Required Wire Properties**

<table>
<thead>
<tr>
<th>Tactile Feedback</th>
<th>Low-Med Tip load</th>
<th>1:1 Torque Response</th>
<th>Flexibility in shaft</th>
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Collateral Wiring

- Flexibility in the shaft
- High torque control
- Atraumatic tip

Required Wire Properties:
- Low Tip Load
- Spring Coil
- Hydrophilic Wire
- 1:1 Torque Response
- Flexibility in shaft
Microcatheters

General Use
- Finecross
- SuperCross
- Micro-14
- Nhancer Pro

Channel Dilators
- Retro & Antegrade
- Corsair Pro
- Turnpike
- Teleport

Ca+ Antegrade
- Retrograde
- Corsair XS
- Caravel
- Turnpike LP
- Mamba Flex

Turnpike Spiral
Principles of ADR- with the Stingray and Cross Boss System

- Site of re-entry controllable (to <1 mm)
- Aims to revascularize all distal branches
- Should lead to good run-off
- 1 year outcomes do not appear to be different from other strategies of CTO revascularization
Classic ADR case

- CTO proximal RCA
- Non ambiguous proximal cap
- Lesion length about 20mm
- Very good distal target with no bifurcation at the distal cap
- Distal vessel fills via bridging collaterals and collaterals from Cx to PLV
1st Limitation of the CrossBoss Catheter- Stiff with bias to the outer curvature of vessel
2nd Limitation of CrossBoss Catheter-
sidebranch seeking
Knuckle Boss Technique Illustration—Side branch avoidance & finishing with the Boss
Hematoma Management-101

Following Knuckle wire

Following CrossBoss
Orientation & Re-entry with StingRay catheter
Final Angiograms
The Fundamentals of Retrograde CTO Technique

Gain access in vessel distal to CTO

Conduits
- Septal collaterals
- Epicardial collaterals
- Bypass grafts

Cross CTO and gain true lumen control proximal and distal

Techniques
- Retrograde Wire Crossing (RWE)
- Reverse CART (XCART)
- Classic CART

PCI
- Externalized Wire
- Conversion to antegrade system
- Safe removal of equipment
Case Example Retrograde Baseline
Retrograde Wire – Septal crossing
Retrograde Wire Escalation
Final Angiograms