Is CTO revascularisation justified?

Interventional Perspective:

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Why should we consider opening CTOs?

- Symptoms ✓
- Quality of life ✓
- Survival X
- Left ventricular function X
The Symptomatic Patient on Maximal Tolerated Medical Therapy and Impaired Quality of Life

As an Interventionalist: Should I Perform PCI on THIS Patient?
Common Conception of CTO PCI

- Low Success Rates
- Greater Procedural Risk
- Limited Knowledge of procedure and referral options

Potential of CTO PCI

- Symptom relief
- Good outcomes in the right environment with low risk

Perceptions limiting CTO PCI
The Issues?

• What is the likelihood of success?
• What is the risk?

• The patient
• The lesion
• The cathlab
• The operator

• The cost
• The time
The Patient

• Ideal
  • Single vessel non-LAD CTO with no other stenosis

• BUT, we also need to treat
  • Partially treated MVD with a residual symptomatic CTO
  • Patients late post CABG with failed grafts

• Factors that decrease likelihood of success
  • Renal function
    • Contrast limitation
  • Previous CABG
    • Tenting at the anastomosis
    • Calcium
    • Length

• Factors that increase risk
  • LV dysfunction
  • Renal function
The Lesion

• Lesion assessment:
  • J-CTO score
    • Proximal cap
    • Intra-CTO calcium
    • In-CTO tortuosity
    • Lesion length
    • Previous procedural failure

Duration of occlusion is not a factor

Morino et al. JACC Interv 2011; 4: 213 - 21
RECHARGE Registry: Hybrid Algorithm in Europe

1,253 CTO PCIs in 17 centers

- J-CTO ≤ 1 (N=365)
  - AWE: 94%
  - ADR: 10%
  - RETRO: 14%

- J-CTO ≥ 2 (N=888)
  - AWE: 74%
  - ADR: 50%
  - RETRO: 29%

Strategy applied (%)
Strategy success (%)
Proximal Cap and Lesion Length

• **Proximal cap**
  • Impacts direction of approach to the CTO
    • Antegrade versus retrograde

• **Lesion Length**
  • Impacts crossing strategy
    • Antegrade wire escalation (AWE) vs Dissection Re-entry (ADR/RDR)

• **Dual injection**
  • Drop magnification
  • No panning
  • Sequential injections
  • Longer acquisitions
Tapered Cap

Round / Flat Cap

Ambiguous Cap
Proximal Cap
EuroCTO success rate: 86.3%

(G. Werner EuroPCR 2017)
Complications

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Khan et al</th>
<th>OPEN-CTO Operator Reported</th>
<th>OPEN-CTO Core Lab</th>
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</thead>
<tbody>
<tr>
<td>In-hospital Death</td>
<td>0.7</td>
<td>0.9</td>
<td>0.9</td>
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<tr>
<td>Periprocedural MI</td>
<td>2.6</td>
<td>2.6</td>
<td>2.6</td>
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<tr>
<td>Emergent CABG</td>
<td>1.5</td>
<td>0.7</td>
<td>0.7</td>
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<tr>
<td>Clinical Perforation</td>
<td>3.4</td>
<td>3.9</td>
<td>4.8</td>
</tr>
</tbody>
</table>

A.C. Salisbury: OPEN CTO
Predictors of MACCE

- **Age (per +10 y)**: 1.34 (1.06, 1.70)
- **Diabetes**: 0.72 (0.44, 1.17)
- **Chronic Kidney Disease**: 1.57 (0.82, 2.99)
- **Prior CABG**: 0.75 (0.46, 1.22)
- **LVSD or Hemodynamic Support**: 0.66 (0.37, 1.16)
- **Occlusion Length > 20 mm**: 1.00 (0.61, 1.64)
- **Any Retrograde Approach**: 2.88 (1.71, 4.86)
Hybrid Algorithm

- Reduces time, radiation and contrast
- No more risky
- Favourable cap
- Good target

Dual injection

1. Ambiguous proximal cap
2. Poor distal target

NO

<20mm

Antegrade

Antegrade wire escalation
The Cathlab

- Factors that increase likelihood of success
  - Complete range of
    - Guides
    - Wires
    - Microcatheters
      - Antegrade
      - Retrograde

- Factors that mitigate risk
  - Coils
  - Covered stents
  - Pericardiocentesis set
Multivessel Disease

• LAD CTO
  • Favours CABG
• Additional factors shifting the balance toward CABG
  • SYNTAX score >22
  • Diabetes
  • LV dysfunction

• If PCI is to be performed
  • Start with the CTO to ensure complete revascularization
  • CABG remains an option in case of failure
Is CTO PCI Justified

- YES
  - But not in every patient
  - AND not in every environment

- After a realistic discussion of risks and benefits
  - CTO PCI is indicated in the setting of persistent symptoms despite best tolerated medical therapy
A reasonable approach:

• **Ideal candidates:**
  • Symptomatic despite OMT
  • Single vessel CTO
  • Prior CABG
  • Viable myocardium
  **PLUS**
  • High likelihood of success
  • Low likelihood of complications

• **Good candidates:**
  • Symptomatic but not able or willing to take maximal medical Rx
  • **PLUS** likely success without complications

• **Acceptable:**
  • Multivessel disease with syntax score ≤ 22
    • (Treat CTO first to ensure complete revascularisation)