Management of In-Stent Chronic Total Occlusions

Kevin J. Croce MD,PhD

Director CTO and Complex Coronary Artery Intervention Program

Director BWH Translational Discovery Laboratory

Harvard Medical School

@kevinjamescroce
kcroce@bwh.harvard.edu
Background

Occlusive ISR is an uncommon cause of CTOs (<5%)

Most are symptomatic

Presence of stent(s) within CTO
- ‘Roadmap’ (decreases anatomic ambiguity)
- Protection against perforation
ISR  CTO Success Rates

- Abbas 2006: 63%
- Werner 2009: 70%
- Abdel-Karim 2011: 71%
- Christopoulos 2014: 86%
- Wilson 2014: 90%
- Azzalini 2017: 87%
ISR CTO - Higher Long-Term MACE

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Predictors of in-stent CTO Procedural Failure

- Stent fracture
- Stent under expansion
- Marked tortuosity
Hybrid Approach to Within-Stent CTO

1st Strategy - CrossBoss

2nd Strategy - wire escalation*

3rd Strategy - retrograde

* Consider as first line strategy if proximal cap tapered, highly angulated entry into the CTO, very severe proximal cap disease or proximal cap begins before stent margin
Factors that favour initial use of the CrossBoss

- Proximal cap located within the stent
- Blunt proximal cap
- Distal cap located within the stent

Factors that favour initial use of AWE

- Tapered proximal cap
- Proximal cap that begins before the stent or there is significant disease at the inlet.
- Highly angulated entry into the CTO
- Stent fracture or underexpansion at the inlet
- Very resistant proximal cap
Algorithm for Escalating CrossBoss Back-Up

A: Strong guide support against contralateral aortic wall
B: CrossBoss at proximal cap
C: Side-branch balloon anchor
D: Side-branch balloon anchor

Instant occlusion

Guide extension (N.B. will require ≥ 7 F system)
Overcoming CrossBoss Failure Within Tortuous In-Stent CTO Segments
• 68 year old male
• CABG 2007
• Redo sternotomy 2019 for AVR
• ACS
Diagnostic Angiogram

- Patent LIMA
- Culprit VG-OM
- Multilayer DES - thrombus
LCX CTO PCI

Plan
- Dual injection
- Cross boss
- AWE
- Retrograde option
Cross Boss Stalled $\Rightarrow$ Antegrade wire escalation:
Resistant proximal Cap - Pilot 200, Mongo, Gaia 3
Turnpike / Spiral = no cross - swap to caravel
True Lumen

Sion Blue exchange - caravel tip broke off
Left caravel tip on wire

NC balloon unexpandable
IVUS = calcium, only 45% stent expansion
1.4mm laser

NC balloon expandable

Overlapping DES w / post dilation
Gooseneck snare caravel tip w wire

Final – did not coil graft

IVUS improved expansion
120cc contrast
Discharge hospital day 3  @ baseline renal function
If it is not possible to secure entry within the stent, a retrograde approach may be required.

A retrograde approach if available will resolve this issue.
Sub-intimal Crush?
RCA CTO PCI:

- Three Layer ISR failure
- Resistant proximal cap
RCA CTO PCI:
- Balloon un-crossable
- Substrut
- Parallel wire Pilot 50
- Balloon 2.0 and 3.0mm (waist)
- IVUS

IVUS - Laser - Roto - Brachy Case
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Diagnosis??
IVUS - Laser - Roto - Brachy Case

RCA CTO PCI:
- 1.4mm ELCA – no cross
RCA CTO PCI:
- Stent Roto: 1.25 and 1.75mm burr
- 190RPM, 10 passes total
RCA CTO PCI:
- 3.5mm angiosculpt
- 4.0 mm NC balloon
- Brachytherapy
- Final result
Conclusions

• Angiographic features of ISR CTO PCI failure include
  - Tortuosity (stent fracture)
  - Ostial lesions
  - Calcification

• The hybrid strategy applies to ISR with a few additional considerations

• If the original stent is significantly undersized / stent fracture within stent passage may be challenging

• Intravascular imaging alters ISR treatment decision making