Guide wire selection and Microcatheters

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Prevalence of CTO

• True prevalence among general population is unknown

• Coronary angiography show: (Khan JK. Am Heart J 1993;126:561-4)
  – CTO’s present in 35% of patients
  – 12% have more than one Occlusion
  – Prior history of Myocardial Infarction: 50%

• RCA is the most frequently involved vessel in CTO, followed by LAD and LCX. (Cohen HA. Am Heart J 2003;146:513-519)
CTO Environment

- CTO treatment is often referred to as “the final frontier in interventional cardiology” and remains one of the greatest challenges in the interventional cardiologists daily practice.
- The interest in CTO treatment is increasing but success rates remain on operator experiences.
- Studies show clinical benefits for the patient. Especially in the DES era.

Source: Dr. W. Udayachalerm, King Chulalongkorn Memorial Hosp., Bangkok
71 year old white male; cardiac arrest while driving; at autopsy had total occlusion of LAD and 75% of RCA

courtesy Renu Virmani MD
Wire performance characteristics influence choice

- Flexibility
- Support
- Steering
- Lubricity
- Tracking
- Prolapse tendency
- Visibility
- Tractile feedback

Performance characteristics affect suitability in varying clinical situations

Wire choice should be based on performance requirements for each procedure
The selection of guidewire is influenced by:

- Vessel take Off
- Vessel Anatomy
  - (Irregular, tortuous, diffuse)
- Lesion location
  - (distal, mid or proximal)
- Lesion morphology
Special Guide wires for CTO

- Hydrophilic coated wires
  - Whisper, Choice PT, Pilot, Terumo NT, Shinobi
- Cross-IT family, Progress
- Asahi Guide wire
  - Miracle & Conquest family
- Special wire for retrograde approach
  - Fielder FC, Fielder XT, Sion, Sion Blue
CTO guidewires

- Fielder XT
- Fielder XT-A
- Fielder XT-R
- Ultimatebros
- Miracle 3
- Miracle 6
- Miracle 12
- Confianza Pro
- Confianza Pro 12
- Confianza Pro 8-20
- Gaia 1\textsuperscript{st}
- Gaia 2\textsuperscript{nd}
- Gaia 3\textsuperscript{rd}
- Progress 40
- Progress 80
- Progress 120
- Progress 140T
- Progress 200T
- PILOT 50
- PILOT 150
- PILOT 200
- SION
- SION black
- SION blue
- Suoh 03
Purpose(s) of using guide wires in CTO

• Antegrade wiring
• Retrograde wiring
• Special purpose
  – Externalization
  – Extremely tortuous
CTO Wiring

wire shaping

Primary bend ~ <30°
1-2mm from tip

Primary bend ~ <
30°
1-2mm from tip

Secondary bend ~ 10-15°
Wire Shaping
Creation of Re-entry

- Small false lumen
  - Easy to make re-entry
- Large false lumen
  - Difficult to make re-entry

True lumen
Antegrade Wiring Techniques

SLIDING TECHNIQUE:
This technique, a common technique for crossing functional occlusions or very narrow lesions, benefits from using lubricious a polymer sleeved guide wire.

DRILLING TECHNIQUE:
The guide wire is advanced using gentle movements. Straight tip guide wires facilitate tactile feedback and steerability. Step up with stiffer guide wires.

PENTRATING TECHNIQUE:
Penetrating the obstruction aiming at the target. The direction of the guide wire is more precisely controlled. Tapered tip guide wires permit higher penetrating forces.
Antegrade CTO Recanalization

basic wiring techniques

Uncontrolled drilling

FAILURE!
Antegrade CTO Recanalization

**basic wiring techniques**

Controlled Drill – 90 degree arc

- Tapered or rounded tip designs
- Standard manipulation
- Parallel wiring
Antegrade CTO Recanalization

*basic wiring techniques*

**Penetration Technique**

- Suited for tapered, stiff tip designs
- Straight segments
- Difficult fibrous caps
- May use to redirect in conjunction with parallel wire technique
Antegrade CTO Recanalization

basic wiring techniques

Sliding technique

- Polymer sleeve SOFT probe for visible/suspected microchannels
- May use floppy wire with support catheter instead
- **BEWARE** bridging collaterals “masquerading” as microchannel
- Polymer sleeved wires **NOT** forced against resistance, small tip bend, only very minor rotation
- “soft” wires if polymer sleeve – Fielder series, Whisper, PT II
Differences in Wire Manipulation between Techniques

• Penetration Technique
  – *Directional control*
  – *If needed, pivot at tip*

• Controlled drill
  – *Pivot on “heel” of wire*
  – *Crush plaque in quadrant*

• Sliding/probing
  – *Maintain tip freedom*

Thompson CA, Cardiac Interventions Today 2009
Antegrade Wiring Techniques

- Usually the first strategy
- Wire choosing: hydrophilic vs hydrophobic
- Wire shaping: $1^\circ$ & $2^\circ$ curve
- Single wire technique (+ microcatheter for guide wire support and directional stability)
- Wire manipulation
  - Sliding or gliding, Drilling & Penetrating
- If single wire failed:
  - 2 wires technique(s): Pararelle wire, Se-Saw wire
  - Go retrograde (if possible)
Techniques of CTO
Guidewire Manipulation

Penetration vs. Controlled Drilling ≠ Drilling
Tip Structure ~ 1mm Pre-shape

Pre shape
1mm – approx. 45°
Standard Manipulation of Gaia Wires

- When the wire tip is deflected, it is directed towards sub-intimal space.
- If you push too much, the knuckled tip will dissect the vessel.

It's important 1) to change the wire direction or 2) to increase the tip force “keeping the wire tip straight”.

Tactile feelings are translated into visual perception!
The importance of active wire control and the required wire performance

Active wire control

Changing the direction by controlling the wire tip with torque.

Push force

Make a course correction when the wire goes out from the path for wire crossing.
Antegrade wiring

1) Tapered floppy guidewires
2) Gaia series
3) Confianza family
Principle of “Antegrade Loose Tissue Tracking”

If we can control ① between ② and ③

② < ① < ③

Wire easily pass CTO like as wire wish

① = wire tip force
② = resistance in loose tissue
③ = resistance in plaque
Retrograde Wiring Techniques

- Select channel & injection of contrast via microcatheter
- Use small balloon or channel dilater
- Guide wire: fielder FC or XT, whisper MS, Sion
- When retrograde wire pass into distal true lumen: Connect between the channels
  - Use as marker or reshape the lumen
  - Kissing wire technique
  - CART or reverse CART
  - Externalization or snaring the wire, balloon tapping
  - SIAM kissing technique
Strategies for Retrograde Approach

• Use retrograde wire as a marker then facilitate antegrade wire passing
• Real retrograde passing of guide wire
  – How to connect between antegrade and retrograde channels
Techniques to Connect between the Channels

- If successful crossing with retrograde wire
  - Kissing wire technique
  - Trapping of retrograde wire
  - Exchange to 300 cm wire or Snaring of retrograde wire
- If retrograde wire fails to cross
  - CART or reverse CART technique
  - SIAM kissing technique
Retrograde Approach navigate the antegrade GW to the distal true lumen.
Using Microcatheter(s)

MicroCatheters
Standard, PTFE coating with single marker: Finecross
Specialty, for drilling or advanced techniques: Tornus, Corsair

Over-the-Wire Balloons
Small Diameter; 1.50 mm, 1.25 mm, or 1.00 mm diameter
Non-Compliant; high nominal pressure with flat compliance curves
ASAHI Corsair Microcatheter

Atraumatic, radiopaque tapered tip

SHINKA-Shaft

Tungsten Braiding

Stainless wire: Consists of 8 thinner wires braided with 2 larger ones.

Precisely access the most challenging anatomy
快適な PCI へ
もうひとつの提案

For daily use
Platinum marker enables clear visibility of catheter tip under fluoroscopy.

Distal Marker Tip
Distal Shaft
Proximal Shaft

Safety System (5cm)
Designed to first identify any catheter breakage due to over rotation of catheter.

Covered Tube (30cm)
Prevent blood leakage.

Tip
Product Configuration

Wire Lumen: 0.014”GW compatible

Enhanced Performance of Crusade

1. Excellent Trackability enabled by flex and minimized distal shaft profile.
2. Good proximal shaft support (stylet is not required)
3. Excellent GW maneuverability enabled by two-layered GW lumen configuration.
Rotatable range of OTW lumen GW

Angle and position of distal part of GW

0.34mm in diameter
5-degree
140-degree

GW rotatable range
approx. 300~305-degree

GW rotatable range
approx. 335~340-degree

※GW: ASAHI Gaia Second
Place a soft wire in the side branch first.

Bring the Crusade down on the monorail port.

Side port of Crusade.

Stiff wire exits side port to penetrate proximal cap.

Crusade catheter provides support to prevent wire prolapse or deflection.
Microcatheters

- Better support
- Better penetration
- Contrast injection or drug(s) delivery
- As a marker
- Wire exchange
- Dilate collateral channels
- Parallel/Se-Saw wire techniques
- Siam technique
54 Y/O male with CTO in LCx and LAD
Finecross with Gaia 1
Easily pass LCx lesion
Exchange to soft wire and balloon dilatation
Final result in LCx (DES 2.25 x 13)
Instant-restenosis LAD
Tip injection from MC
Balloon dilatation
DES 3.0 x 40 mm
50 Y/O male with Calcified RCA-CTO
Try with Fielder XTR
Antegrade wire couldn’t cross
Retrograde wiring
Retrograde wire couldn’t cross
Antegrade & Retrograde wiring
Wires kissing
CART technique
Antegrade fashion
Final results
A long CTO-RCA
MC with GAIA 1
Continue Antegrade wiring
Exchange to workhorse wire
Final Results
56 Y/O male with previous PCI and recurrent angina, re-CAG showed???
Baseline angiogram
Bilateral injection
Antegrade wire(s) couldn’t cross
Go Retrograde!!
Reverse CART
Antegrade wire pass
Final Results
Benefit of CTO Intervention