PCI for Chronic Total Occlusion
: Guiding Catheter and Guidewire
Guiding Catheter for CTO
Guiding Catheter for CTO

7F or larger guider with all Side Hole

- Left Coronary Artery
  - LAD: EBU 3.5, EBU 4.0
  - LCX: AL 1.0, 1.5

- Right Coronary Artery
  - AL 0.75, 1.0

Strong Back up support
Guiding Catheter for RCA

AL

EBU

JR

JR
Two Guiding Catheter for RCA
Guiding Catheter for LCA
Position of Support Catheter
Guidewires for CTO
## Guidewire Selection
### Polymer-Coated (Hydrophilic) Wires

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Wire</th>
<th>Shaft Diameter</th>
<th>Stiffness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guidant</td>
<td>Whisper</td>
<td>0.014”</td>
<td>1 gram</td>
</tr>
<tr>
<td></td>
<td>Pilot 50</td>
<td>0.014”</td>
<td>2 gram</td>
</tr>
<tr>
<td></td>
<td>Pilot 150 &amp; 200</td>
<td>0.014”</td>
<td>4 &amp; 6 gram</td>
</tr>
<tr>
<td>Boston Scientific</td>
<td>Choice PT &amp; P2</td>
<td>0.014”</td>
<td>2 gram</td>
</tr>
<tr>
<td></td>
<td>PT Graphix &amp; P2</td>
<td>0.014”</td>
<td>3-4 gram</td>
</tr>
<tr>
<td>Cordis</td>
<td>Shinobi</td>
<td>0.014”</td>
<td>2 gram</td>
</tr>
<tr>
<td></td>
<td>Shinobi Plus</td>
<td>0.014”</td>
<td>4 gram</td>
</tr>
<tr>
<td>Medtronic Vascular</td>
<td>Persuader</td>
<td>0.014”</td>
<td>3 &amp; 6 gram</td>
</tr>
<tr>
<td></td>
<td>Persuader 9</td>
<td>0.014”</td>
<td>9 gram</td>
</tr>
<tr>
<td></td>
<td>(tip 0.011”)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abott Vasc. Asahi</td>
<td>Confianza Pro (Conquest)</td>
<td>0.014”</td>
<td>9 &amp; 12 gram</td>
</tr>
<tr>
<td></td>
<td>(tip 0.009”)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Guidewire Selection

## Non-Coated (Non-Lubricious) Coil Wires

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Wire</th>
<th>Shaft &amp; tip Diameter</th>
<th>Stiffness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abott Vascular Asahi</td>
<td>Medium</td>
<td>0.014”</td>
<td>2 gram</td>
</tr>
<tr>
<td></td>
<td>Miraclebros</td>
<td>0.014”</td>
<td>3, 4.5, 6, 12 g</td>
</tr>
<tr>
<td></td>
<td>Confianza</td>
<td>0.014”</td>
<td>9 &amp; 12 gram</td>
</tr>
<tr>
<td></td>
<td>Confianza Pro</td>
<td>0.014” (tip 0.009”)</td>
<td>9 &amp; 12 gram</td>
</tr>
<tr>
<td>Medtronic Vascular</td>
<td>Persuader</td>
<td>0.014”</td>
<td>3 &amp; 6 gram</td>
</tr>
<tr>
<td></td>
<td>Persuader 9</td>
<td>0.014” (tip 0.011”)</td>
<td>9 gram</td>
</tr>
<tr>
<td>Guidant</td>
<td>HT Intermediate</td>
<td>0.014”</td>
<td>2-3 gram</td>
</tr>
<tr>
<td></td>
<td>HT Standard</td>
<td>0.014”</td>
<td>4 gram</td>
</tr>
<tr>
<td></td>
<td>Cross-IT 100</td>
<td>0.014” (tip 0.011”)</td>
<td>2 gram</td>
</tr>
<tr>
<td></td>
<td>Cross-IT 200</td>
<td>0.014” (tip 0.011”)</td>
<td>3 gram</td>
</tr>
<tr>
<td></td>
<td>Cross-IT 300</td>
<td>0.014” (tip 0.011”)</td>
<td>4 gram</td>
</tr>
<tr>
<td></td>
<td>Cross-IT 400</td>
<td>0.014” (tip 0.011”)</td>
<td>6 gram</td>
</tr>
</tbody>
</table>
## Guidewire Selection

1. **Soft**
   - Traverse (Guidant)
   - Rinato (Asahi Intec)
   - Whisper (Guidant)

2. **Intermediate**
   - Neos (Asahi Intec)
   - Miracle 3g (Asahi Intec)

3. **Stiff**
   - Miracle 4.5g (Asahi Intec)
   - Miracle 6g (Asahi Intec)
   - Miracle 12g (Asahi Intec)
   - Conquest Pro (Asahi Intec)
Guidewire Selection
Soft wires

- Traverse (Guidant)
  for general use to advance the support catheter and to confirm the entrance

- Rinato (Asahi Intec)
  for not so tight CTO (recent occlusion)

- Whisper (Guidant)
  for CTO with small channels
  for recent occlusion with severe tortuosity
Guidewire Selection
Intermediate wires

- **Neos (Asahi Intec)**
  for CTO on non-tortuous vessel

- **Miracle 3g (Asahi Intec)**
  for CTO on tortuous vessel
  for general use
Guidewire Selection

Stiff wires

- **Miracle 4.5g, 6g (Asahi Intec)**
  for standard step-up strategy
  Miracle 3g -> Miracle 4.5g
  -> Miracle 6g -> Miracle 12g or Conquest

- **Miracle 12g (Asahi Intec)** for so tight CTO
  to penetrate proximal or distal cap
  to crash tight plaque within CTO
  to puncture from pseudo to true lumen

- **Conquest Pro (Asahi Intec)** for so tight CTO
  to penetrate proximal or distal cap
  to penetrate tight plaque within CTO
  to puncture from pseudo to true lumen
Guidewire Selection

- **Miracle 12g** is more controllable
to penetrate **proximal cap**,to advance in the tight CTO with bending,to puncture from pseudo to true lumen

- **Conquest should be used**
  only when the appropriate direction can be seen
to penetrate **distal cap**,to puncture from pseudo to true lumen

- **Conquest should not be used**
to seek the true lumen or advance for long distance
Guidewire Selection for CTO
Steps for Success

- Become familiar with one or two wire sets
- Over-the wire balloon or Transit catheter
- Frequent wire changes
- Frequent reshaping of wire tip
- Stepwise approach
- Penetration of proximal cap
- Wire passage through the body of the CTO
- Penetration of the distal cap
Guidewire Selection for CTO
Stepwise Approach

1. Explore with Soft Tip or Medium Wire
   - Asahi: Soft or medium  2 gram
   - Guidant: 014” intermediate 2 gram
     014” Standard  4 gram
   - Boston Sci: Choice PT (Hydrophilic) 2 gram
     PT Graphix (Hydrophilic) 3-4 gram

2. Medium to Heavy Wire
   - Asahi: Miraclebros 3, 4.5, 6 gram
   - Mdt Vasc: Persuader 3, 6 gram
   - Cordis: Shinobi (Hydrophilic) 2, 4 gram
   - Guidant: Cross-IT 100, 200  2, 3 gram
3. Heavy Wire (Distal Cap)
   Asahi: Miraclebros 6, 9 gram
   Confianza 8, 12 gram
   Confianza Pro 9, 12 gram
   Guidant: Cross-IT 300 4 gram
   Cross-IT 400 6 gram
   Medtronic Vascular Persuader 9 9 gram

4. Following successful crossing to true lumen.
   Exchange for soft-tipped wire (avoid hydrophilic)
   Asahi: soft
   Guidant: HT-Floppy
### Randomized Comparison of the CrossWire vs. Conventional Wire

<table>
<thead>
<tr>
<th></th>
<th>Conventional (n=46)</th>
<th>Crosswire (n=42)</th>
<th>P-value</th>
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</thead>
<tbody>
<tr>
<td>1st GW Success (%)</td>
<td>34.8</td>
<td>73.8</td>
<td>0.001</td>
</tr>
<tr>
<td>2nd GW attempt (%)</td>
<td>10.8</td>
<td>-</td>
<td>0.004</td>
</tr>
<tr>
<td>Crossover (%)</td>
<td>58.7</td>
<td>26.2</td>
<td>0.009</td>
</tr>
<tr>
<td>Total attempt duration</td>
<td>21.2 ± 10.5</td>
<td>14.8 ± 9.8</td>
<td>0.004</td>
</tr>
<tr>
<td>(min)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total GW number</td>
<td>1.70 ± 0.56</td>
<td>1.29 ± 0.51</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Angiographic Success(%)</td>
<td>78.3</td>
<td>71.4</td>
<td>NS</td>
</tr>
<tr>
<td>Procedure Time (min)</td>
<td>57.2 ± 32.8</td>
<td>42.0 ± 19.7</td>
<td>0.013</td>
</tr>
<tr>
<td>Fluoro time (min)</td>
<td>24.3 ± 14.1</td>
<td>19.2 ± 10.5</td>
<td>0.06</td>
</tr>
<tr>
<td>In-Hospital MACE (%)</td>
<td>0</td>
<td>0</td>
<td>N/A</td>
</tr>
</tbody>
</table>

T. Lefevre et al, Am J Cardiol 2000
# Technical Improvements in Treating CTO’s

<table>
<thead>
<tr>
<th></th>
<th>New Guide Wires</th>
<th>Old Guide Wires</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>69</td>
<td>81</td>
</tr>
<tr>
<td>&gt;15 mm Occ.</td>
<td>35 (51%)</td>
<td>21 (26%)</td>
</tr>
<tr>
<td>Bridging Coll.</td>
<td>23 (33%)</td>
<td>12 (15%)</td>
</tr>
<tr>
<td>&lt;3 months old*</td>
<td>34 (49%)</td>
<td>49 (60%)</td>
</tr>
<tr>
<td>Success*</td>
<td>55 (80%)</td>
<td>50 (62%)</td>
</tr>
</tbody>
</table>
HI-TORQUE PILOT™
Family of Guide Wires

A polymer-tip, hydrophilic guide wire designed for CONTROL
HI-TORQUE PILOT™ Design

- Polymer cover with Hydrocoat hydrophilic coating for effortless lesion access
- 2 mm single marker for measurement of lesion length
- 15 mm translucent intermediate coils
- 30 mm radiopaque tip coils
- DURASTEEL™ core material offers excellent tip shape retention and durability
- Modified RESPONSEASE™ parabolic technology designed to maximize torque response and control while providing additional support.
- Polymer-tip designed to tackle the challenges of difficult lesions
Choice PT Guidewire

- Description: Crossing guidewire with light rail support, unibody stainless steel core and hydrophilic-coated polymer sleeve for smooth device delivery
- Application: Designed for more challenging cases involving severe tortuosity and tight lesions.
- Available in 182 cm and 300 cm length, Straight and J-Tip Configurations
- Wire diameter .014”
- Tip radiopacity 35 cm
- Compatible with: Magnet™ Exchange device
PT2™ Coronary Guide Wire

PT2 Moderate Support

PT2 Light Support

CTO LIVE 2007
Big Tips Are for Waiters!

0.010” tip
0.007” microchannel

0.014” tip
0.007” microchannel
Crosswire NT

- Polyurethane which mixed Tungsten (45wt%)
  - Urethane/Hydrophilic coating = Distal 40 cm only
    - Ensure a better handling
    - Reduce a chance of slipping out from the lesion
    - Enhance the stiffness of shaft body

- Milder Core Wire Tapering
  - For wider applications

- Packaging
  - Trayless package to be environmental friendly

Size: 0.014 inch, 180 cm
Cross-IT XT Wire: Tapering Tip

- Designed for greater torque transmission/control
- Broad transition/tapered core design based on ACS HI-TORQUE TRAVERSE
- Tapered tip coil design (0.014” to 0.010” at distal 3 cm)
- Hydrophilic coating over distal 30 cm
- PTFE coating over proximal portion
- 30 cm of coils
Cross-IT XT Wire: Range of Tip Stiffness Levels

- Different lesions may require different tips
- Guide wire must have enough tip stiffness to cross
- Physicians may prefer to “step up”
Recanalization with Cross-IT XT Guidewire

Success Rate (%) 34.8
- 100 XT 61
- All Cross-it XT wires 76
- Cross-IT & Other GW 82

In-Hospital Events
- Pericardial Tamponade 0.5%
- Non Q-MI 1%
- Death 0

n= 214 CTO
MC = vascular micro channels

HJ Buettner et al, ACC 2002
Shinobi

Duraglide Spray coating

Flattened Radiopaque Coil

Flex-Joint Bond

Shinobi: .007” Inner Corewire Diameter
Shinobi Plus: .010” Inner Corewire Diameter
SHINOBI Advantage in Uncrossable Lesions

• Designed as a highly steerable wire with exceptional tactile feel - “to sleek in”
  - Permanent PTFE sleeve extends over the tip for added lubricity & more control as compared to hydrophilic coatings
  - FLEX-JOINT Bond enhances distal flexibility & tip control

• Able to cross tight lesions
  - Firm tip flexibility that is easy to see
  - Flattened radiopaque coils yield more surface area to improve tip memory

• Two support levels (WIZDOM & Stabilizer PLUS platforms)
  - Added tip pushability with the extra support of the SHINOBI Plus
Persuader Crossing Guidewires

- Diameter: 0.014” system
- Materials:
  - Core Wire: Stainless Steel
  - Outer Cover: Coils (Stainless Steel/Platinum)
- Distal Radiopaque Tip: 3 cm
- Tip Shape: Straight Tip Only
- Total length (RX): 180 cm
- Total length (OTW): 300 cm
- Extension System: Doc Extension
- Coating: Hydro-track (Hydrophilic) & Pro/Pel (Silicone)
Persuader 3

Grind Profile:

- (Flat drop)

Outer Covering

Coating

- Teflon
- (Hydro-Track or Pro/Pel)

Support

Tip Stiffness
Asahi Neo’s Guidewire Line-up

**Light**
AG145000
Radio-opacity 3cm
Diameter 0.014inch
Length 175cm

Improved lubricity and good tip shape memory with our unique core design. Excellent torque response. This wire has a flexible tip and can be used as a first choice wire for almost all procedures. (Tip load 0.5G)

**Soft**
AG141000
Radio-opacity 3cm
Diameter 0.014inch
Length 175cm

This is a first choice guidewire with high torque response and excellent steerability because of the unique core property. (Tip load 0.7G)

**Intermediate**
AG142000
Radio-opacity 3cm
Diameter 0.014inch
Length 175cm

This is a guidewire with a good balance of tip flexibility and support performance. (Tip load 3.0G)

**Standard**
AG143000
Radio-opacity 3cm
Diameter 0.014inch
Length 175cm

Improved tip stiffness with our unique core taper design. (Tip load 6.5G)
**Asahi Neo’s Fielder**

- **Catalog No.**: AGP140000
- **Tip weight**: 1.0G
- **Radiopacity length**: 3cm
- **Outside diameter**: 0.014inch
- **Total length**: 175cm

**Specifications**
- **22 cm Polymer Sleeve & Hydrophilic coating**
- **12 cm Spring Coil**
- **3 cm Radiopaque Coil**
- **0.014”**
- **PTFE Coating**
Asahi Neo’s Fielder: Comparison

- **Fielder**
  - 60 mm
  - 110 mm
  - 50 mm
  - 220 mm

- **Whisper MS**
  - 50 mm
  - 240 mm
  - 290 mm

- **Whisper LS**
  - 50 mm
  - 240 mm
  - 290 mm

- **Choice PT**
  - 60 mm
  - 70 mm
  - 250 mm
  - 380 mm

All dimensions are in millimeters (mm) and 0.014".
Asahi Neo’s Route

- Catalog No.: AGH147000
- Tip weight: 0.8G
- Radiopacity length: 3cm
- Outside diameter: 0.014 inch
- Total length: 175cm
Asahi Neo’s Rinato

- Improved support performance at the range of 50 - 100 mm from tip, which is most often used with/for mounting intervention device(s).
- Excellent Torqueability (near to 1:1)
- Good lubricity even in tortuous vessels.
**Asahi Neo’s vs. ACS (soft type): Structural Comparison**

**ASAHI NEO’S Family**

**Light**
- Improved lubricity and tip shape memory with our unique core design. Excellent torque response. This wire has the flexible tip and can be used as a first choice wire for almost all procedures. (Tip load 0.5G)

**Soft**
- This is a first choice guidewire with high torque response and excellent steerability because of the unique core property. (Tip load 0.7G)

**HI-TORQE Family**

**Floppy II**
- Flexible tip by using shaping ribbon. (Tip load 0.4G)

**Traverse**
- Core-To-Tip structure. Its stiffness is middle between HTF II and HTI. (Tip load 0.7G)

**Balance**
- Good durability and shape adjustability by applying memory shape alloy (Nitinol Elastinite) to its core. Flexible tip by using shaping ribbon. (Tip load 0.4G)

**Balance Middle Weight**
- Good durability and shape adjustability by applying memory shape alloy (Nitinol Elastinite) to its core. Higher support performance than Balance. (Tip load 0.5G)
ASAHI Wires: Miraclebros & Confianza Family

- Miraclebros 3g
- Miraclebros 4.5g
- Miraclebros 6g
- Miraclebros 12g
- Confianza 9g
- CP(Confianza Pro) 9g
- CP(Confianza Pro) 12g

- Excellent trackability, 1:1 torque, and tactile response
- Incremental tip stiffness and wire support (Miraclebros line)
- Smallest tapered tip design (Confianza & CP, 0.009")
Asahi MiracleBros Wires

- MiracleBros Family 3, 4.5, 6, & 12
- Smooth trackability & delivery with Joint-less spring coils
- Core-to tip design
- Excellent tip shapeability & shape retention
- Radiopacity = 11cm
  - Visibility of full wire length, for chronic occlusions
- Hydrophilic coating
**Miracle Series**

**Miracle 3**
- AG14M050
- Tip Radiopacity: 11cm
- 0.014inch
- 175cm

**Miracle 4.5**
- AG14M045
- Tip Radiopacity: 11cm
- 0.014inch
- 175cm

**Miracle 6**
- AG14M060
- Tip Radiopacity: 11cm
- 0.014inch
- 175cm

**Miracle 12**
- AG14M070
- Tip Radiopacity: 11cm
- 0.014inch
- 175cm

(Tip Stiffness 3.0G)

(Tip Stiffness 4.5G)

(Tip Stiffness 6.0G)

(Tip Stiffness 12.0G)
**Confianza**
- Designed for chronic occlusions
- Hydrophobic coating
- Tip tapers to 0.009”
- Tip Load = 9 g
- Radiopacity = 20 cm

**Confianza Pro (CP)**
- Designed for chronic occlusions
- Hybrid: hydrophobic tip for tacktile feedback & hydrophilic coating for lubricity in lesion
- Tip tapers to 0.009”
- Tip Load = 9g, 12g
- Radiopacity = 20 cm
Confianza Wire (Conquest)

- Developed for CTO lesions
- Higher crossability than Miracle series
- Distal OD is 0.009 inches (φ 0.23mm with tapered coil)
- Tip Stiffness 9.0G
CONQUEST
AG143090
Tip Radiopacity
20cm
0.014inch
175cm

Grand Slam
AG141002
Tip Radiopacity 4cm
0.014inch
175cm
Flexible distal tip.
Provide more support for tortuous vessel.
Tip Stiffness 0.7G

Maker Wire
AG141010
Tip Radiopacity
3cm
0.014inch
175cm
**Asahi Neo’s vs. ACS (CTO type): Structural Comparison**

**ASAHI NEO’S Family**

**Intermediate**

This is a guidewire with a good balance of tip flexibility and support performance. (Tip load 3.0G)

**Miracle 3**

Applying the structure which further improves torque performance for CTO use. The tip part has the structure which is difficult to be trapped by the lesions. (Tip load 3.0G)

**Miracle 6**

(Tip load 6.0G)

**CONQUEST**

This wire is developed for CTO use. Diameter of tip coil is tapered to 0.009 inch (Ø 0.23 mm). (Tip load 9.0G)

**HI-TORQUE Family**

**Intermediate**

Good controllability and torque response with Core-To-Tip Structure (Tip load 2.0G)

**Standard**

Suitable to CTO. High pushability and support performance (Tip load 5.0G)

**STING**

Improved trackability by its thicker distal core and longer taper length than HTS. (Tip load 8.0G)

**CROSS-IT**

For CTO use. Tip diameter is 0.010 inch. (Tip load 3.5G)
Steerable guidewire: Hydrophilics

- Radiopaque Deflectable Tip: .029" (0.73mm)
- Distal Tip: .022" (0.56mm)
- Distal Shaft: .042" (1.06mm)
- Proximal Shaft: .049" (1.24mm)
- Torque Handle
- Catheter Hub
- Tip Deflection Twist Knob
- Strain Relief

Dimensions:
- 3.5cm
- 140cm
- 158cm

CTO LIVE 2007
Tapering Tip Guidewires: Designed to Enter MicroChannels

- Cross It Series (Guidant)-(0.10)
- Confianza Series (Asahi, Abbott (0.009))

Lubricious vs Not

If microchannels can be visualized to connect, then lubricious wires are frequently successful and always quick.
Microchannels

- Provide contact with agents that might alter CTO Lytics: O’Neill, et al
Terumo’s Progreat

2.2Fr. <super selective>

- Excellent Trackability
- Excellent Handling
- Enough Flow rate

2.2Fr. <super selective>  Fr. <super selective>

Maximum O.D. GW 0.018”

Gradient Shaft

Φ 0.55

Platinum Radiopaque

Tungsten Coil (40 μm)
Terumo’s Progreat

2.0Fr. <super selective>

Catheter Size: 2.0 - 2.7Fr. (Distal-Proximal)
Inner diameter: 0.49mm/0.019inch
Length: 100cm, 110cm, 130cm, 150cm
Max. Injection Pressure: 750psi
Hydrophilic coating

Outer surface: Hydrophilic coating
(Except 60mm from proximal end)
Asahi’s Tornus

- Braided stainless steel catheter
  - for greater support and pushability
- 1mm distal radiopaque marker
  - for easy visualization of the distal tip
- Tapered threaded tip
- Excellent flexibility for tortuous anatomy

<table>
<thead>
<tr>
<th>Tornus 2.1 Fr</th>
<th>.028”</th>
<th>.024”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tornus 2.6 Fr</td>
<td>.035”</td>
<td>.028”</td>
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</table>