ΧΡΟΝΙΕΣ ΟΛΙΚΕΣ
ΑΠΟΦΡΑΞΕΙΣ:
ΥΛΙΚΑ ΚΑΙ ΤΕΧΝΙΚΕΣ

Άννα Δαγρέ, PhD, FESC, FSCAI
Γεν. Νοσοκομείο Ελευσίνας "ΘΡΙΑΣΙΟ"

ΠΑΝΕΛΛΗΝΙΑ ΣΕΜΙΝΑΡΙΑ ΟΜΑΔΩΝ ΕΡΓΑΣΙΑΣ ΕΚΕ
ΘΕΣΣΑΛΟΝΙΚΗ, 09/02/2018
Disclosures

❖ None
Right tool for the right reason

Overkill

Knife to gunfight
ANATOMY DICTATES STRATEGY

1. Proximal cap
   - 1. Proximal vessel tortuosity - caliber
   - 2. Ambiguous or clear?
   - 3. Tapered or blunt?
   - 4. Side branches?
   - 5. Calcification

2. Lesion length
   - <20mm or ≥ 20mm

3. Distal vessel
   - 1. Caliber and quality of distal vessel
   - 2. Bifurcation
   - 3. Prior bypass graft insertion sites

4. Collaterals
   - 1. Type (septal, bypass grafts, epicardial)
   - 2. Size (Werner classification)
   - 3. Tortuosity
   - 4. Dominance
   - 5. Angle and location of entry

Scoring Systems for Predicting Technical Success of CTO

**J-CTO score**

- **Tapered**
  - Entry with any tapered tip or dimple indicating direction of true lumen is categorized as "tapered".
- **Blunt**
  - Entry with any tapered tip or dimple indicating direction of true lumen is categorized as "tapered".
- **Calcification**
  - Regardless of severity, 1 point is assigned if any evident calcification is detected within the CTO segment.
- **Bending > 45 degrees**
  - One point is assigned if bending > 45 degrees is detected within the CTO segment. Any tortuosity separated from the CTO segment is excluded from this assessment.
- **Occlusion length**
  - Using good collateral images, try to measure "true" distance of occlusion, which tends to be shorter than the first impression.
- **Re-try lesion**
  - Is this Re-try (2nd attempt) lesion? (previously attempted but failed)

**Variables and definitions**

- **Total points**
  - Category of difficulty (total point)
    - easy (0)
    - Intermediate (1)
    - difficult (2)
    - very difficult (≥3)

**PROGRESS CTO score**

**Figure 1** Summary of the PROGRESS CTO Score

- **Proximal cap ambiguity**
  - (1 point)
- **Absence of "interventional" collaterals**
  - (1 point)
- **Moderate/severe tortuosity**
  - (1 point)
- **Circumflex CTO**
  - (1 point)

- **Poor cap visualization or absence of clearly tapered stump**
- **Interventional collateral**
- **Non-interventional collateral**

**2 bends>70 degrees or 1 bend>90 degrees**

*Morino Y et al J Am Coll Cardiol Intv 2011;4:213-21*  
*Christopoulos G et al J Am Coll Cardiol Intv 2016;9:1-9*
1. Approach: Femoral – consider **45 cm sheath**
   Radial
2. Guide: **7 or 8 French** – support
   
   - RCA:AL type / LCA: XB, EBU type
   - Side holes +/–
3. Virtually always: **dual injections**
Asahi Sion Family

Variety of choices that suits you best
ASAHI SION series guidewire

ASAHI SION blue ES
High-support

ASAHI SION blue
All-around wire

ASAHI SION black
High lubricity

High maneuverability

Hightension Stainless Steel Core
0.36mm (0.014")

Silicone Coating
Hydrophilic Coating
SLIP-COAT
PTFE Coating

Employs the ASAHI brand rope coil, which provides torqueability, flexibility and resiliency.
• Fielder XT-A
• Fielder XT-R

"One minute guidewire"

XT- R/A : Core technology is the same as ASAHI SION Family
### Asahi Miracle/Confianza wire family

**Straight Tip**

<table>
<thead>
<tr>
<th>Model</th>
<th>Tip Load</th>
<th>Radiopacity Length</th>
<th>Jointless</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASAHI MIRACLEBROS™ 3</td>
<td>3.0G</td>
<td>11 cm</td>
<td></td>
</tr>
<tr>
<td>ASAHI MIRACLEBROS™ 4.5</td>
<td>4.5G</td>
<td>11 cm</td>
<td></td>
</tr>
<tr>
<td>ASAHI MIRACLEBROS™ 6</td>
<td>6.0G</td>
<td>11 cm</td>
<td></td>
</tr>
</tbody>
</table>

**Tapered Tip**

<table>
<thead>
<tr>
<th>Model</th>
<th>Tip Load</th>
<th>Radiopacity Length</th>
<th>Outside Diameter</th>
<th>Tip Outside Diameter</th>
<th>Jointless</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASAHI CONFIANZA™ 9</td>
<td>9.0G</td>
<td>20 cm</td>
<td>0.014 inch</td>
<td>0.009 inch</td>
<td></td>
</tr>
<tr>
<td>ASAHI CONFIANZA PRO™ 9</td>
<td>9.0G</td>
<td>20 cm</td>
<td>0.014 inch</td>
<td>0.009 inch</td>
<td></td>
</tr>
<tr>
<td>ASAHI CONFIANZA PRO™ 12</td>
<td>12.0G</td>
<td>20 cm</td>
<td>0.014 inch</td>
<td>0.009 inch</td>
<td></td>
</tr>
</tbody>
</table>

For delivering Stingray balloon

Confianza = tapered tip
Pro = hydrophilic coating
Asahi Gaia Family

Composite core

Smooth entry into the occluded lesion

**Easy control within the lesion**

<table>
<thead>
<tr>
<th>Product</th>
<th>Diameter (in)</th>
<th>Tip Load (gf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASAHI Gaia First</td>
<td>0.010 - 0.014</td>
<td>1.7</td>
</tr>
<tr>
<td>ASAHI Gaia Second</td>
<td>0.011 - 0.014</td>
<td>3.5</td>
</tr>
<tr>
<td>ASAHI Gaia Third</td>
<td>0.012 - 0.014</td>
<td>4.5</td>
</tr>
</tbody>
</table>

**vs**

Rotation

Intentional control through deflection to stay true lumen
RETROGRADE CTO PCI

VERY COMPLEX COLLATERALS
Construction

SUOH 03

Twist wire = 7 wires

Distal rope Coil = 4 wires

ACT ONE = 6 wires

Core wire = 1 wire

Proximal coil = 1 wire

Total 19 wires!

Sianos G “The Experts Live” Workshop 2017
Features

- Tip Load 0.3 gr, Coreless
- Combination of Flexibility and maneuverability
- Enhanced Tip Durability
- Can not predict to navigate at discretion
# SENTAI Guidewires

<table>
<thead>
<tr>
<th>Workhorse Wires</th>
<th>Tip Load (gf)</th>
<th>Tip Diameter (in)</th>
<th>Radiopaque Tip Length (cm)</th>
<th>Core Material</th>
<th>Coating</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SAMURAI™</strong></td>
<td>0.5</td>
<td>0.014</td>
<td>4</td>
<td>Stainless Steel</td>
<td>Moderated hydrophilic**</td>
</tr>
<tr>
<td><strong>MARVEL™</strong></td>
<td>0.9</td>
<td>0.014</td>
<td>3</td>
<td>Stainless Steel</td>
<td>Hydrophilic</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specialty Crossing Wires</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SAMURAI™ RC</strong></td>
<td>1.2</td>
<td>0.014</td>
<td>4</td>
<td>Stainless Steel</td>
<td>Hydrophilic</td>
</tr>
<tr>
<td><strong>FIGHTER™</strong></td>
<td>1.5</td>
<td>Tapered 0.009</td>
<td>3.5</td>
<td>Stainless Steel</td>
<td>Clear polymer jacket/hydrophilic</td>
</tr>
<tr>
<td><strong>HORNET™</strong></td>
<td>10</td>
<td>Tapered 0.008</td>
<td>3.5</td>
<td>Stainless Steel</td>
<td>Hydrophilic</td>
</tr>
<tr>
<td><strong>HORNET™ 10</strong></td>
<td>14</td>
<td>Tapered 0.008</td>
<td>3.5</td>
<td>Stainless Steel</td>
<td>Hydrophilic</td>
</tr>
<tr>
<td><strong>HORNET™ 14</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Fighter™ Specialty Crossing Wire**

<table>
<thead>
<tr>
<th>Key Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tapered tip</td>
</tr>
<tr>
<td>Clear polymer jacket</td>
</tr>
<tr>
<td>Hydrophilic coating</td>
</tr>
<tr>
<td>Ideal prolapse wire</td>
</tr>
<tr>
<td>Moderate rail support</td>
</tr>
</tbody>
</table>

### Specifications

<table>
<thead>
<tr>
<th>Name</th>
<th>Coil Diameter (inch)</th>
<th>Tip Diameter</th>
<th>Length (cm)</th>
<th>Coil length (cm)</th>
<th>Radiopaque (cm)</th>
<th>Tip Load (gf)</th>
<th>Core Material</th>
<th>Tip Shape</th>
<th>Coating</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIGHTER</td>
<td>0.014</td>
<td>0.009</td>
<td>190 300</td>
<td>18</td>
<td>3.5</td>
<td>1.5</td>
<td>Stainless Steel</td>
<td>Straight</td>
<td>Clear Polymer Jacket w/ Hydrophilic</td>
</tr>
</tbody>
</table>
## Hornet wire family

**Coil Length (15cm) / Hydrophilic Coating**

- Radiopaque (3.5 cm)
- 0.014 inch
- Hydrophilic Coating
- Stainless Steel Core
- 0.008 inch

**PTFE Coating**

### Table

<table>
<thead>
<tr>
<th>Name</th>
<th>Coil Diameter (inch)</th>
<th>Tip Diameter (inch)</th>
<th>Total Length (cm)</th>
<th>Coil Length (cm)</th>
<th>Radiopaque (cm)</th>
<th>Tip Load (gf)</th>
<th>Penetration Force (gf/mm²)</th>
<th>Core Material</th>
<th>Tip Shape</th>
<th>Coating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hornet</td>
<td>0.014</td>
<td>0.008</td>
<td>190 300</td>
<td>15</td>
<td>3.5</td>
<td>1</td>
<td>31</td>
<td>Stainless Steel</td>
<td>Straight</td>
<td>Hydrophilic</td>
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<tr>
<td>Hornet 10</td>
<td>0.014</td>
<td>0.008</td>
<td>190 300</td>
<td>15</td>
<td>3.5</td>
<td>10</td>
<td>308</td>
<td>Stainless Steel</td>
<td>Straight</td>
<td>Hydrophilic</td>
</tr>
<tr>
<td>Hornet 14</td>
<td>0.014</td>
<td>0.008</td>
<td>190 300</td>
<td>15</td>
<td>3.5</td>
<td>14</td>
<td>432</td>
<td>Stainless Steel</td>
<td>Straight</td>
<td>Hydrophilic</td>
</tr>
</tbody>
</table>

**Penetration Power**

Hornet 10 > Confianza Pro 12

\[
\text{Penetration Power} = \frac{\text{Tip load}}{\pi \times (D/2)^2}
\]
Asahi Gaia Next

Line-up & Technical Specs

SLIP-COAT® Hydrophilic coating : 40cm

<table>
<thead>
<tr>
<th>Product</th>
<th>Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASAHI Gaia Next 1</td>
<td>0.36mm/0.27mm (0.014inch/0.011inch)</td>
</tr>
<tr>
<td>ASAHI Gaia Next 2</td>
<td>0.36mm/0.30mm (0.014inch/0.012inch)</td>
</tr>
<tr>
<td>ASAHI Gaia Next 3</td>
<td>0.36mm/0.30mm (0.014inch/0.012inch)</td>
</tr>
</tbody>
</table>

- Length : 190cm
- Hydrophilic coating length : 40cm
- Coil length : 15cm
- Radiopaque length : 15cm
To increase the penetration ability in a complex occlusion, the ASAHI GAIA Next series have higher tip loads.

*The above data was obtained by company standardized test, which may differ from industry standardized tests.
*The above data does not prove that all devices have exactly the same performance with the samples used for these tests.
Anti trapping performance
Microchannels:
tapered polymeric wires
Fielder XT
Fielder XT-A or XT-R

Penetration:
Stiffer tapered wires
Conquest PRO 9/12
Hornet
GAIA 2 or 3
Progress 140/200
Stiffer non tapered wires
Pilot 200
Tortuosity – long occluded segment

Tortuosity:

- Soft polymeric wires
  - Tend to bend

- Stiffer tapered wires
  - Risk of perforation

Knuckling wires:

- Fielder XT (smaller)
- Pilot 200 (bigger)
Collateral crossing: septals

Possible sequence
“Collateral Crossing”

SION

SION Black (FFC)

XTR (FXT)
Collateral crossing: epicardial

Possible sequence
“Epicardial Collateral Crossing”

SION

SUOH

CTO iBooks
www.ctoibooks.com
MICROCATHETERS

- FineCross (Terumo)
- Progreat (Terumo)
- Corsair (Asahi)
- Caravel (Asahi)
**FineCross™ MG — Coronary Micro-Guide Catheter**

- **2.6 Fr. (0.87 mm)**
- **1.8 Fr. (0.60 mm)**
- **Glide Technology™ hydrophilic coating** (on distal portion)

**Tapering structure**
- **Catheter tip**
- **Flexible tip**
- **Hydrophilic coating**

---

**Corsair Micro Catheter**
- **0.018” (ID). PTCA Guide Wire 0.014” (OD).**
- Guide wire buckles within larger lumen.

**Corsair Micro Catheter**
- **0.015” (ID). PTCA Guide Wire 0.014” (OD).**
- Corsair + Maximum Support.

---

- **CWR and CCWR**
- **Avoid too much rotation (>10)**
Corsair Pro

- Optimization of catheter stiffness profile
- Removing of coil marker
- Spiral protector

Improved performance

- Tracking ability
- Kink resistance at proximal shaft
Stiffer than Corsair

- Antegrade approach
- More of a support catheter
- Better for septals than epicardial
❖ High Torque Response  1:1  
❖ Firm and Flexible shaft  
❖ Antegrade approach  

Hydrophilic coating: 70/85cm
Microcatheters for antegrade CTO approach

Good Guiding Back-up
Not very calcified CTO lesions
Pushable MC
Finecross
M Cath

Less Guiding Back-up
Ostial or very proximal lesions, planned ADR
Rotatable MC
Corsair
Turnpike Spiral
Microcatheters for retrograde CTO approach

Septal Crossing
- Rotatable MC
  - Corsair
  - Turnpike

Epicardial Crossing
- >1.5mm
- <1.5mm
  - Low profile MC
    - Finecross
    - Turnpike LP
    - Caravel
Dual Lumen Microcatheters

**Nhancer RX**
- Oval shaft
- Minor axis: 2.3F (0.75 mm)
- Crossing profile
- Major axis: 3.3F (1.1 mm)

**Fine Duo**
- Round shaft
- 0.97 mm crossing profile

**Crusade**
- Round shaft
- 1.2 mm crossing profile

**Twin Pass Torque**
- Dual-Lumen O.D.: 3.4F x 2.7F
- Distal Tip O.D.: 2F

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Dual-Lumen O.D.</th>
<th>Distal Tip O.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5200</td>
<td>Twin Pass</td>
<td>3.4F x 2.7F</td>
<td>2F (0.66mm / 0.026&quot;)</td>
</tr>
<tr>
<td>5201</td>
<td>Twin Pass Torque</td>
<td>3.5F x 3.5F</td>
<td>2.1F (0.71mm / 0.028&quot;)</td>
</tr>
</tbody>
</table>
Dual Lumen Catheters Applications

Reverse wire technique

Bifurcation CTO wiring

Wiring acute angulated bifurcations

Parallel wiring technique
Guide extension with an integrated trapping balloon for maintaining guidewire position

- 6F, 7F & 8F.
Trapper

Trapping Technique

- **Core Wire**: Tip to hub for durability during multiple uses.
- **Distal Markerband**: 1 mm length to confirm position in guide catheter.
- **Non-compliant Balloon**: 6-8F compatible, 2.4 mm at nominal, uncoated.
- **Low-profile Shaft**: 2F diameter.
- **Telescope**: Compatible with 90 or 100 cm guide catheters.
- **Markerband**: 2 mm long and double thickness of POBA for easy identification.
- **Orange Manifold**: Unique and easily identifiable.

**Trap it**

- **Radiopaque Tip**: 2.5 x 15 mm balloon 6-8F compatible
- **Shaft**: 90 cm guiding catheter marker (T-100 only)
- **Hemostasis Valve**: Flat stop
- **Hub**:

---

**Diagram:**

- Wire trap
- Balloon inflated in guide (Not on wire)
- Catheter
- Distal wire
Crossing and Re-entry Devices

- **CrossBoss catheter**
  Stiff, metallic, OTW

- **Stingray balloon**
  2.5/10mm

- **Stingray re-entry wire** (300cm)
Intravascular imaging

- Standard Tip
- Short Tip

2.5 mm
### Complication management

Covered stents

<table>
<thead>
<tr>
<th>Jostent Graftmaster 3.0/16</th>
<th>PK Papyrus 3.0/15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandwich design</td>
<td>Covered single stent design</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Crossing profile [mm diameter]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.57</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Guide catheter compatibility*</th>
</tr>
</thead>
<tbody>
<tr>
<td>6F</td>
</tr>
</tbody>
</table>
Complication management

Coils

AZUR Peripheral Coil System

Helical HydroCoil® Embolization System

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>REF</th>
<th>ORDER NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 mm</td>
<td>4 cm</td>
<td>45-480204</td>
<td></td>
</tr>
</tbody>
</table>

LOT: 13092306

AZUR™ Detachment Controller
Bacterial collagenase obtained by fermentation of *Clostridium histolyticum*

Unlike human collagenase, bacterial collagenase cleaves human collagen at multiple sites for more rapid and effective digestion.

- Lyophilized and stored at -20°C providing 3-yr shelf life
- Re-suspended in 0.9% saline prior to injection into CTO

**Animal:** *Circulation* 2003;108:1259
**FIM:** *Circulation* 2012;125:522
Total Occlusion Studies in Coronary Arteries (TOSCA) - 5

Clinically Eligible and Consent Provided

Angiographically Eligible

Occlusion Confirmed

day 0

Double blind

placebo

900 μg

1200 μg

12 minutes via microcatheter

day 1

Antegrade CTO PCI

Next-day Discharge

30-day Follow-up

Confirmation of Occlusion:

1. documented failed attempt
2. tap test: 1 minute attempt to wire

No rescue with:
dissection re-entry retrograde

N=75
Novel Approach to CTO Under Investigation

SoundBite crossing system

- Mechanical amplifier
- Piezo driver
- Connector
- Single large amplitude shock wave
- Wire platform
- Console (adjustable amplitude and rate)
- Single large amplitude shock wave

Teflon coating

- 0.013" core
- Beta titanium 300 cm long
- Linear stiffness transition
- Platinum radio-opaque marker
- Distal tip bulb over 1 mm
Novel Approach to CTO Under Investigation

Initial results of a first-in-human study on the PlasmaWire™ System, a new radiofrequency wire for recanalization of chronic total occlusions

- A novel bi-polar RF wire system
- Plasma-mediated plaque ablation creates a channel inside a CTO

Summary

- Right tool + right time + right way = Success
- Stock appropriate tools for your practice
- Know how to use them
- Prepare for emergencies