ΧΡΟΝΙΕΣ ΟΛΙΚΕΣ ΑΠΟΦΡΑΞΕΙΣ:
ΥΛΙΚΑ ΚΑΙ ΤΕΧΝΙΚΕΣ

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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**

<table>
<thead>
<tr>
<th>Variables and definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tapered</strong></td>
</tr>
<tr>
<td>Blunt</td>
</tr>
<tr>
<td>Entry shape</td>
</tr>
<tr>
<td>□ Tapered (0)</td>
</tr>
<tr>
<td>□ Blunt (1)</td>
</tr>
<tr>
<td><strong>Calcification</strong></td>
</tr>
<tr>
<td>Regardless of severity, 1 point is assigned if any evident calcification is detected within the CTO segment.</td>
</tr>
<tr>
<td>□ Absence (0)</td>
</tr>
<tr>
<td>□ Presence (1)</td>
</tr>
<tr>
<td><strong>Bending &gt;45 degrees</strong></td>
</tr>
<tr>
<td>One point is assigned if bending &gt; 45 degrees is detected within the CTO segment. Any tortuosity separated from the CTO segment is excluded from this assessment.</td>
</tr>
<tr>
<td>□ Absence (0)</td>
</tr>
<tr>
<td>□ Presence (1)</td>
</tr>
<tr>
<td><strong>Oclusion length</strong></td>
</tr>
<tr>
<td>Using good collateral images, try to measure “true” distance of occlusion, which tends to be shorter than the first impression.</td>
</tr>
<tr>
<td>□ &lt;20mm (0)</td>
</tr>
<tr>
<td>□ ≥20mm (1)</td>
</tr>
<tr>
<td><strong>Re-try lesion</strong></td>
</tr>
<tr>
<td>Is this Re-try (2nd attempt) lesion? (previously attempted but failed)</td>
</tr>
<tr>
<td>□ No (0)</td>
</tr>
<tr>
<td>□ Yes (1)</td>
</tr>
<tr>
<td><strong>Category of difficulty (total point)</strong></td>
</tr>
<tr>
<td>□ easy (0)</td>
</tr>
<tr>
<td>□ Intermediate (1)</td>
</tr>
<tr>
<td>□ difficult (2)</td>
</tr>
<tr>
<td>□ very difficult (≥3)</td>
</tr>
<tr>
<td><strong>Total points</strong></td>
</tr>
</tbody>
</table>

**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
- Intervventional 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*
CTO basics

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

High-support

ASAHI SION

High maneuverability

ASAHI SION black

High lubricity

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>Joint-less</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>
<tr>
<td>ASAHI MIRACLEBROS™ 12</td>
<td>12.0G</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>Joint-less</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASAHI CONFIANZA™ 9</td>
<td>9.0G</td>
<td>20 cm</td>
<td>0.014 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></td>
</tr>
<tr>
<td>ASAHI CONFIANZA PRO™ 12</td>
<td>12.0G</td>
<td>20 cm</td>
<td>0.014 inch</td>
<td></td>
</tr>
</tbody>
</table>

**Confianza** = tapered tip

**Pro** = hydrophilic coating

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- **For delivering Stingray balloon**
- **19.9 cm Hydrophilic Coating**

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- **Increasing Support**
Asahi Gaia Family

Composite core

Smooth entry into the occluded lesion

Easy control within the lesion

ASAHI Gaia First
- Diameter: 0.010 - 0.014"
- Tip load: 1.7gf

ASAHI Gaia Second
- Diameter: 0.011 - 0.014"
- Tip load: 3.5gf

ASAHI Gaia Third
- Diameter: 0.012 - 0.014"
- Tip load: 4.5gf

Micro-cone tip

VS

Intentional control through deflection to stay true lumen
RETROGRADE CTO PCI

VERY COMPLEX COLLATERALS
Twist wire = 7 wires

ACT ONE = 6 wires

Distal rope Coil = 4 wires

Core wire = 1 wire

Proximal coil = 1 wire

Total 19 wires!
Features
• Tip Load 0.3 gr, Coreless
• Combination of Flexibility and maneuverability
• Enhanced Tip Durability
• Can not predict to navigate at discretion
<table>
<thead>
<tr>
<th>Wire Type</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>SAMURAI™</td>
<td>0.5</td>
<td>0.014</td>
<td>4</td>
<td>Stainless Steel</td>
<td>Moderated hydrophilic*</td>
</tr>
<tr>
<td>MARVEL™</td>
<td>0.9</td>
<td>0.014</td>
<td>3</td>
<td>Stainless Steel</td>
<td>Hydrophilic</td>
</tr>
<tr>
<td>SAMURAI™ RC</td>
<td>1.2</td>
<td>0.014</td>
<td>4</td>
<td>Stainless Steel</td>
<td>Hydrophilic</td>
</tr>
<tr>
<td>FIGHTER™</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>HORNET™</td>
<td>1</td>
<td>Tapered 0.008</td>
<td>3.5</td>
<td>Stainless Steel</td>
<td>Hydrophilic</td>
</tr>
<tr>
<td>HORNET™ 10</td>
<td>10</td>
<td>Tapered 0.008</td>
<td>3.5</td>
<td>Stainless Steel</td>
<td>Hydrophilic</td>
</tr>
<tr>
<td>HORNET™ 14</td>
<td>14</td>
<td>Tapered 0.008</td>
<td>3.5</td>
<td>Stainless Steel</td>
<td>Hydrophilic</td>
</tr>
</tbody>
</table>

*Reduced hydrophilic coating on distal 1 cm
## Fighter™ Specialty Crossing Wire

<table>
<thead>
<tr>
<th>Name</th>
<th>Coil Diameter (inch)</th>
<th>Tip Diameter (inch)</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</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

<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>
</tr>
<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

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

Line-up & Technical Specs

SLIP-COAT®  Hydrophilic coating :  40cm

ASAHI Gaia Next 1  0.36mm/0.27mm (0.014inch/0.011inch)
ASAHI Gaia Next 2  0.36mm/0.30mm (0.014inch/0.012inch)
ASAHI Gaia Next 3  0.36mm/0.30mm (0.014inch/0.012inch)

- 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
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

---

**Finecross 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
  - >1.5mm

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

Nhancer RX

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

FineDuo

- Round shaft
- 0.97 mm crossing profile

Crusade

- Round shaft
- 1.2 mm crossing profile

Twin-Pass TORQUE

dual access catheter

Model | Description | Dual-Lumen O.D. | Distal Tip O.D.
--- | --- | --- | ---
5200 Twin-Pass | 3.4F x 2.7F (1.14mm / 0.045" x 0.91mm / 0.036") | 2F (0.66mm / 0.026")
5201 Twin-Pass Torque | 3.5F x 3.5F (1.17mm / 0.046") | 2.1F (0.71mm / 0.028")
• Guide extension with an integrated trapping balloon for maintaining guidewire position
• 6F, 7F & 8F.
Crossing and Re-entry Devices

- **CrossBoss catheter**  
  Stiff, metallic, OTW
- **Stingray balloon**  
  2.5/10mm
- **Stingray re-entry wire** (300cm)
Complication management

Covered stents

**Jostent Graftmaster 3.0/16**
Sandwich design

**PK Papyrus 3.0/15**
Covered single stent design

**Crossing profile**
[mm diameter]

- **Jostent Graftmaster 3.0/16**: 1.57
- **PK Papyrus 3.0/15**: 1.19

24% reduction

**Guide catheter compatibility**

- **Jostent Graftmaster 3.0/16**: 6F
- **PK Papyrus 3.0/15**: 5F

Data on file at BIOTRONIK; * Ø 2.5-4.0 mm... design

Covered single stent design allows for low crossing profile and 5F guide catheter compatibility.
## Complication management

Coils

<table>
<thead>
<tr>
<th>Coils Brand</th>
<th>Description</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>AZUR Peripheral Coil</td>
<td>Description of peripheral coil system</td>
<td>![Coil Image]</td>
</tr>
<tr>
<td>Helical HydroCoil</td>
<td>Embolization system details</td>
<td>![Helical HydroCoil Image]</td>
</tr>
</tbody>
</table>

### Helical HydroCoil Embolization System

- **A**: 2 mm
- **B**: 4 cm
- **C**: 150 cm

<table>
<thead>
<tr>
<th>REF</th>
<th>Order Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>45-480204</td>
</tr>
</tbody>
</table>

| LOT  | Lot Number  | 13092306    |
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

Day 0

Angiographically Eligible

Occlusion Confirmed

Double blind

Placebo 900 μg 1200 μg

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

N=75

No rescue with:
dissection re-entry retrograde

12 minutes via microcatheter

* Dual injection
start with soft polymer-jacketed

Echocardiogram
SoundBite crossing system

Novel Approach to CTO Under Investigation

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

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


- 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