

The essentials of guide wires for CTOs

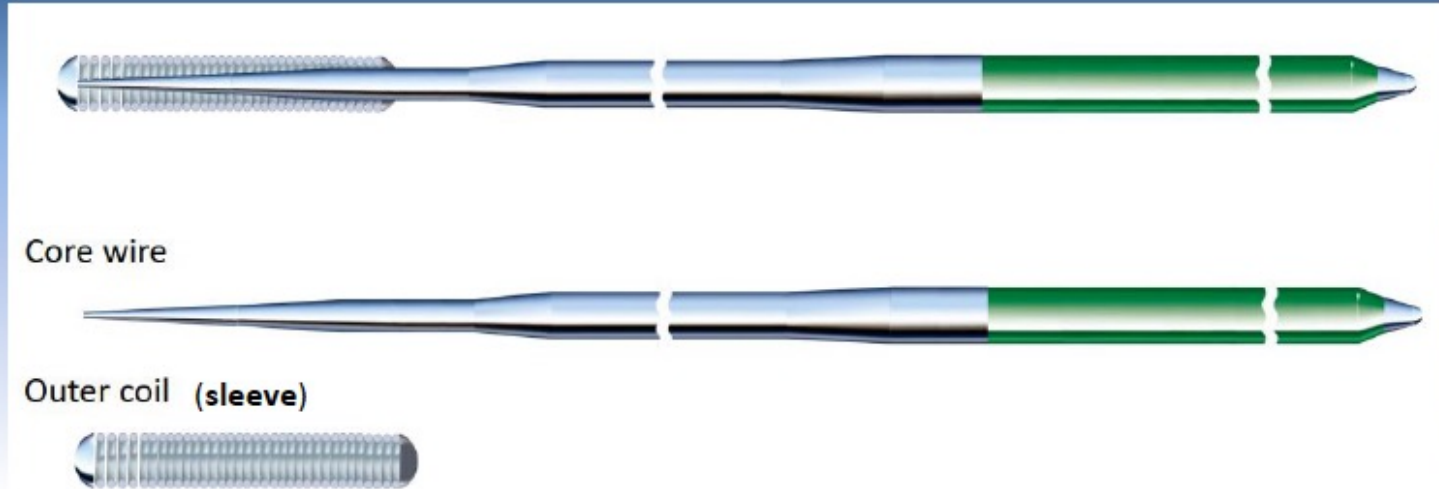
Dr García Touchard

Hospital Puerta de Hierro Majadahonda

Guide wire in CTO PCI

- 1) Essential tool for crossing occlusion
- 2) No single wire fits the whole sequence of PCI
- 3) Difference of Non-CTO PCI wires are small (overlapping), but significant in dedicated wires
- 4) Cross CTO safely, it is imperative to understand the characteristics of each wire
- 5) Use of micro catheter and trapping is essential
- 6) Focus on 3-4 broad categories will foreshorten learning process

Basic Structure of the Guide wire



1. Core Material
2. Core Shape (Tapering)
3. Outer sleeve
4. Tip (shape)
5. Coating (none, hydrophobic, hydrophilic, polymer jacket)

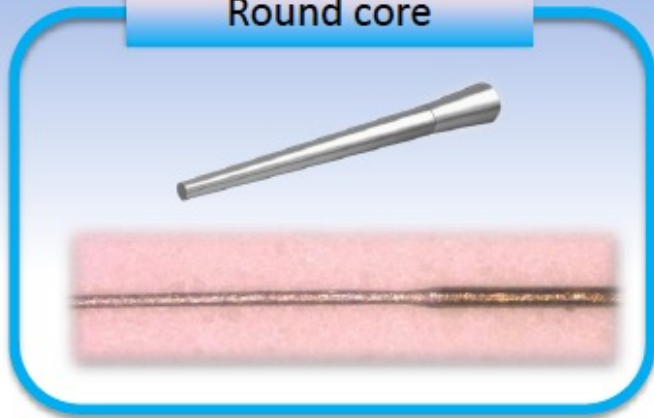
Guide wire basic structure

Difference in the core

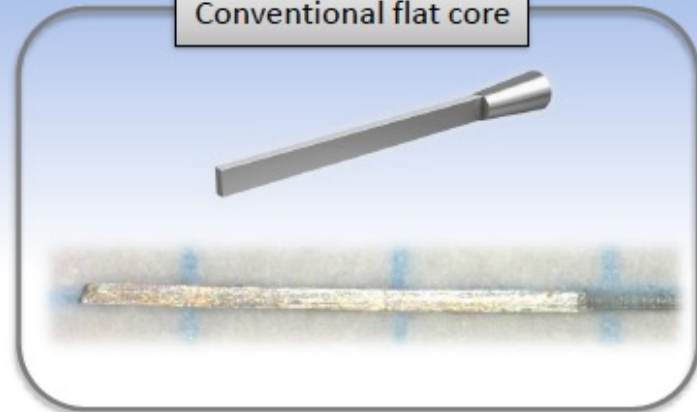
Round core and conventional flat core design



Round core



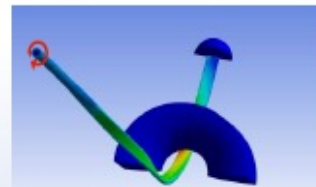
Conventional flat core



Avoid whipping phenomenon

Better maneuverability even in complex vessel anatomy

✓ Whip motion depends on core wire design



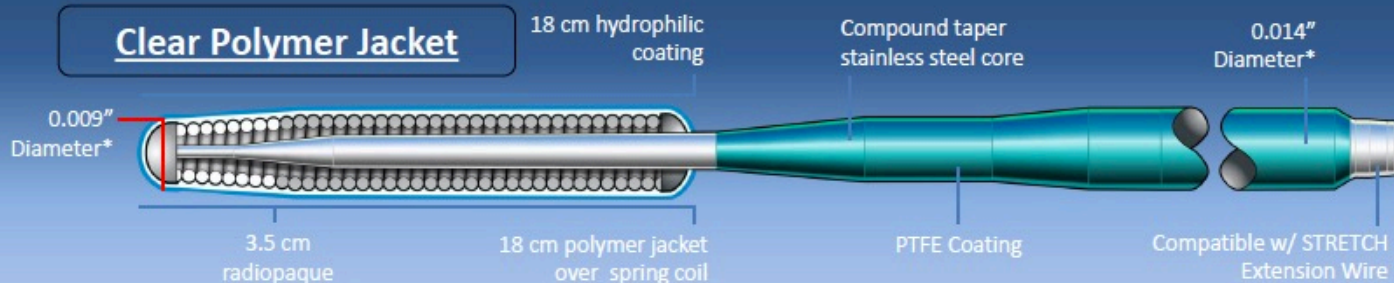
CTO wires

ABBOTT HI-TORQUE PILOT 50/150/200

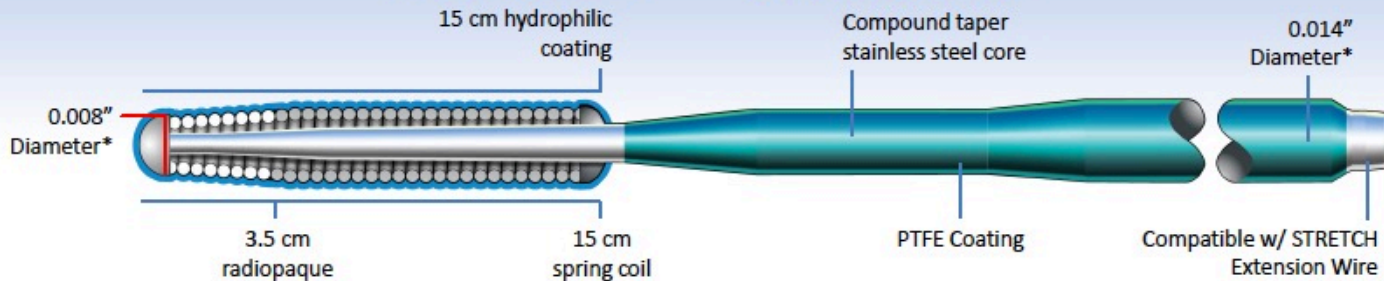


- Tip load: 1.5g/ 2.7g/ 4.1g
- Radiopaque length: 3 cm
- Outside diameter: 0.014"
- Tip Outside diameter: 0.014"
- Coating: **Hydrophilic**
- Tip style: Core to tip
- Polymer cover: **Full Polymer**
- CORE MATERIAL: DURASTEEL Stainless Steel

FIGHTER™ Guidewire

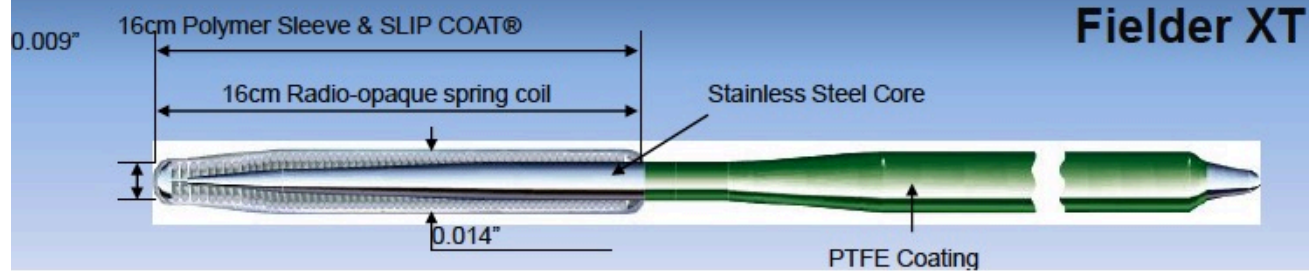


HORNET™ Guidewire

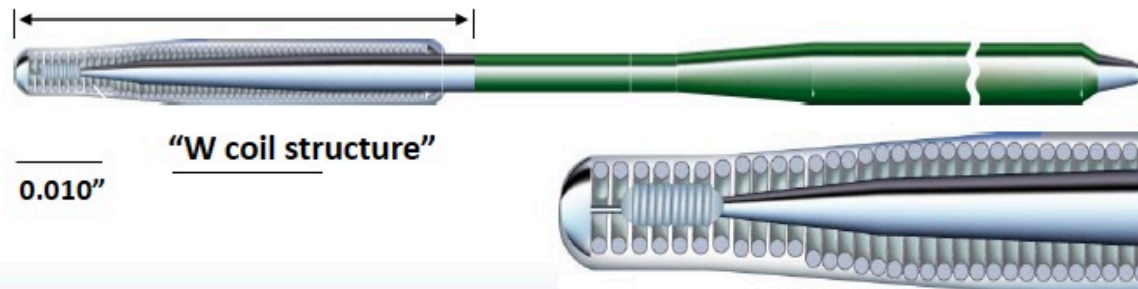


Wire	Tip Load (gf)	Penetration Force (gf/mm ²)
HORNET 10	10.0	308
HORNET 14	14.0	432

Structure of the wires



Polymer jacket with hydrophilic coating ;16cm



More controllable & safe collateral channel tracking; Tip load = 0.6g with Superb torque response "No whip" and Durable tip

Composite guide wire structure

Composite guide wire



Core wire (round / flat)



Outer coil



ACT ONE (inner coil)













Twist wire (runs parallel to the core wire)



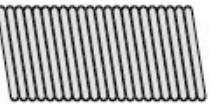

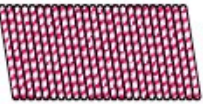

ACT ONE: **Patented**
ASAHI brand **multi wire coil**
provides torque force, torque
response, durability and flexibility.

Terminology & Definition summary

<Primary wires & Coils>

Primary wire		Coil formation (General name)	Coil name (ASAHI original name)	Picture
Wire type	Amount of wires			
Wire 	Single	Single wire coil 		
	Multi	Multi wire coil 		ACT ONE construction 
Wire rope 	Single	Single wire rope coil 		
	Multi	Multi wire rope coil 		XTRAND 

Characteristics of Outer sleeves

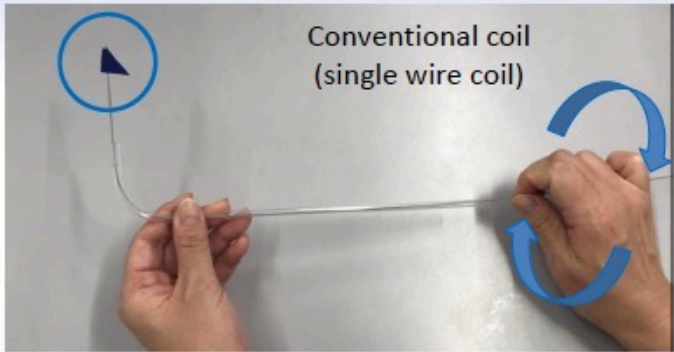
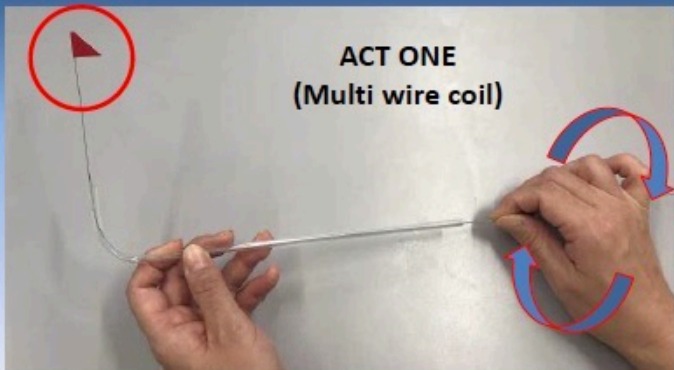
Definition and name	Flexibility	Torque force
<p>Single wire coil</p> <p>i.x) Same as the outer coil of conventional guide wires</p> 	2 nd	3 rd
<p>Multi wire coil</p> <p>i.x) Same as the inner coil, ACT OF In composite guide wires</p> 	4 th	1 st
<p>Single wire rope coil</p> <p>i.x) Same as the outer coil of SUOH 03</p> 	1 st	4 th
<p>Multi wire rope coil</p> <p>i.x) Same as the outer coil of Gaia Next</p> 	3 rd	2 nd

Condition:
Outer diameter of the primary wire (wire / wire rope) is the same.
Same amount of wires in multiple numbers.

Ranking shows the comparison of 4 kinds of coils with 2 different features

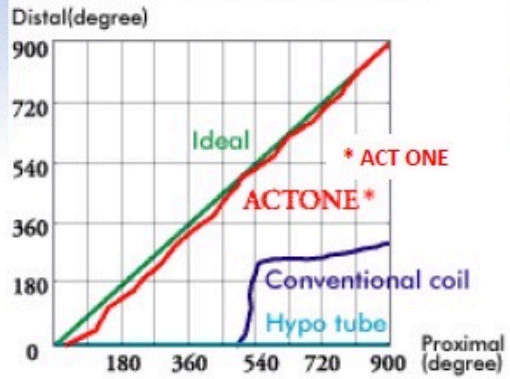
New technology that overcomes the trade-off:

ACT ONE



Same torque force input by hand, but different output at the wire tip.

Torque performance comparison

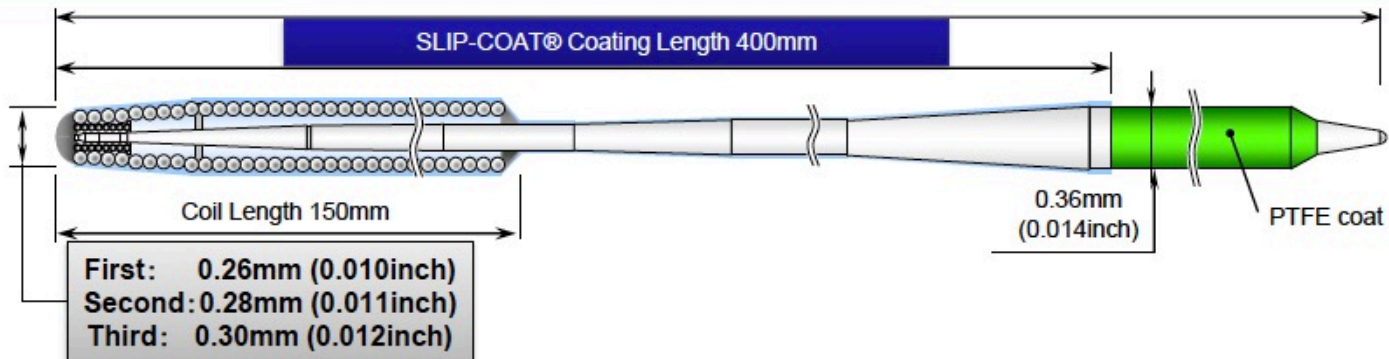


The information contained herein is for informational purposes only and does not constitute an offer of any financial product or service. Please contact your broker for more information.

Compared to our company's coil

Gaia™ Guidewire

Total Length 1900mm



ASAHI Gaia First

Diameter : 0.26mm (0.010") - 0.36mm (0.014")
Tip load : 1.7gf

ASAHI Gaia Second

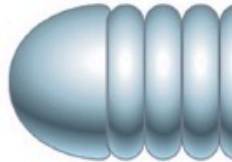





Diameter : 0.28mm (0.011") - 0.36mm (0.014")
Tip load : 3.5gf

ASAHI Gaia Third

Diameter : 0.30mm (0.012") - 0.36mm (0.014")
Tip load : 4.5gf

Tip design / Cross section

The ball tip has been sharpened to provide the necessary penetration ability to enter hard occlusions, while the tip flexibility is still maintained.

	Tip end design	Cross section area
<p>➤ Plain ball tip</p> <p>--- <i>Conventional guidewire</i></p> <p>ULTIMATE bros3 , etc</p>		
<p>➤ Micro-cone tip</p> <p>--- <i>Gaia, Gaia Next</i></p>		
<p>➤ Blunt tip</p> <p>--- <i>Miracle Neo 3</i></p>		

Tip end design

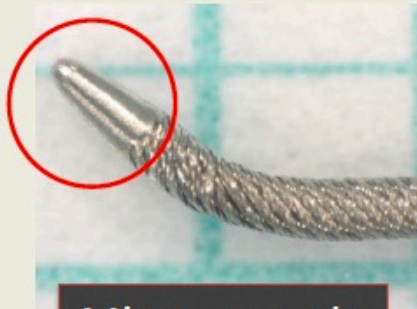


CTO entry

Micro-cone tip vs. plain ball tip

Difference of penetration ability at CTO entry

Gaia Next 1



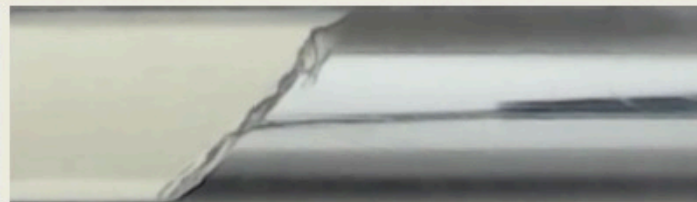
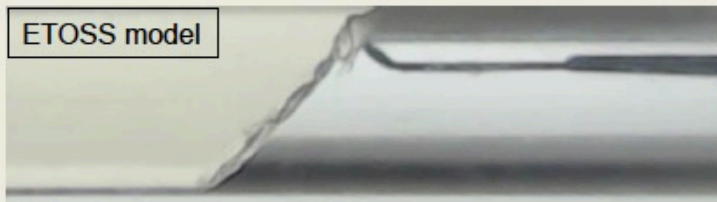
Micro-cone tip



Tentative model
for test

Plain ball tip

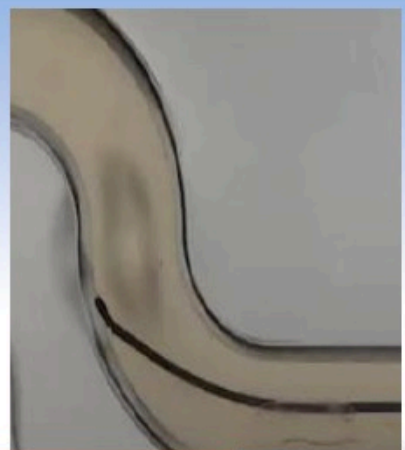
ETOSS model



Tentative model of Gaia Next 1 with plain ball tip failed to enter the lesion as the tip could not stick onto the diagonal entry

Miracle 6 vs. Gaia Next 3 (ETOSS 6000)

Miracle 6
with plain ball tip

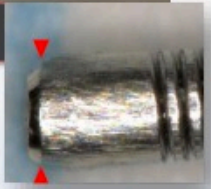


Gaia Next 3
with Micro cone tip



➤ Blunt tip

--- *Miracle Neo 3*

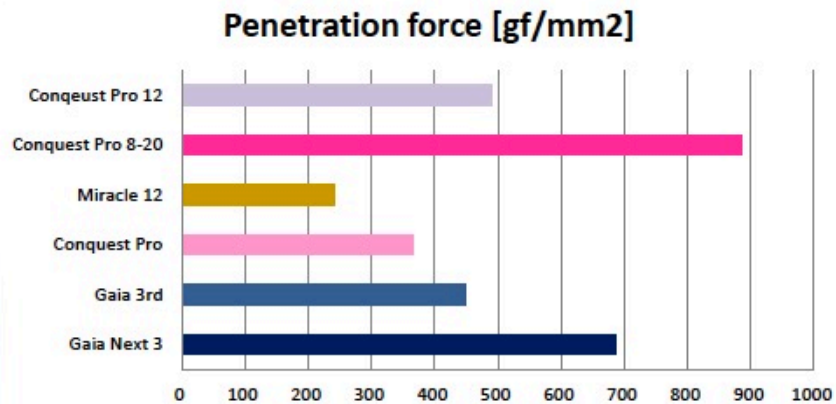
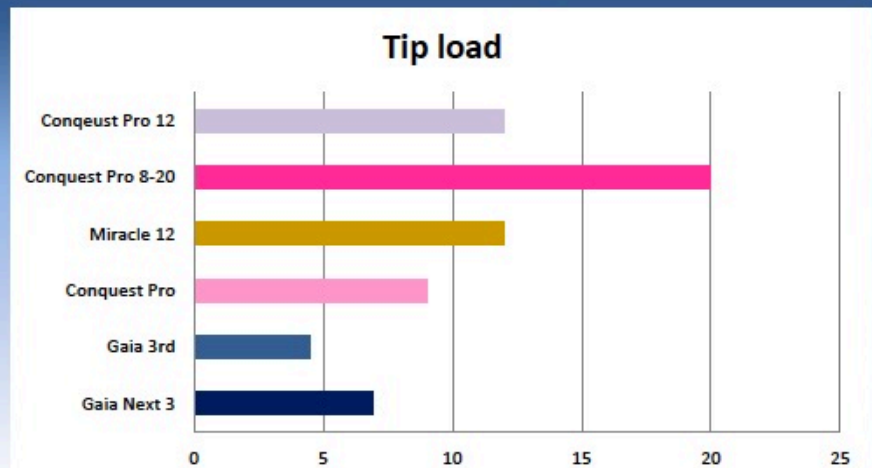


➤ Micro-cone tip

--- *Gaia, Gaia Next*

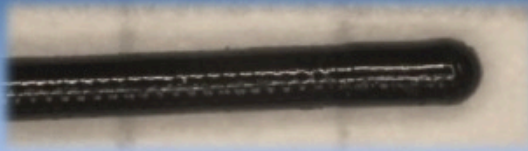


Penetration force and tip load



Coating on CTO wires

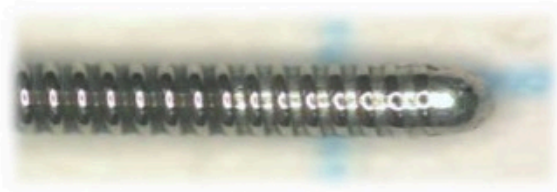
Lubricity
High



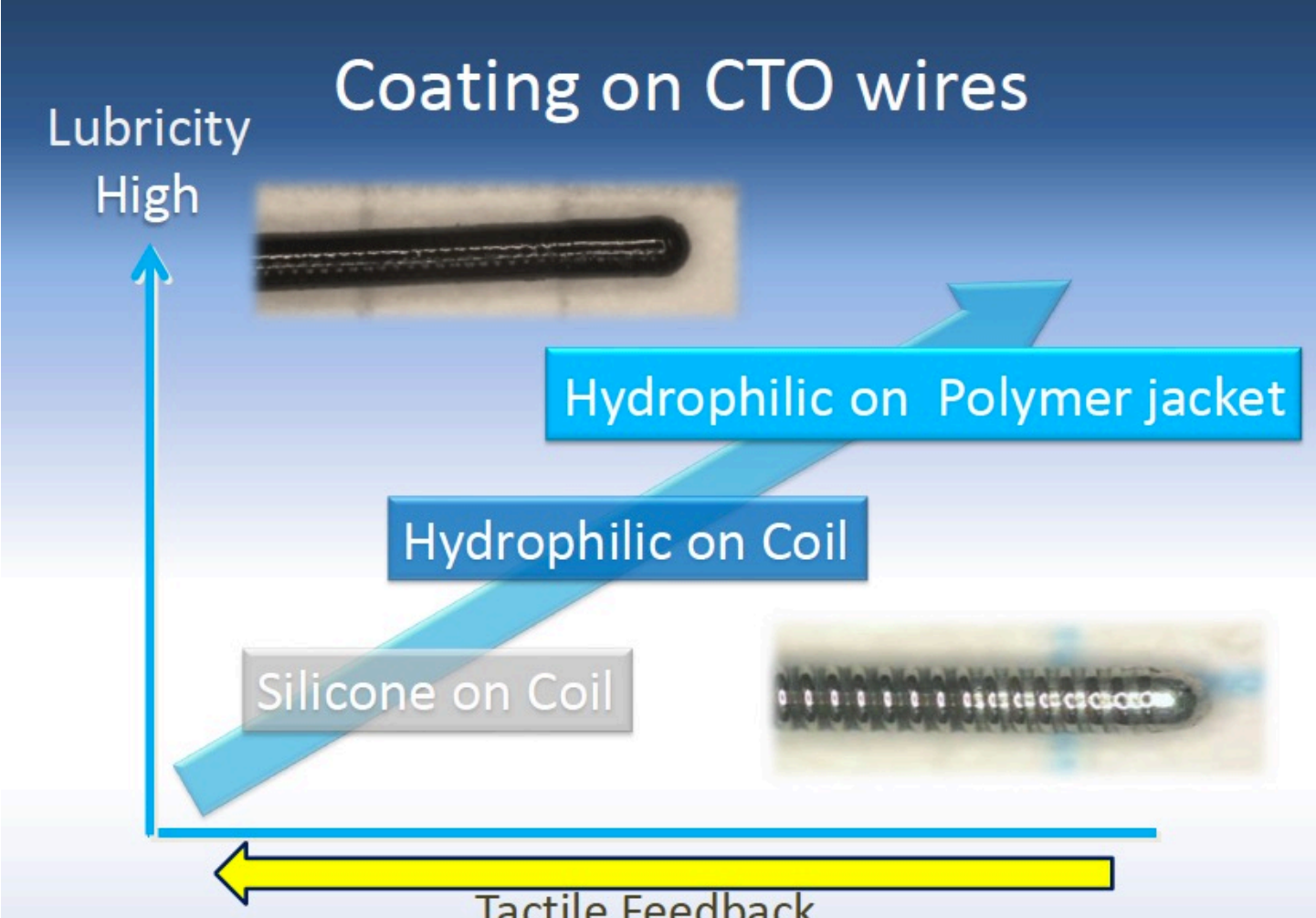
Hydrophilic on Polymer jacket

Hydrophilic on Coil

Silicone on Coil



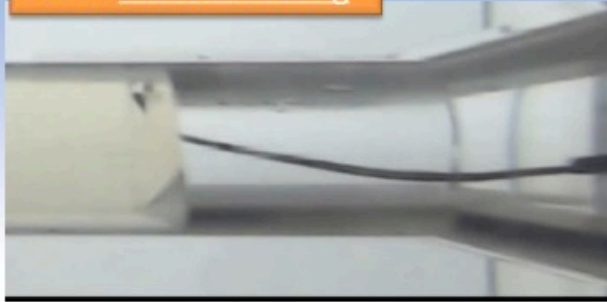
Tactile Feedback



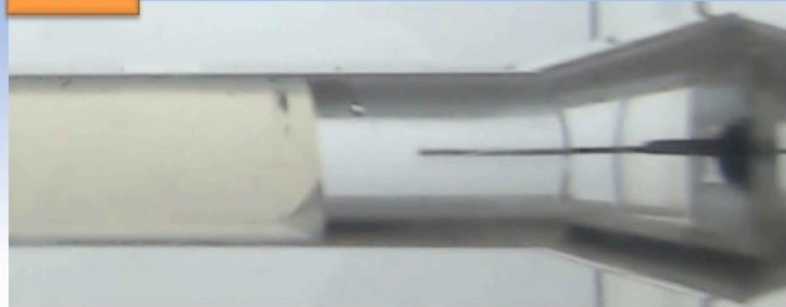
Without coating vs. coating XT-A

Abrupt and smooth entry (ETOSS 8000)

XT-A without coating



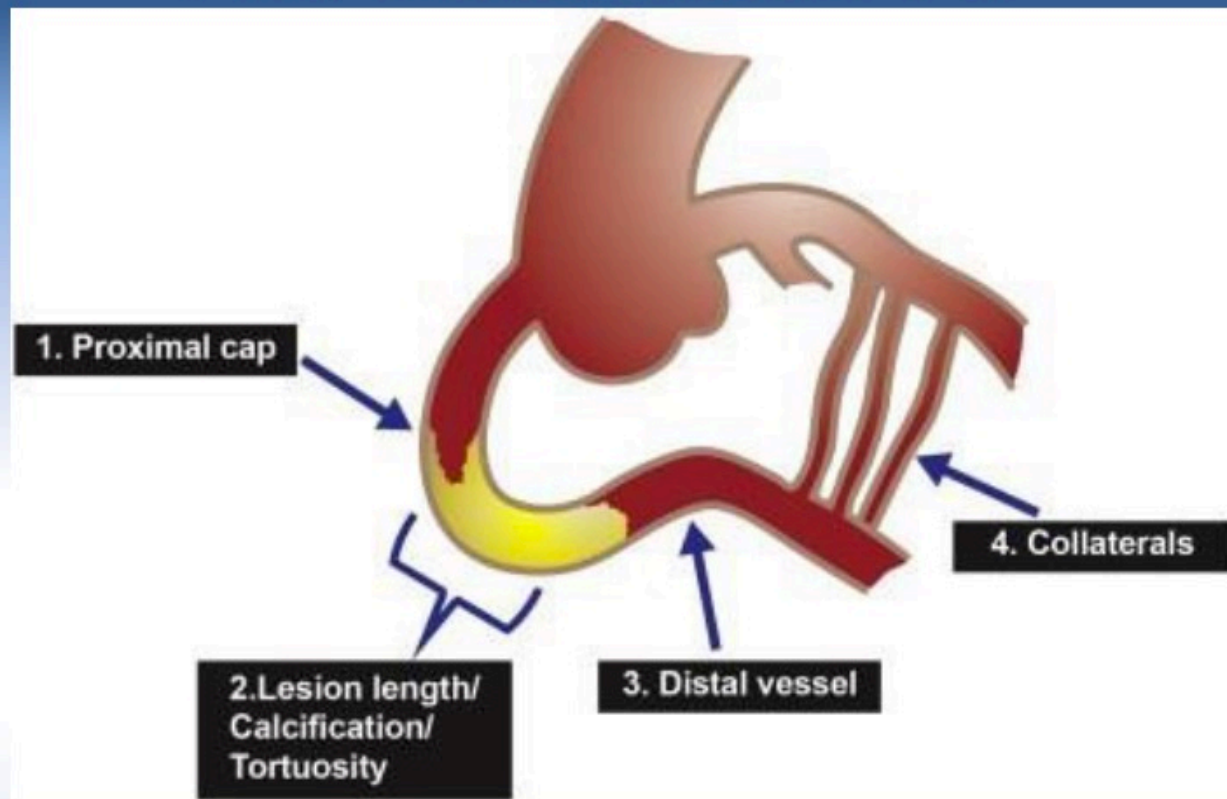
XT-A



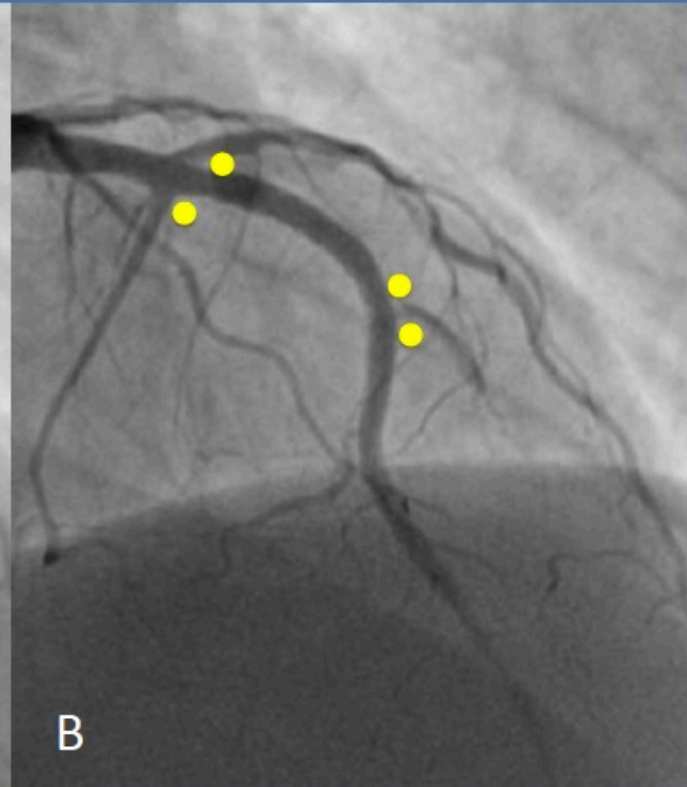
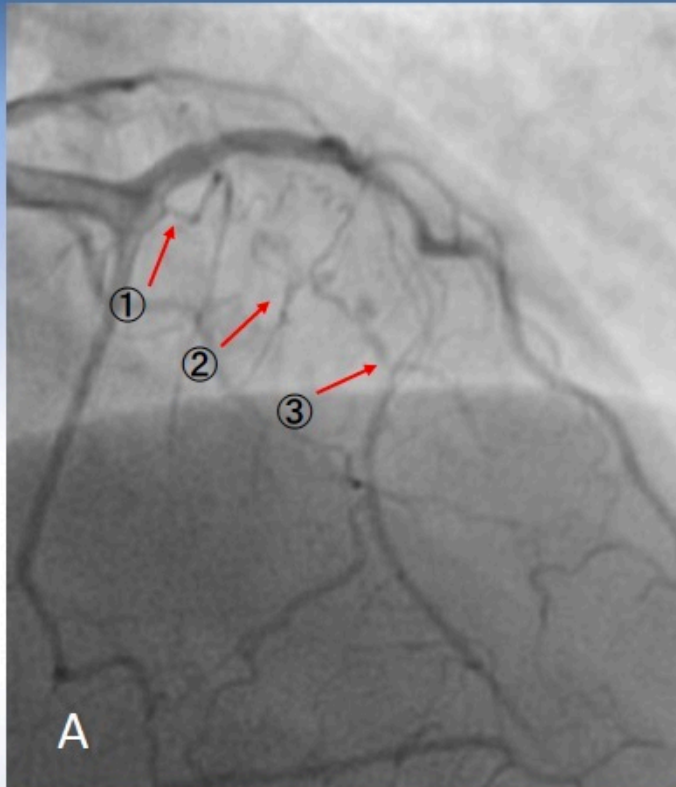
Lesion diameter: 4 mm

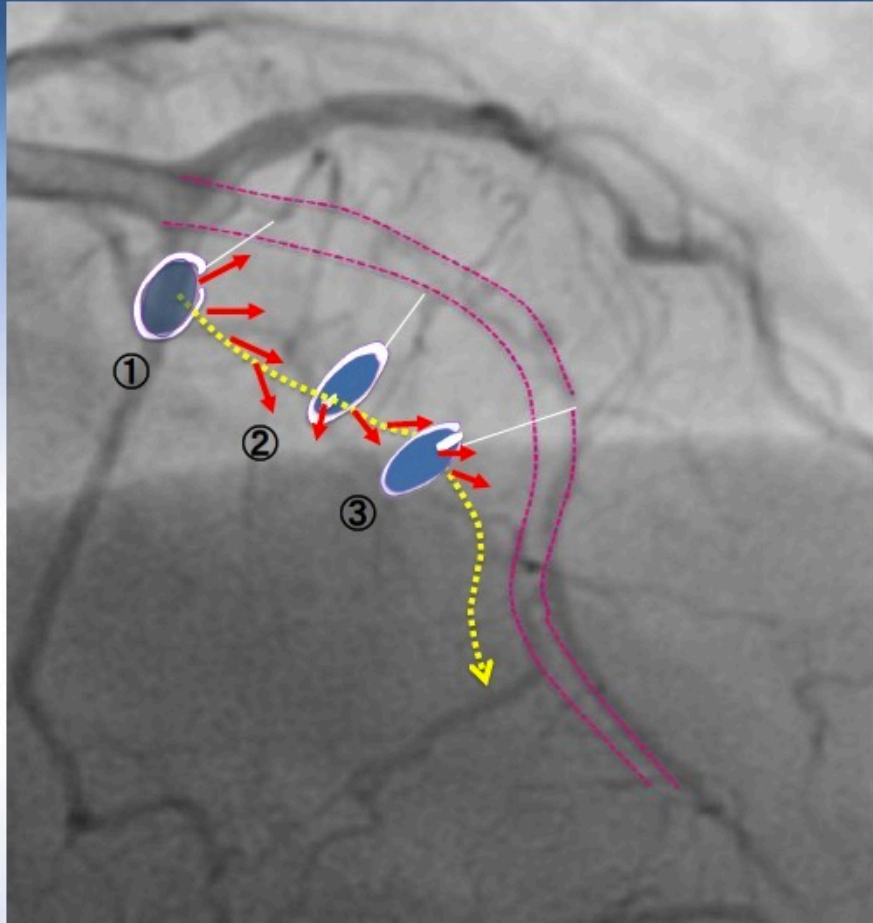
In the case with abrupt and smooth lesion entry, XT-A, after wiping off the coating, could penetrate the lesion as the tip caught at the entry like a hook. However, it failed to go further due to heavy resistance because of the uncoated tip within the lesion. On the other hand, for conventional XT-A, it slipped and was not able to penetrate the lesion.

4 Key Factors in CTO PCI



Expected movement of CTO Wires





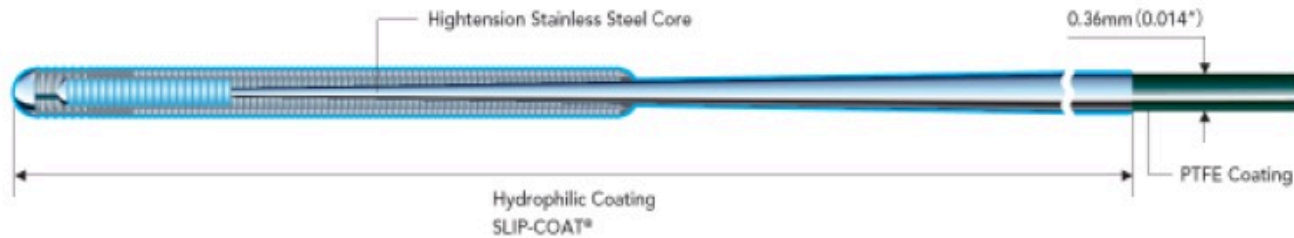
Guide Wires for collatéral crossing

	Sion	Sionblack	XT-R	Suoh 03
Septal CC	STD	AP	Limited	AP
Epicardial CC	AP	limited	Very limited	STD
Atrial or marginal	AP	limited	Very limited	STD
CC 1 or 2	STD	AP	AP	AP
CC 0	AP	limited	AP	STD
Unvisualized CC	limited	?	limited	AP
Corkscrew	limited	limited	Risk of perforation	AP
Rigid Epicardial or AM	limited	limited	Risk of injury	AP

STD : Standard

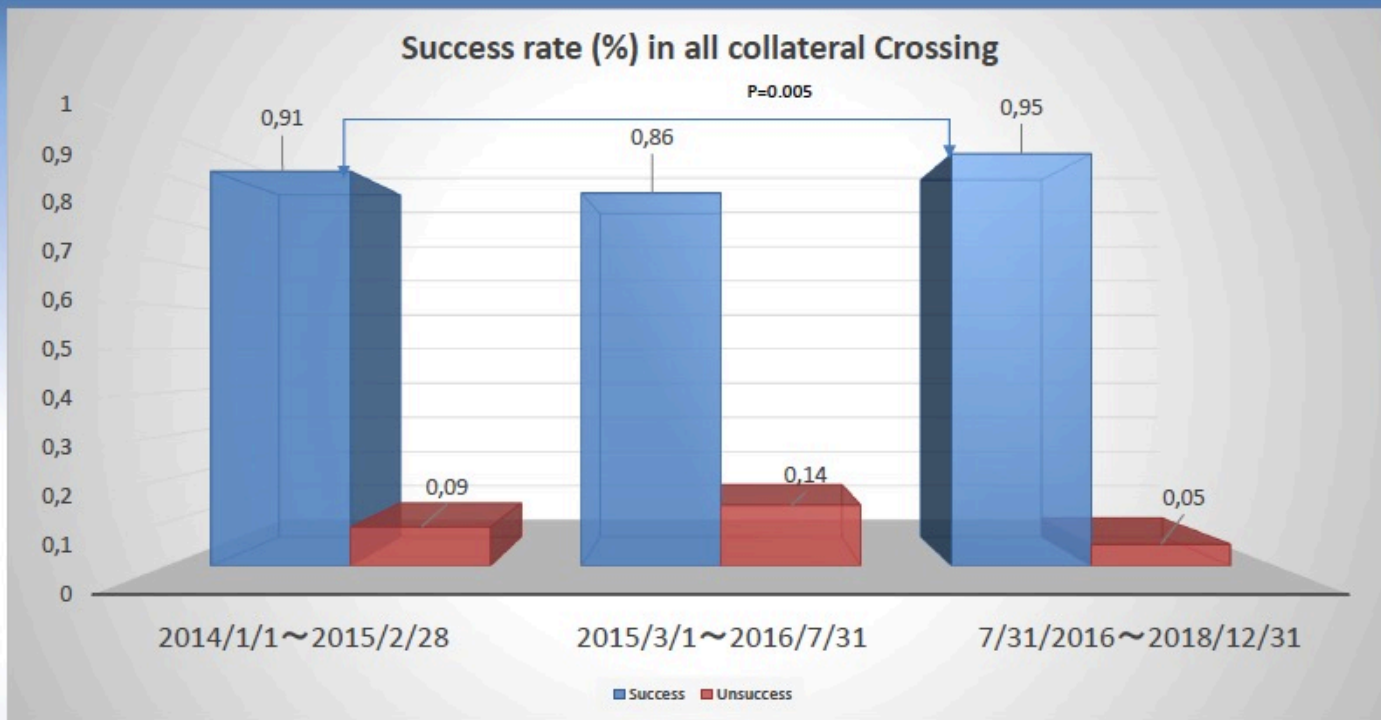
AP: Applicable

Suoh-03



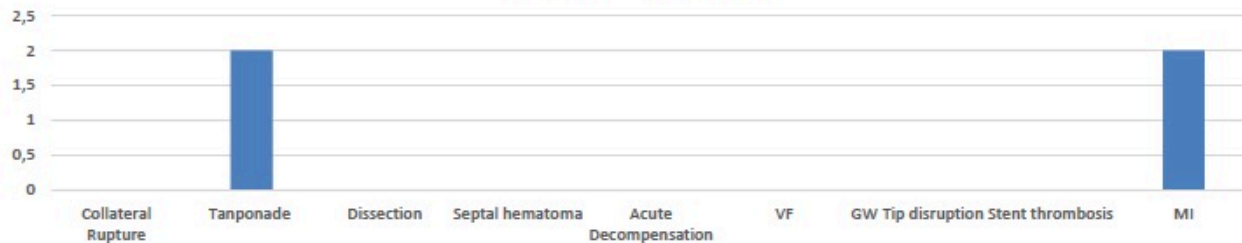
- | | |
|-------------------------------------|---------------------|
| ● Coating: Full Hydrophilic Coating | 52cm |
| ● Usable Length | 190cm |
| ● Coil Length | 19cm |
| ● Radiopaque Length | 3cm |
| ● Tip Load | 0.3gf |
| ● Tip Shape | Straight/ Pre-shape |

Before/After Suoh 03 availability

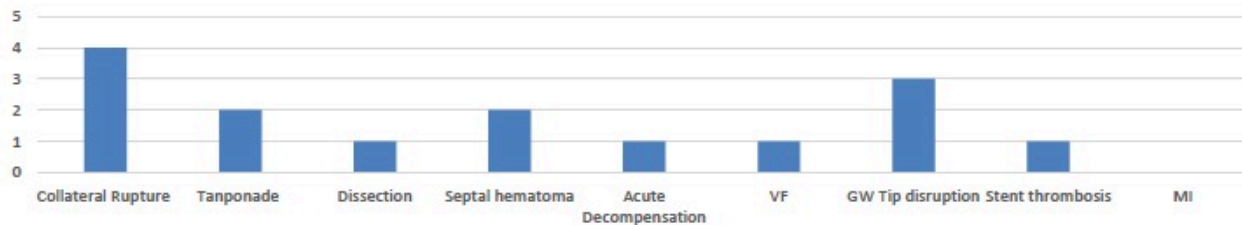


Collateral Crossing complications

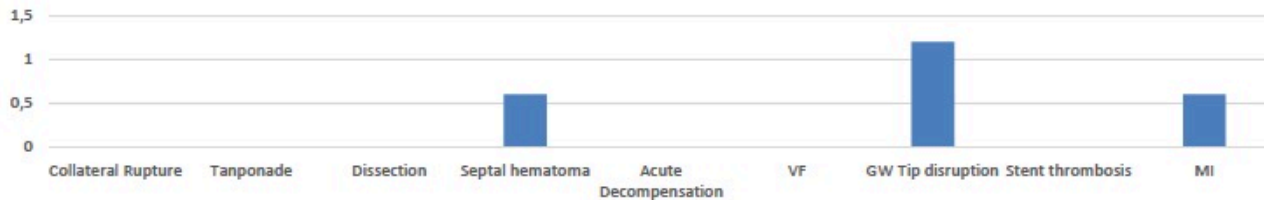
2014/1/1~2015/2/28



2015/3/1~2016/7/31



7/31/2016~2018/12/31

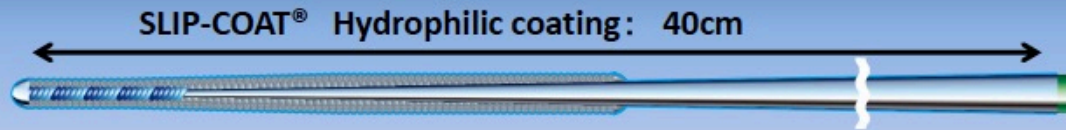


CTO Guide wire

- **Collateral crossing**

Non-tapered, low gram, composite core wires with/without polymer jacket, Sion, Suoh 03, Fielder FC, Sion black, Fielder XT-R(tapered)

Gaia Next™ Guidewire



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)

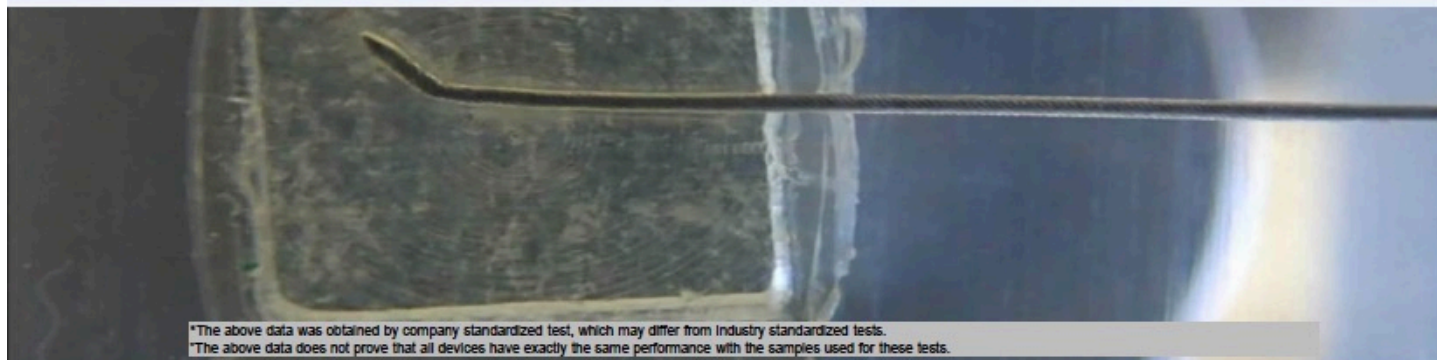
- Length : 190cm
- Hydrophilic coating length : 40cm
- Multi-stranded Coil length : 15cm
- Radiopaque length : 15cm

Anti trapping performance

ASAHI Conquest Pro8-20

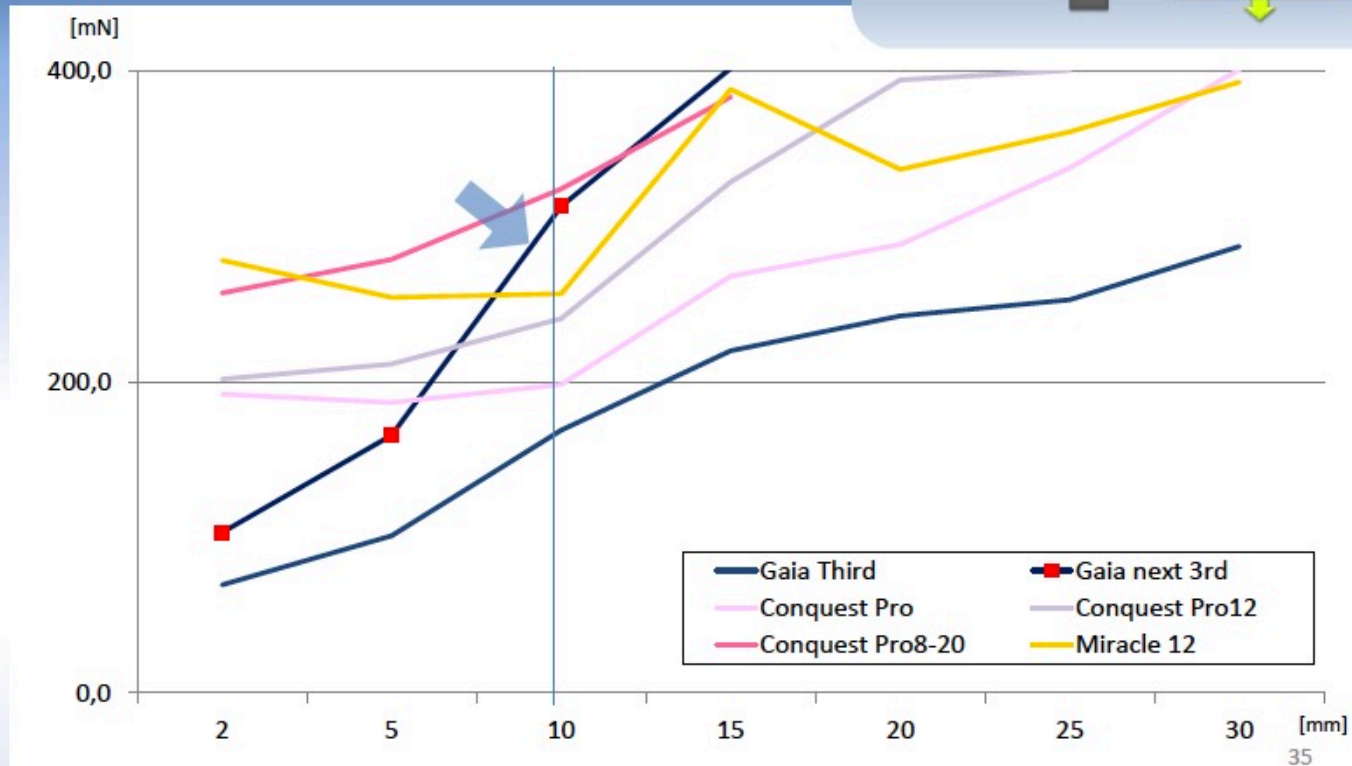
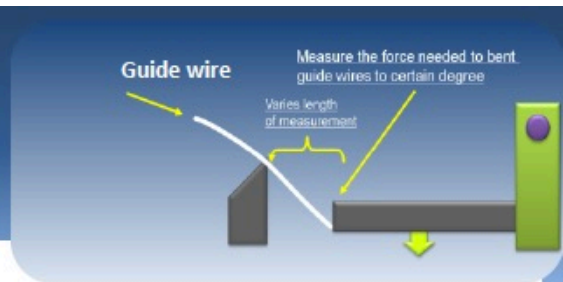


ASAHI Gaia Next



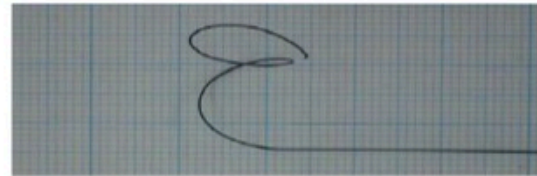
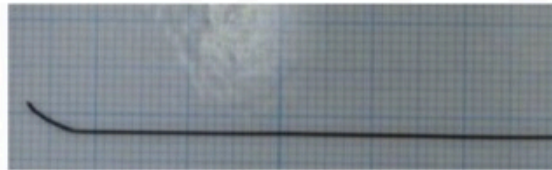
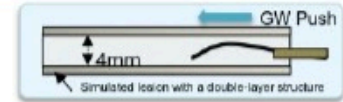
*The above data was obtained by company standardized test, which may differ from industry standardized tests.
The above data does not prove that all devices have exactly the same performance with the samples used for these tests.

Tip flexibility



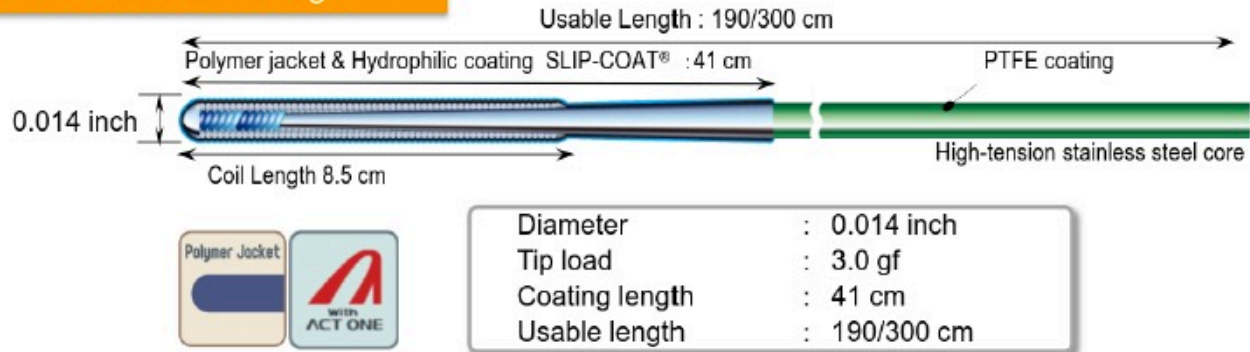
Gladius Mongo

<Using the ETOSS to prolapse and observe the GW tip>

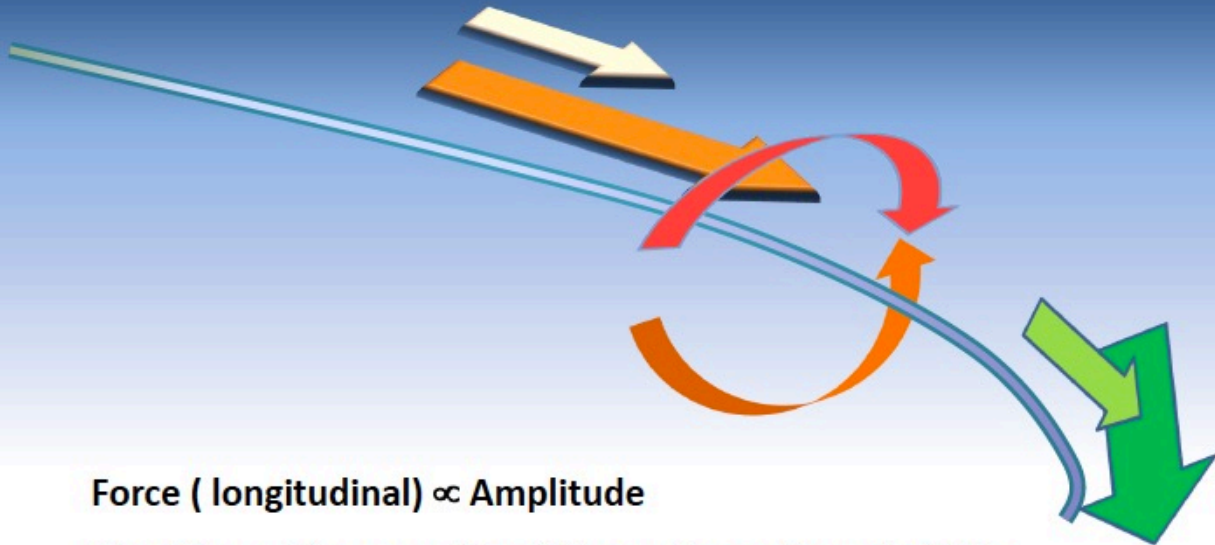


The prolapse is less likely to be enlarged relative to the products of other manufacturers. This can suppress kinking and maintain the GW performance even after the GW has passed through the lesion.

ASAHI Gladius Mongo



Point	Feature	Benefit
Minimize prolapse	Modified distal core balance	Due to high tip durability, maintain the maneuverability even when the prolapse occurs
Lubricity	Polymer jacket and hydrophilic coating SLIP-COAT	High lubricity can help the procedure smoothly during the end even in the complicated lesion.
Torque	ACT ONE®	One-to-one torque is provided because of the absence of whip motion in the torque response.



Force (longitudinal) \propto Amplitude

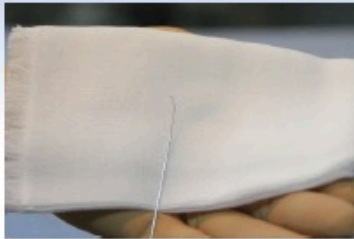
Direction \propto tip curve, tip-stiffness, tissue characteristics

Deflection \propto above mentioned + tip bend + torque transmission

Amplitude + Direction = Vector *

How to create the tip curve ?

1-< 2mm tip
Angle 30-45°
mild 2 nd curve



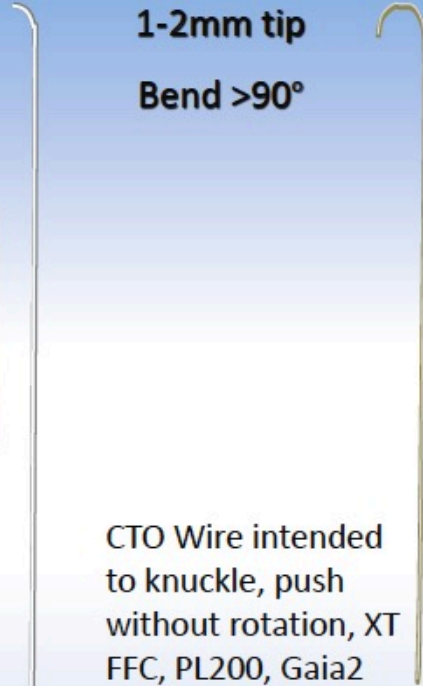
CTO Probing Wire
After Micro catheter
Advancement to the
proximal cap

1-< 2mm tip
Bend ~90°



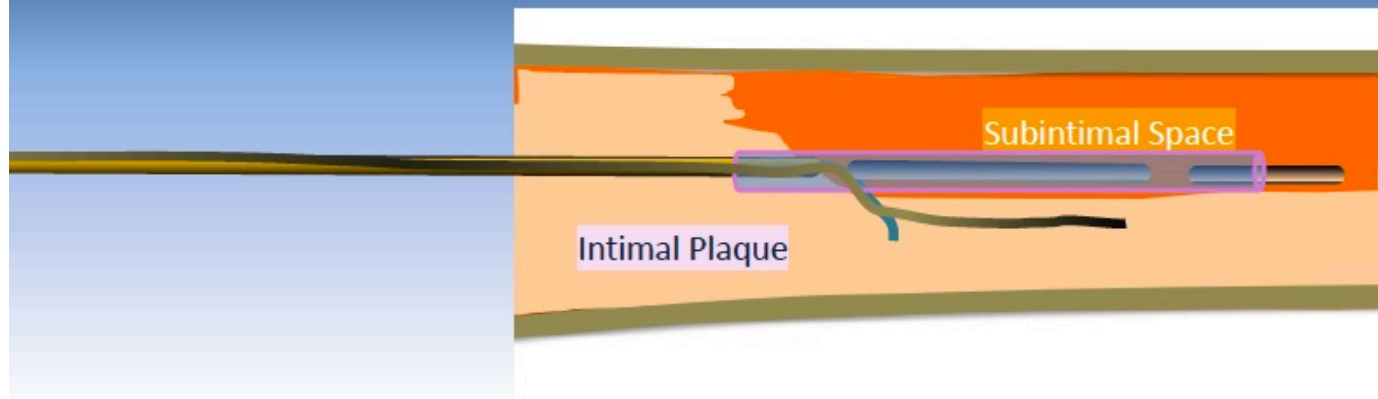
CTO Wire for
intraplaque
puncture from
Subintimal

1-2mm tip
Bend >90°



CTO Wire intended
to knuckle, push
without rotation, XT
FFC, PL200, Gaia2

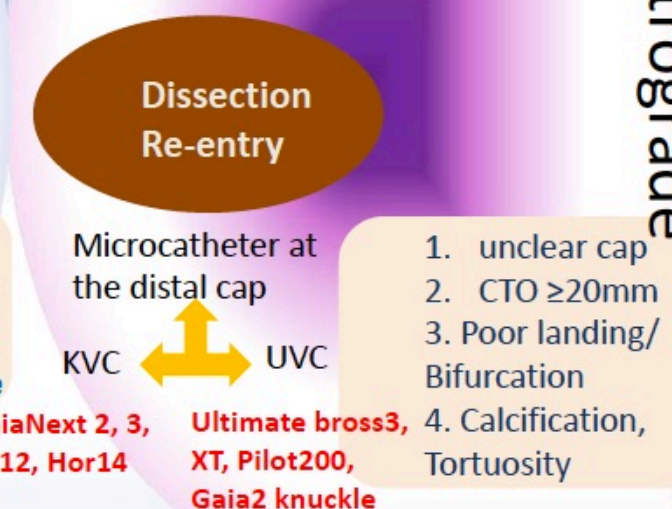
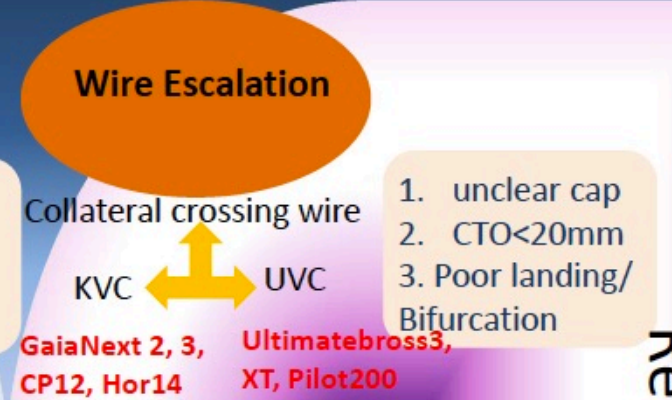
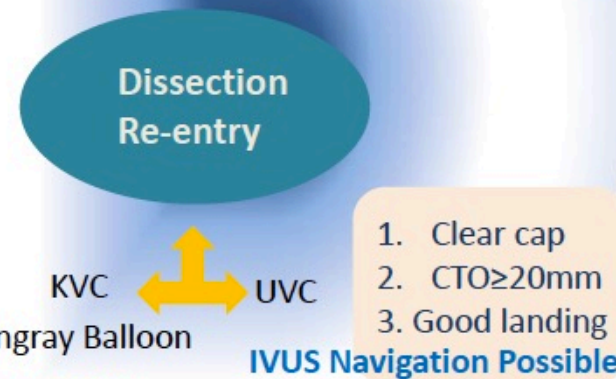
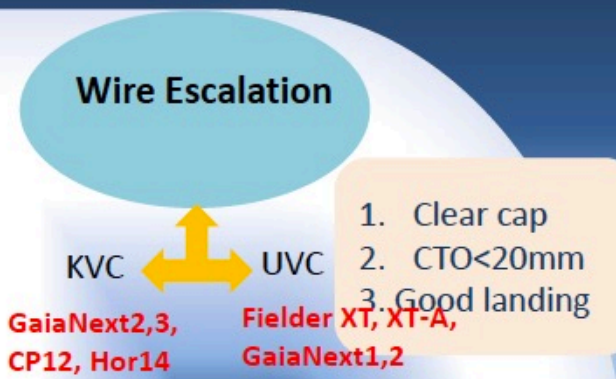
How to re-enter by Stingray system



Stick-and-swap technique

Stingray wire, GaiaNext 3, CP12, Hor14

Antegrade



Retrograde

* KVC= known Vessel Course, +UVC=Unknown Vessel Course, possible tortuosity

CTO Guide wire in Essence

- Cap puncture (both ant & ret) is a key for success
- Trade off in increased penetrability and flexibility
- Parallel wiring and Step-Up or Down remain key strategies and require specific wires
- Faster and efficient wiring possible in a limited loop knuckle in crossing the resistant segment safely
- Deflection control is now possible even in moderate-heavy calcified occlusion in the CTO body
- Adoption of new wire technology needs hands-on experience.