

# Guidewire updates: Concept and Technology

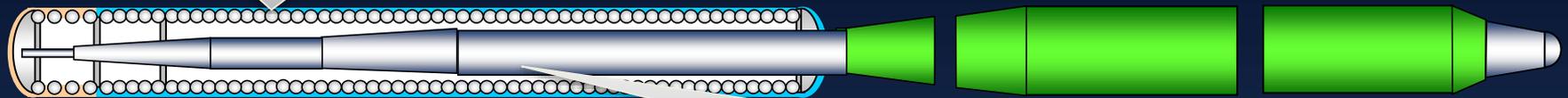
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Asan Medical Center, Seoul, Korea

# Basic structure of wire

## Core wire & coil

Coil: Stainless steel



Core wire: Stainless steel/Nitinol

Radiopaque Coil: Platinum

- Frontline wires = 3cm (circumference )
- CTO wires = 15cm-20cm (circumference )

0.06~0.1mm

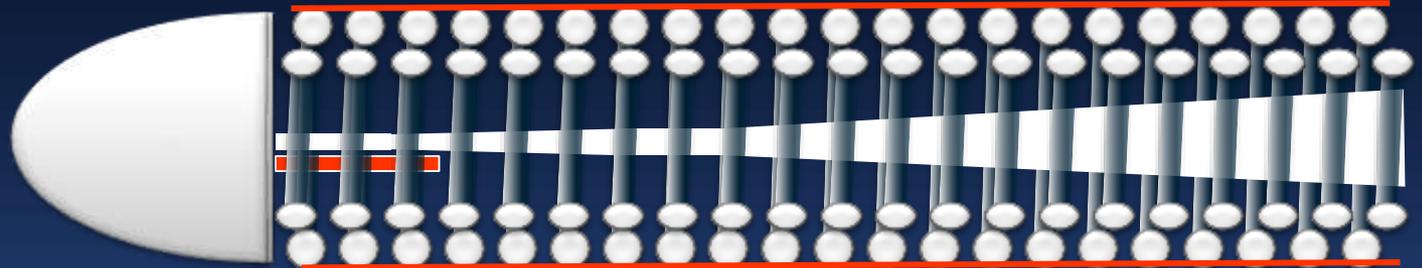
0.36mm  
(0.014")

# Understanding the characteristics of guide wires

## Core wire design at distal tip

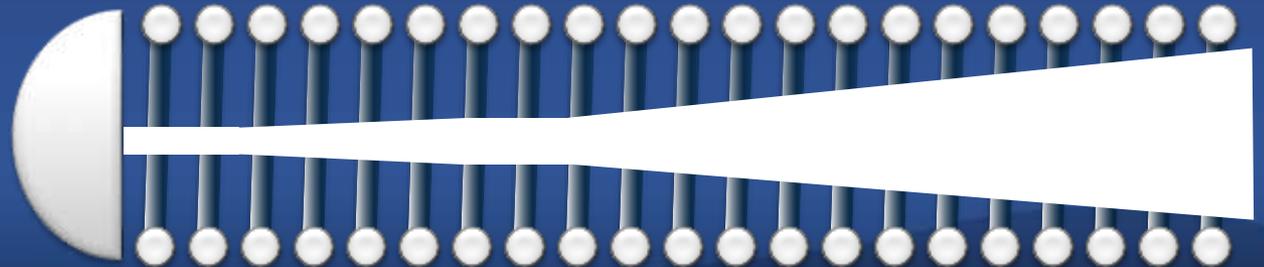
Lubricity: Polymer coating

Soft wire  
Thinner core



Dual coil: tip durability, torqueability, rail support  
Dual core (twist wire): tip durability, torqueability  
Tapering: penetration force

Stiff wire  
Thick core



## Thin core wire



## Design affects performance

- Tip flexibility < tip load • distal shaft flexibility >
- Supportability
- Torque response
- Torque force
- Penetration force
- Trackability



## Coating design/material affects performance

- Lubricity



# Coating type



**Spring coil wire**  
(hydrophilic coating)



**Polymer jacket wire (polymer coating on spring coil wire)**

**Sing coil vs. dual coil**



**Single vs. dual core (twist wire)**



# Tip shape

**Tapered wire**



**Non-tapered wire**



# Tip load (penetration force)

**Low wire**  
 $\leq 1.5$  (2.0) gram

**Intermediate wire**  
1.5 (2.0)-4.5 gram

**high wire**  
 $\geq 4.5$  gram

Wire Category	Wire Name	Polymer Jacket	Tapered Tip (inch)	Tip Load (gf)	Manufacturer
Low penetration force <b>≤ 1.5 (2.0) gram</b>	Fielder XT*	✓	0.009	0.8	Asahi Intecc
	Fielder XT-R*	✓	0.010	0.6	Asahi Intecc
	Fielder XT-A*	✓	0.010	1.0	Asahi Intecc
	Pilot 50	✓	×	1.5	Abbott Vascular
	Fighter	✓	0.009	1.5	Boston Scientific
	Hornet	×	0.008	1.0	Boston Scientific
	Gaia 1st	×	0.010	1.7	Asahi Intecc
	Cross-it 100XT	×	0.010	2.0	Abbott Vascular
Intermediate penetration force <b>1.5 (2.0)-4.5 gram</b>	Pilot 150	✓	×	2.7	Abbott Vascular
	Pilot 200*	✓	×	4.1	Abbott Vascular
	Gladius	✓	×	3.0	Asahi Intecc
	Miracle 3	×	×	3.0	Asahi Intecc
	Ultimate 3*	×	×	3.0	Asahi Intecc
	Gaia 2nd*	×	0.010	3.5	Asahi Intecc
	Cross-it 200	×	0.011	3.0	Abbott Vascular
High penetration force <b>≥ 4.5 gram</b>	Conquest Pro*	×	0.009	9.0	Asahi Intecc
	Conquest Pro 12*	×	0.009	12.0	Asahi Intecc
	Gaia 3rd*	×	0.012	4.5	Asahi Intecc
	Hornet 10	×	0.008	10.0	Boston Scientific
	Hornet 14	×	0.008	14.0	Boston Scientific
	PROGRESS 200T	×	0.009	13.0	Abbott Vascular
	Miracle 12	×	×	12.0	Asahi Intecc

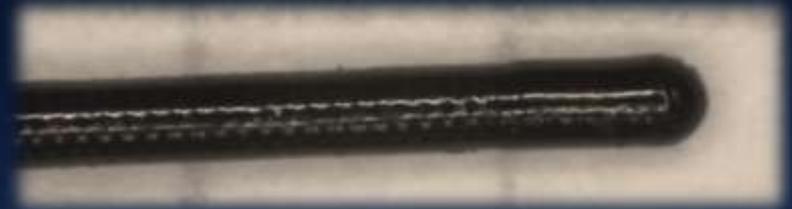
# Coating type

Coil Type



SION / SION blue  
Gaia  
Miracle  
Runthrough

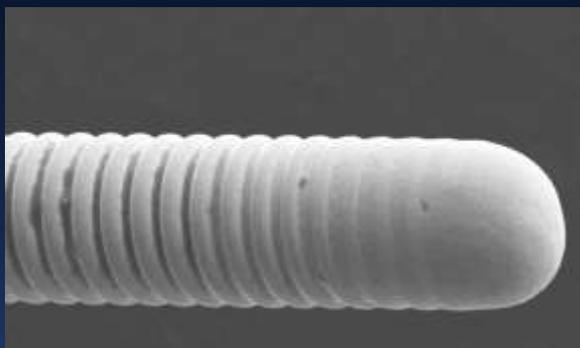
Polymer Jacket Type



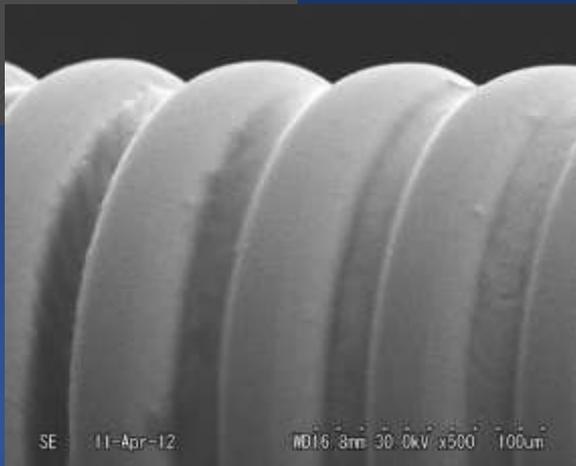
SION black  
XT-R/A  
PILOT

# Understanding the basic structure of guide wires - SEM pictures of outer coils

## Coil Type



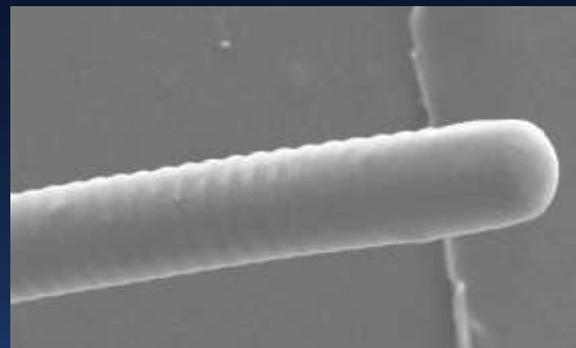
SE 11-Apr-12



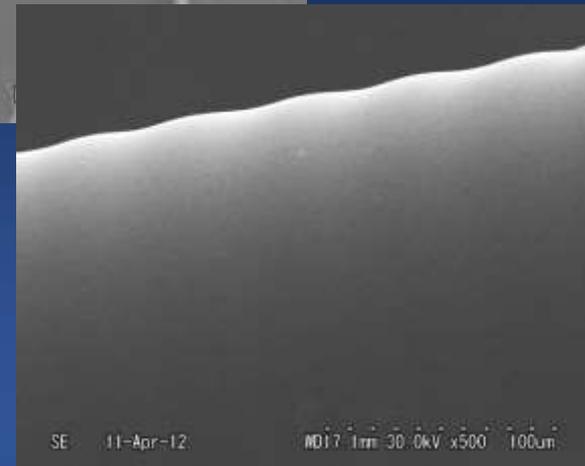
SE 11-Apr-12

MD16 8mm 30.0kV x500 100um

## Polymer Jacket Type



SE 11-Apr-12



SE 11-Apr-12

MD17 1mm 30.0kV x500 100um

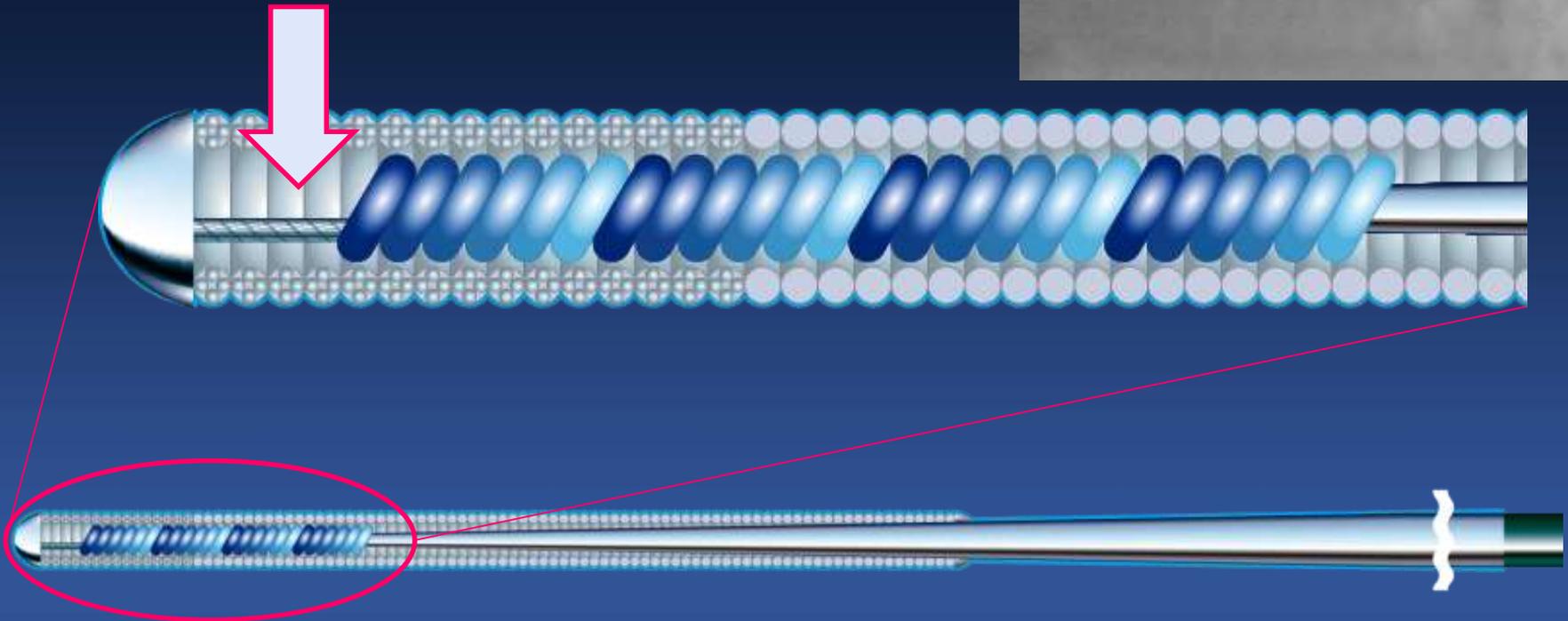
# Difference of core structure at a glance

	Conventional GWs	Gaia series Gaia Next series XT-A XT-R SION blue ES	SION SION blue SION black SUOH 03 *
 <b>ACT ONE (dual coil)</b>	×	● Depending on the product, ACT ONE is placed on tip or separated from tip.	●
 <b>Twist wire (dual core)</b>	×	×	● (sion technology)

\* SUOH 03 has a unique core structure, “no core wire to ball tip”.

# ASAHI SUOH 03

- No core wire to ball tip (tip load 0.3g)
- Only twist wire exist for tortuous channel tracking
- Hydrophilic coating



## SENTAI™ Guidewires

Workhorse

Specialty Crossing

MARVEL™

SAMURAI™

SAMURAI™  
RC

FIGHTER™

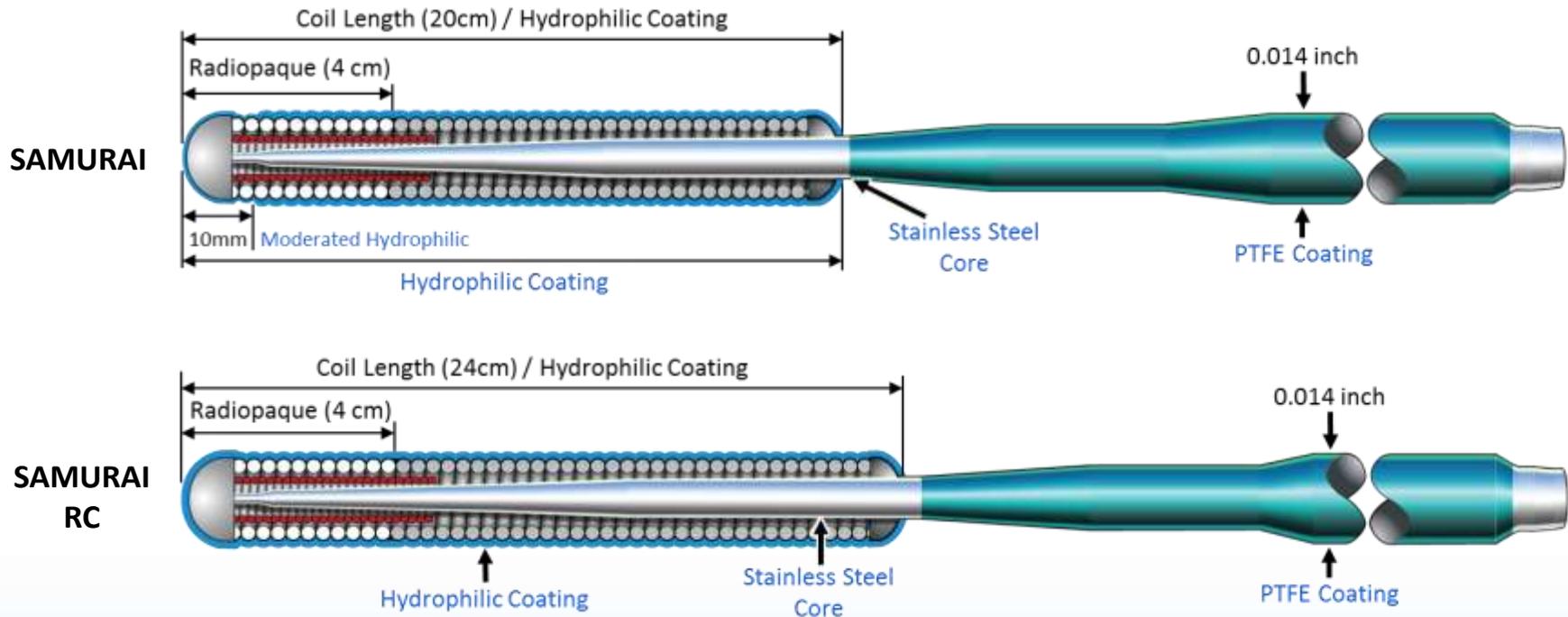
HORNET™

HORNET™  
10

HORNET™  
14

SENTAI guidewires are compatible  
with the Stretch Extension Wire.

# SAMURAI™ vs. SAMURAI™ RC



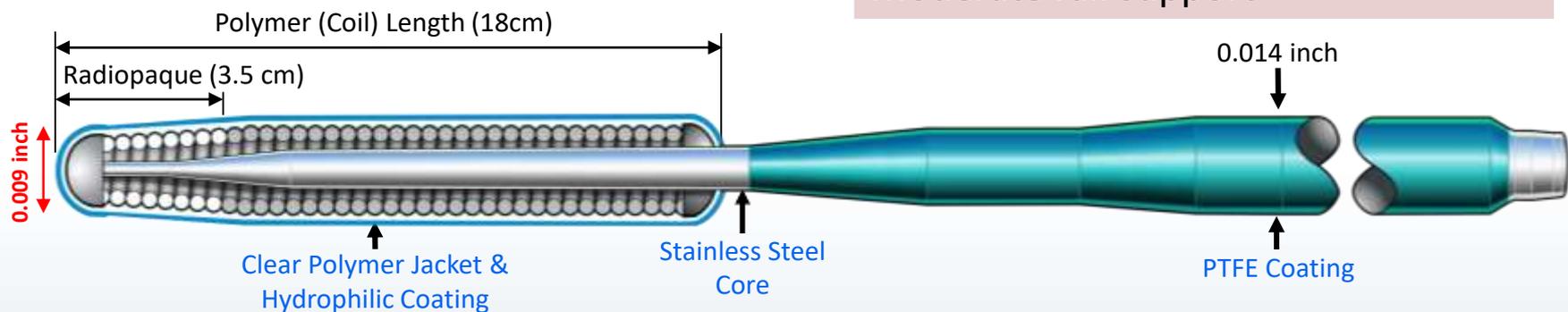
Name	Diameter (inch)	Length (cm)	Coil Length (cm)	Radiopaque (cm)	Tip Load (gf)	Core Material	Tip Shape	Coating
SAMURAI	0.014	190 300	20	4	0.5	Stainless Steel	Straight J	Hydrophilic (Moderated coating on distal 10 mm)
SAMURAI RC	0.014	190 300	24	4	1.2	Stainless Steel	Straight	Hydrophilic (Full Length)

# FIGHTER™ Specialty Crossing Wire

MASTER THE COMPLEX™

Closest Comparator:  
**ASAHI FIELDER® XT**

Key Features
Tapered tip
Clear polymer jacket
Hydrophilic coating
Ideal prolapse wire
Moderate rail support

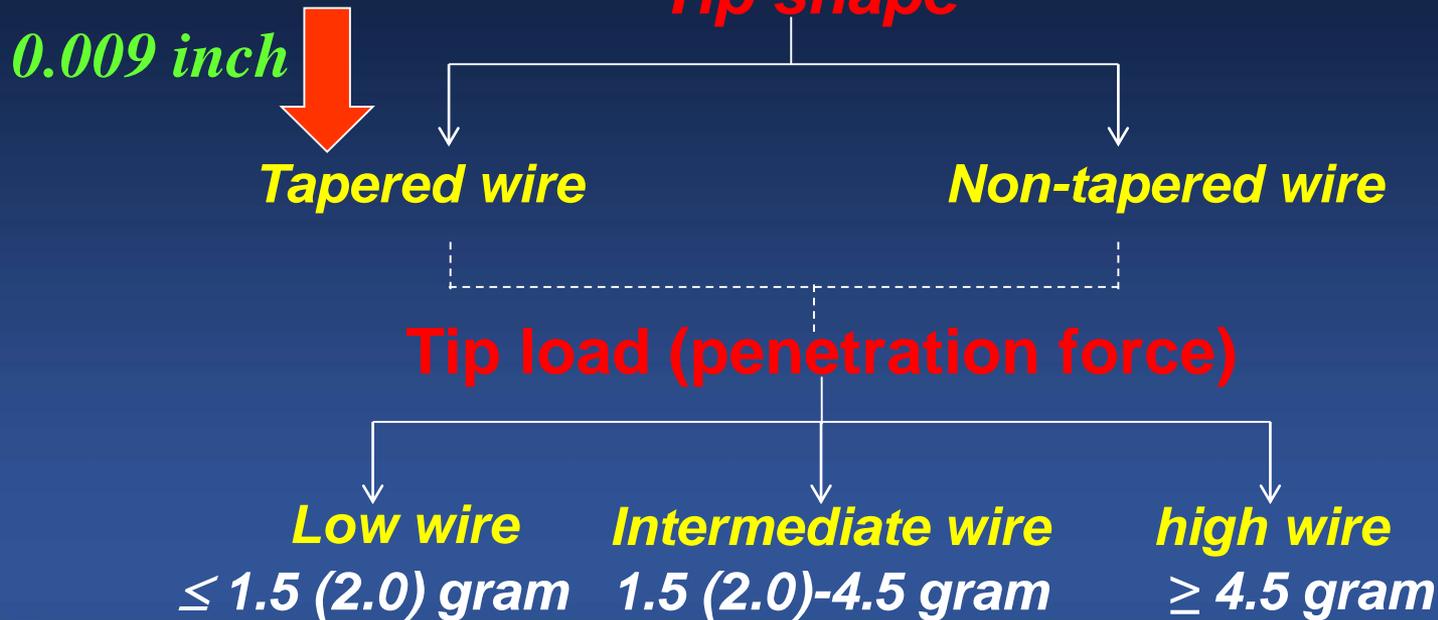


Name	Coil Diameter (inch)	Tip Diameter	Length (cm)	Coil length (cm)	Radiopaque (cm)	Tip Load (gf)	Core Material	Tip Shape	Coating
FIGHTER	0.014	0.009	190 300	18	3.5	1.5	Stainless Steel	Straight	Clear Polymer Jacket w/ Hydrophilic

## Coating type



## Tip shape



**1.5 gram**

# HORNET™ Family

MASTER THE  
COMPLEX™

Closest Comparators:

**HORNET: ASAHI Gaia® First**  
**HORNET 10: ASAHI CONFIANZA**  
**PRO®, ASAHI CONFIANZA PRO® 12**  
**HORNET 14 : ASAHI CONFIANZA**  
**PRO® 12**

## Key Features

Tapered tip: lowest tip profile on market (.008")

Hornet 14: highest tip load on market

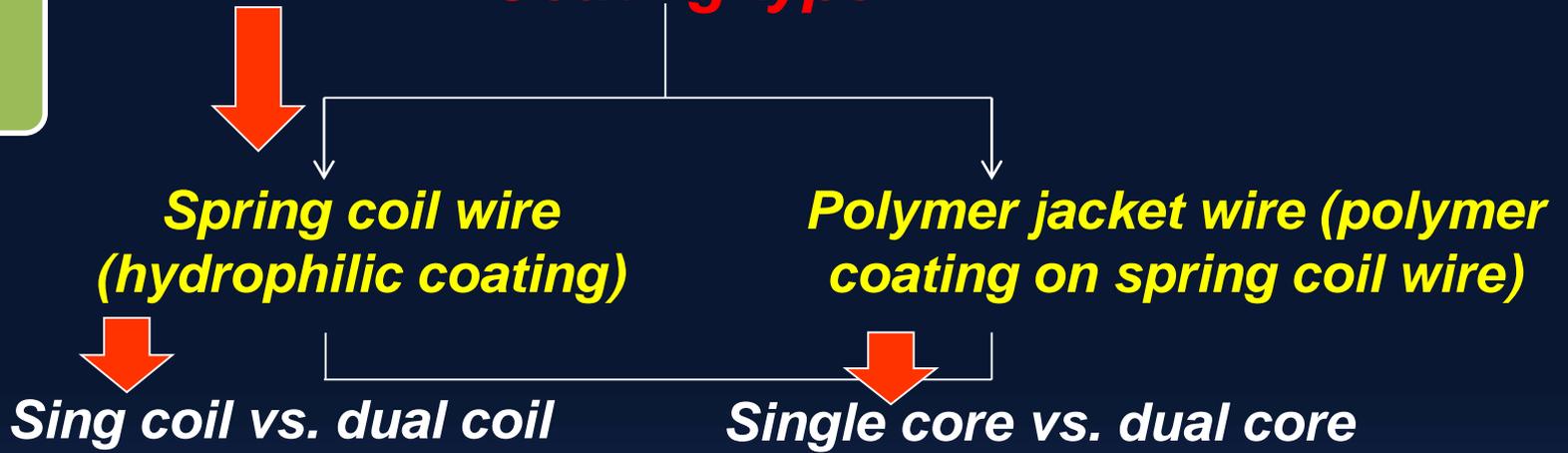
Hornet 10 & 14: highest penetration force on market

Hydrophilic coating



Name	Coil Diameter (inch)	Tip Diameter (inch)	Total Length (cm)	Coil Length (cm)	Radiopaque (cm)	Tip Load (gf)	Penetration Force (gf/mm <sup>2</sup> )	Core Material	Tip Shape	Coating
HORNET	0.014	0.008	190 300	15	3.5	1	31	Stainless Steel	Straight	Hydrophilic
HORNET 10	0.014	0.008	190 300	15	3.5	10	308	Stainless Steel	Straight	Hydrophilic
HORNET 14	0.014	0.008	190 300	15	3.5	14	432	Stainless Steel	Straight	Hydrophilic

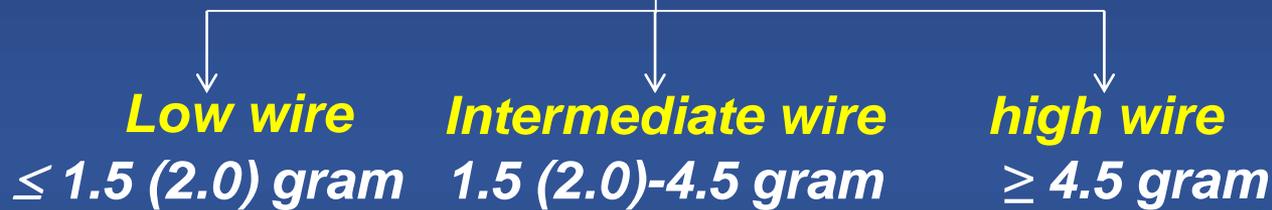
### Coating type



### Tip shape



### Tip load (penetration force)



**1.0 gram**

**10, 14 gram**

# Antegrade wire based strategy

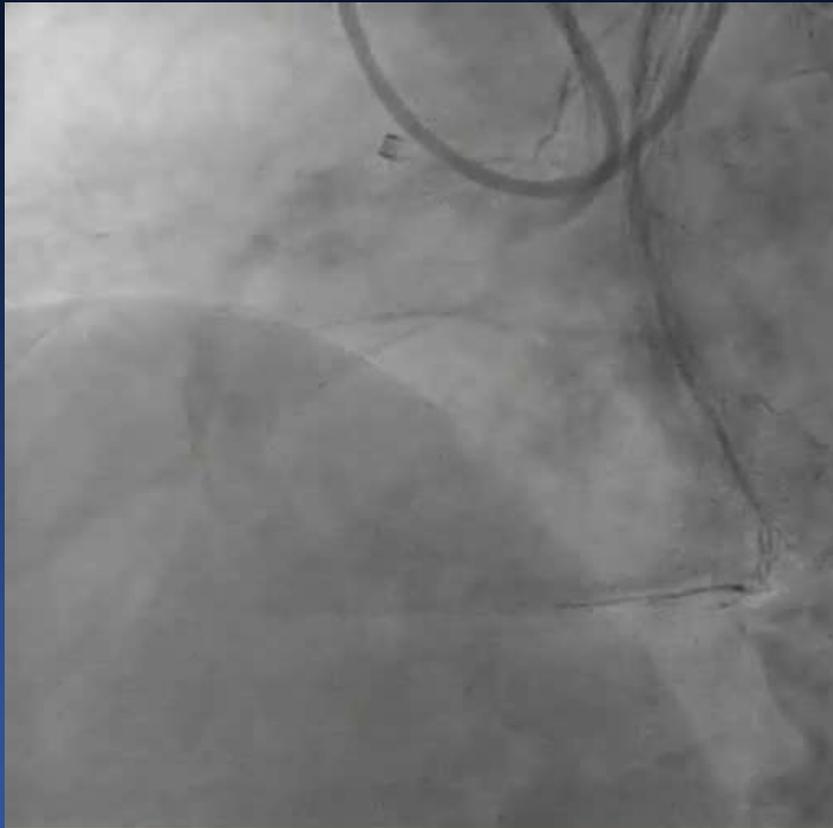


	Visible micro channels	Tapered proximal cap	Blunt proximal cap
Proximal Cap	<p>Low penetration force wire with polymer jacket and tapered tip</p> <p>↓</p> <p>Intermediate penetration force wire</p>	<p>Low penetration force wire</p> <p>↓</p> <p>Intermediate penetration force wire</p>	<p>Intermediate penetration force wire</p> <p>↓</p> <p>High penetration force wire</p>
CTO body	Length <20 mm	Reasonable to continue with wire used to cross proximal cap	
	Length >20 mm or ambiguous course	Step down to a low penetration force wire or intermediate non-tapered wire	
Distal Cap	Escalation from softer more steerable wire to a higher penetration-force wire may be required.		

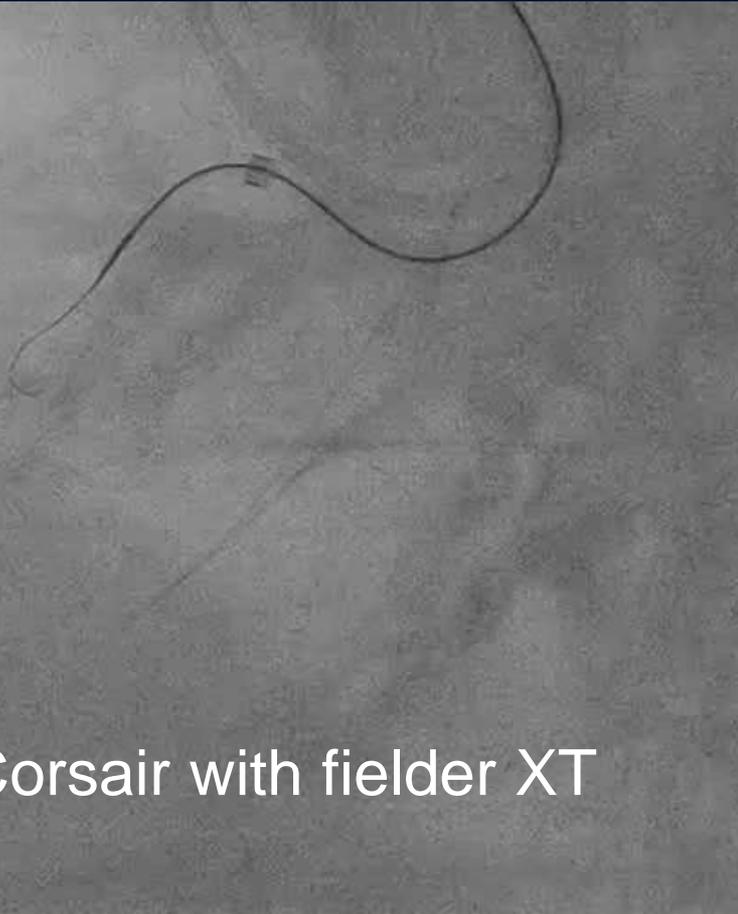
# Microchannel: Fielder XT



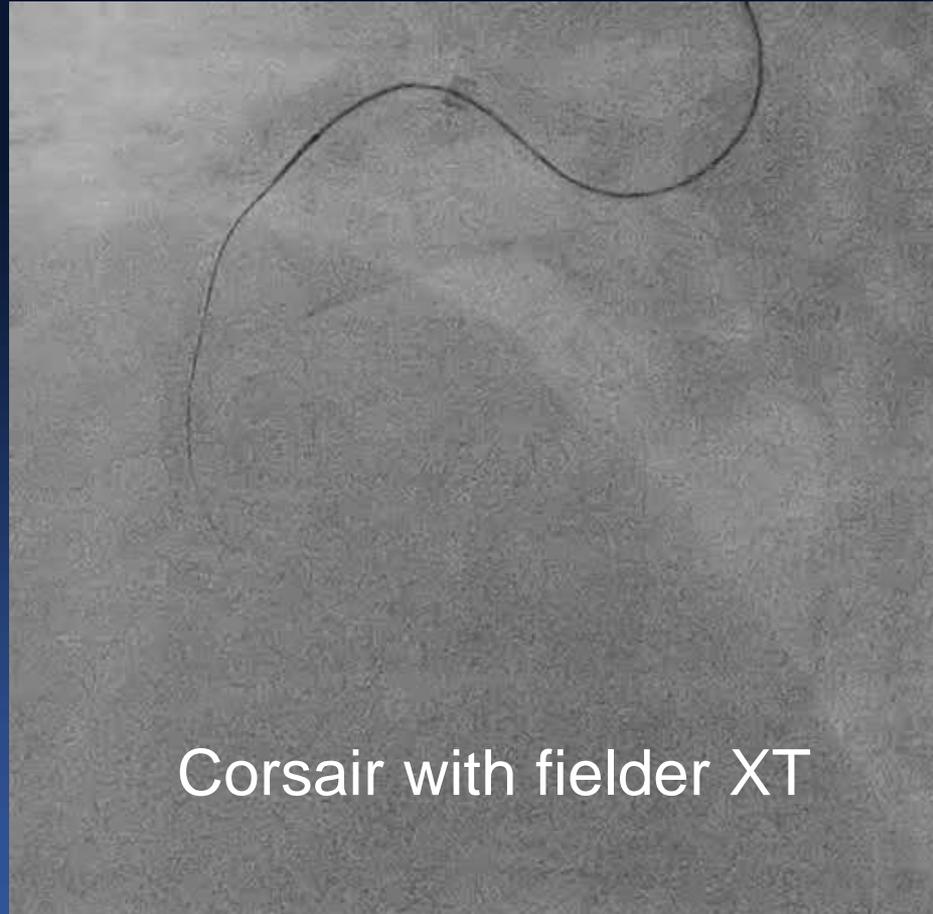
# Long CTO with tapered cap



# Long CTO with tapered cap



Corsair with fielder XT



Corsair with fielder XT

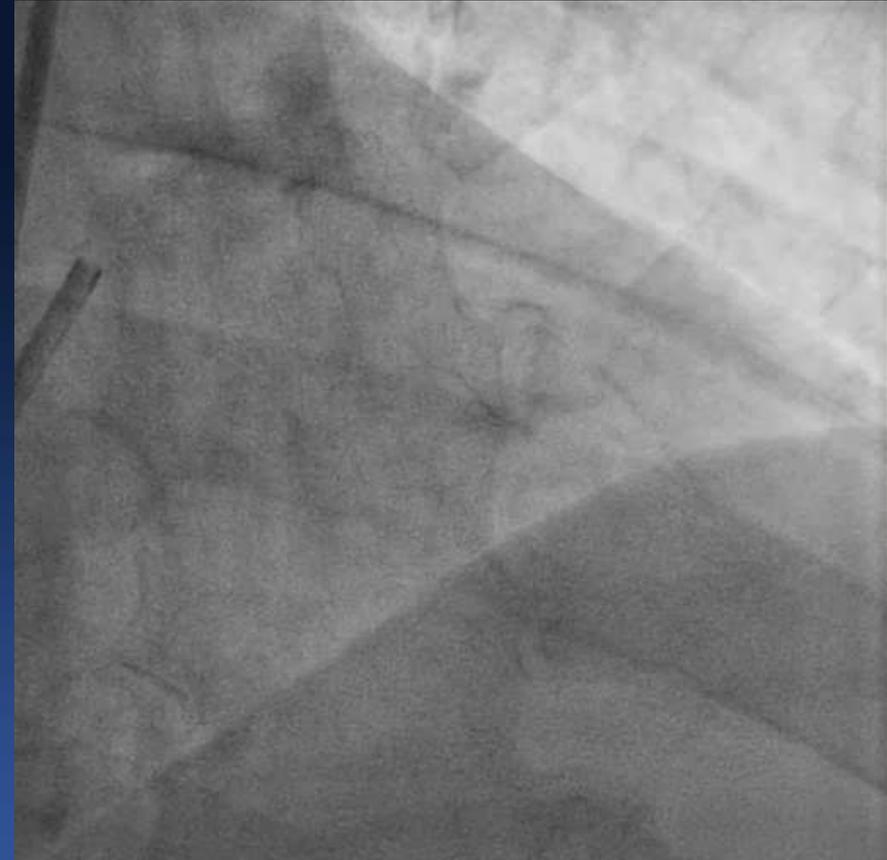
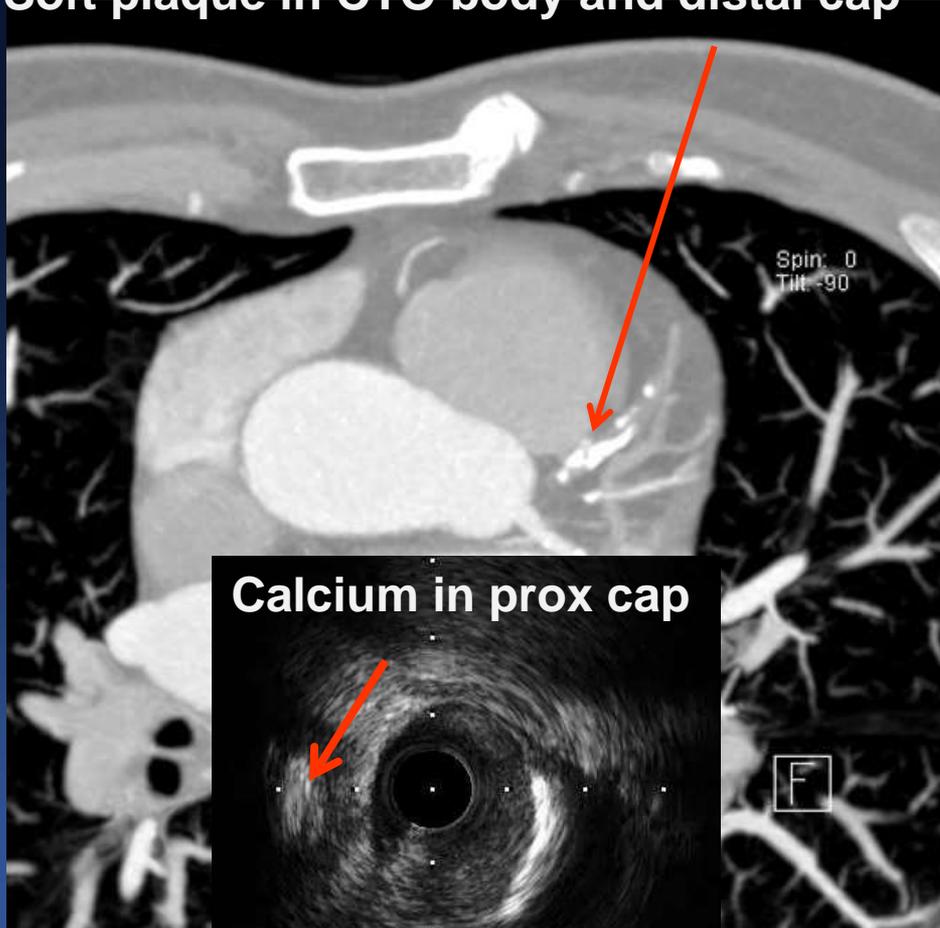
# Antegrade wire based strategy



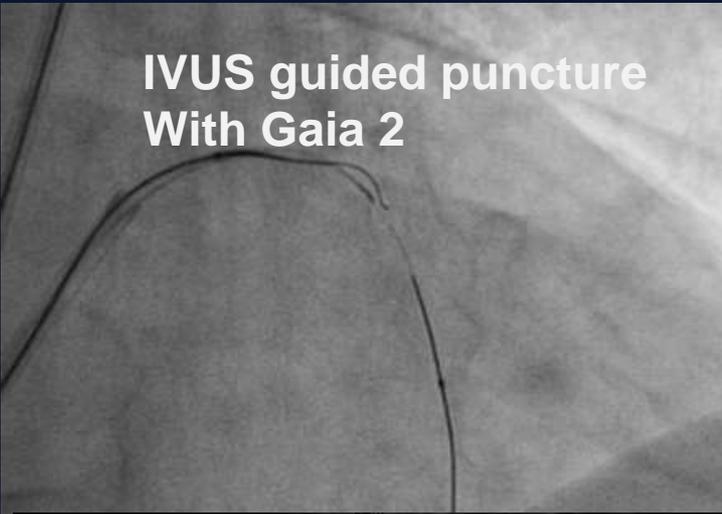
	Visible micro channels	Tapered proximal cap	Blunt proximal cap
Proximal Cap	<p>Low penetration force wire with polymer jacket and tapered tip</p> <p>↓</p> <p>Intermediate penetration force wire</p>	<p>Low penetration force wire</p> <p>↓</p> <p>Intermediate penetration force wire</p>	<p>Intermediate penetration force wire</p> <p>↓</p> <p>High penetration force wire</p>
CTO body	Length <20 mm	Reasonable to continue with wire used to cross proximal cap	
	Length >20 mm or ambiguous course	Step down to a low penetration force wire or intermediate non-tapered wire	
Distal Cap	Escalation from softer more steerable wire to a higher penetration-force wire may be required.		

# 62/M, Prox LAD CTO with no stump

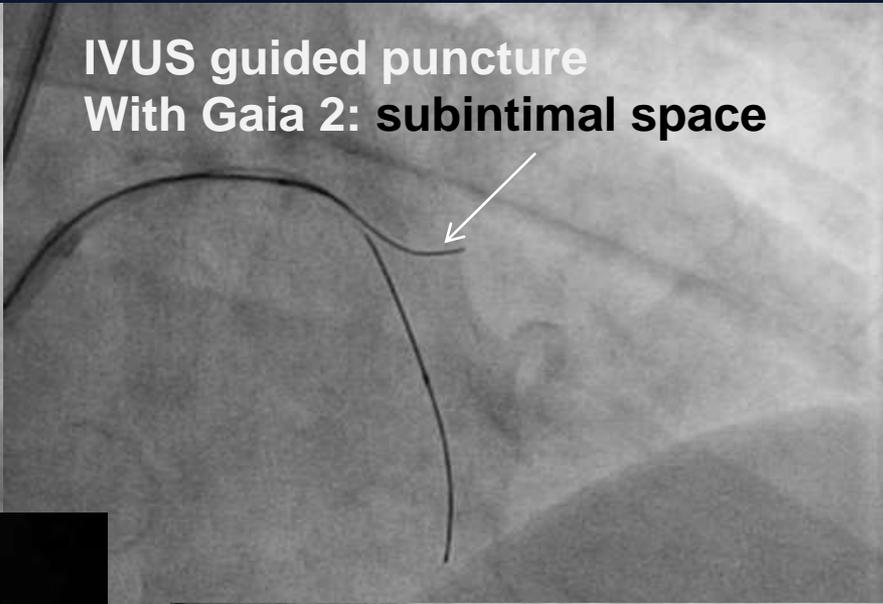
HEAVY CALCIFICATION IN PROXIMAL CAP  
Soft plaque in CTO body and distal cap



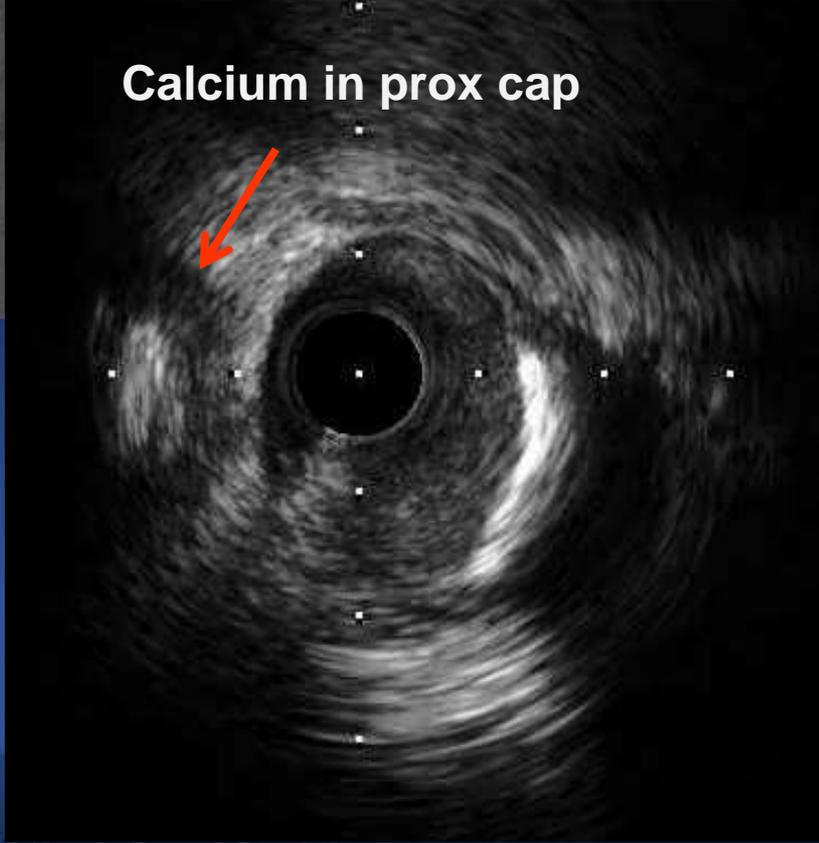
**IVUS guided puncture  
With Gaia 2**



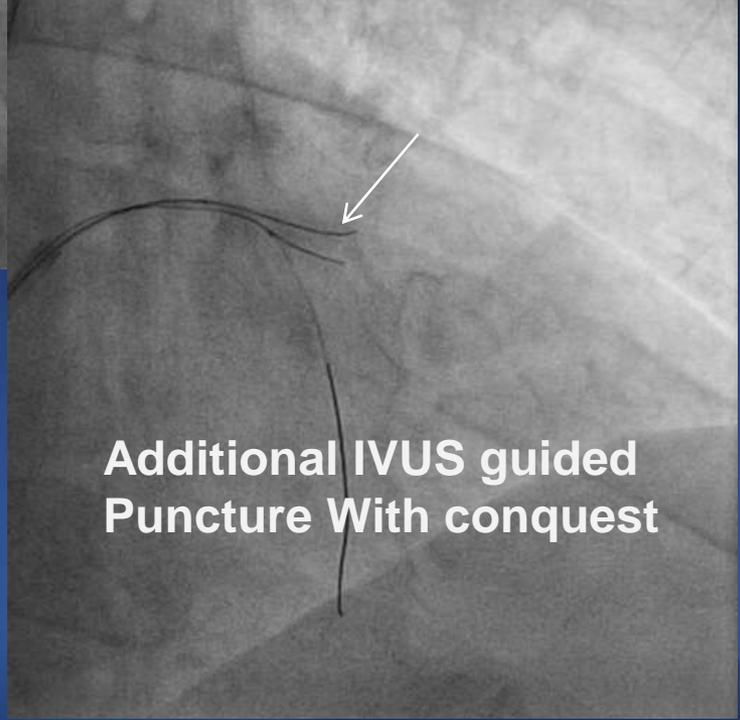
**IVUS guided puncture  
With Gaia 2: subintimal space**



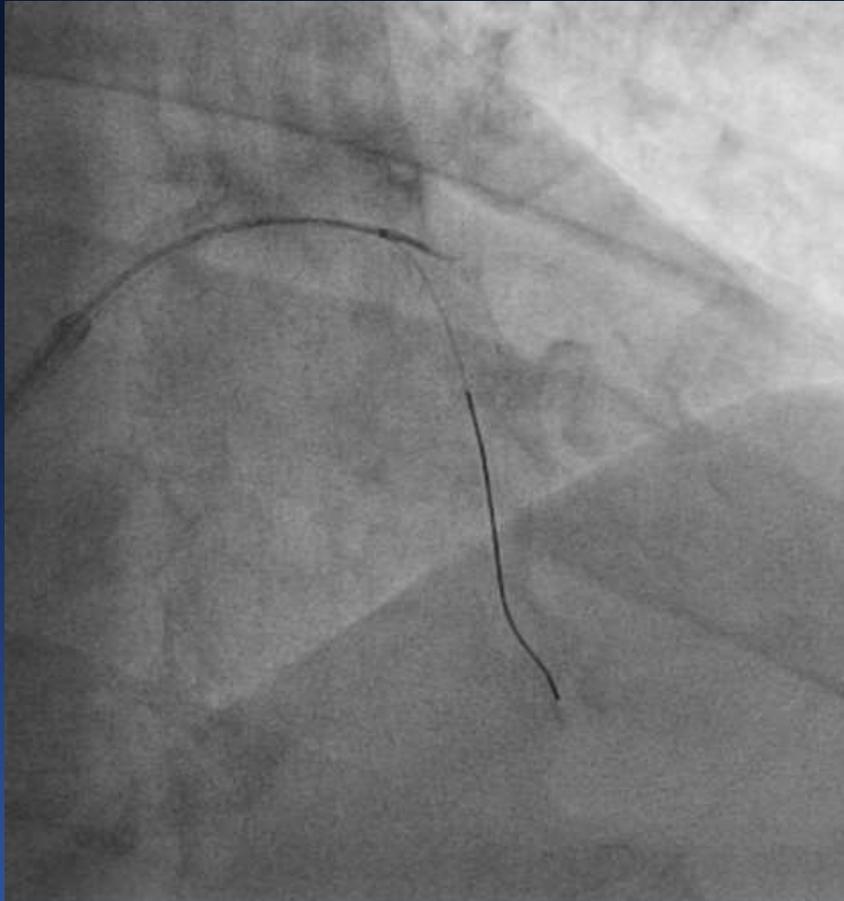
**Calcium in prox cap**



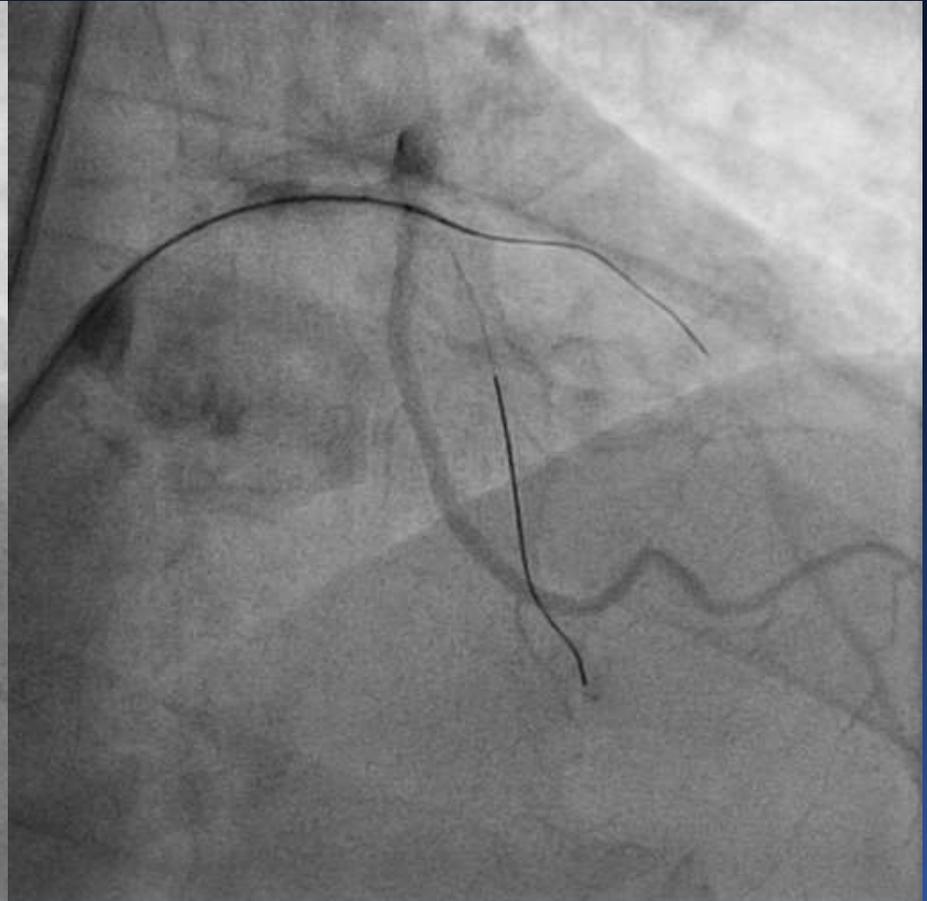
**Additional IVUS guided  
Puncture With conquest**



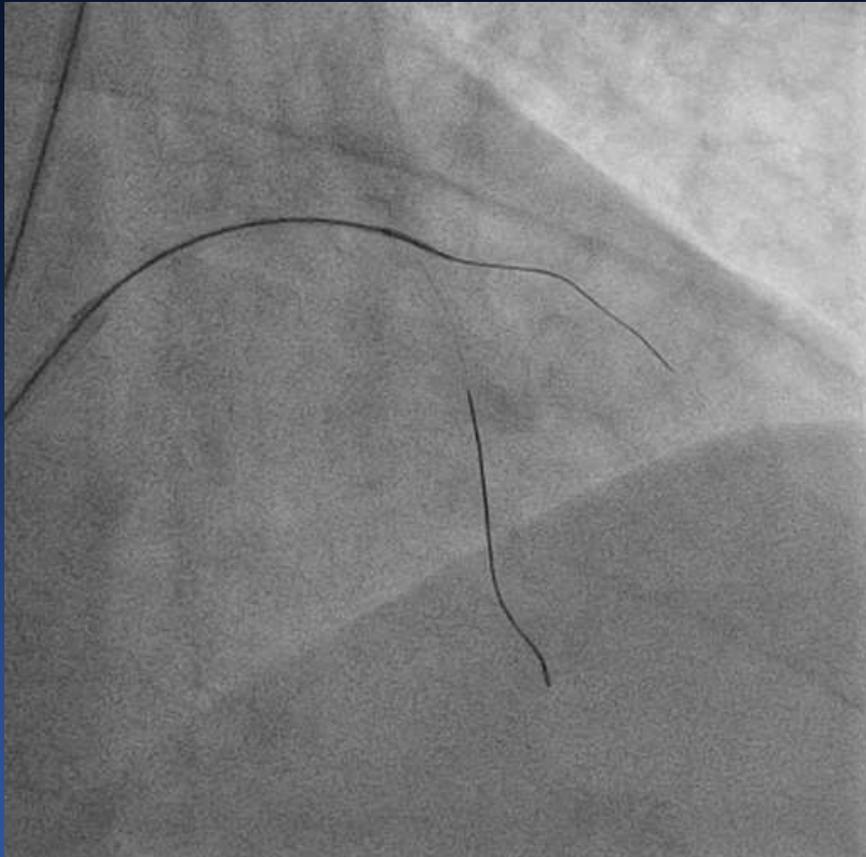
**Corsair advance**



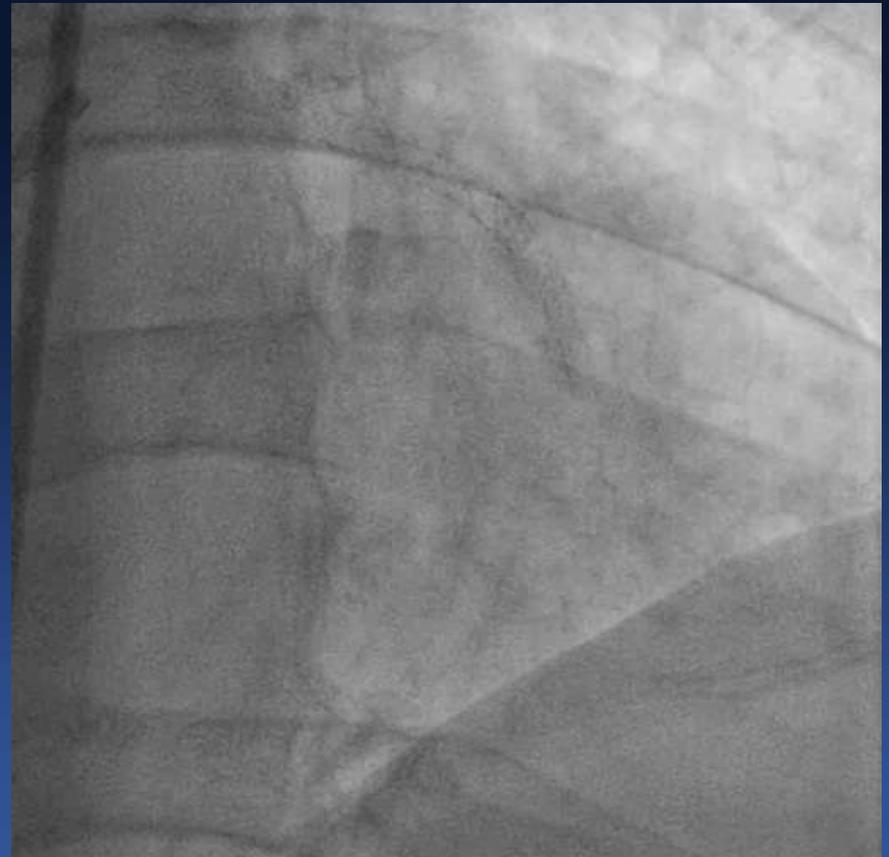
**Fielder XT (step down escalation)**



**Fielder XT wiring**



**Final result**



# Antegrade wire based strategy



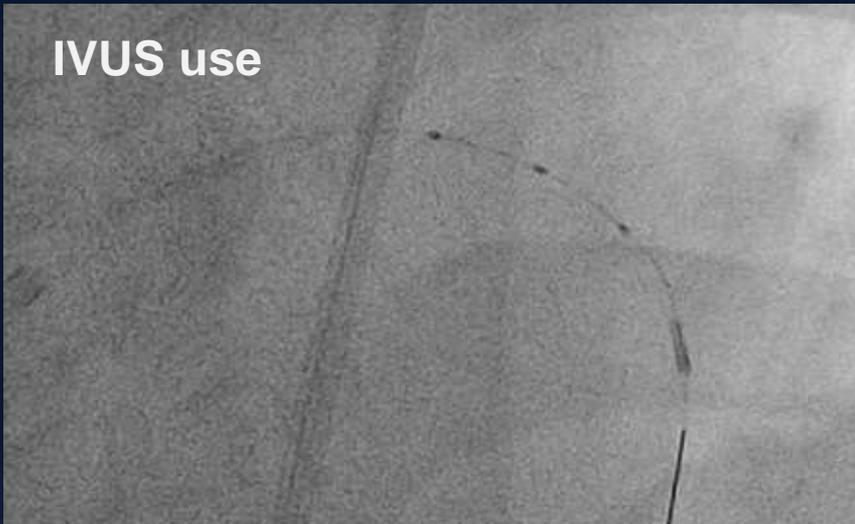
	Visible micro channels	Tapered proximal cap	Blunt proximal cap
Proximal Cap	Low penetration force wire with polymer jacket and tapered tip ↓ Intermediate penetration force wire	Low penetration force wire ↓ Intermediate penetration force wire	Intermediate penetration force wire ↓ High penetration force wire

CTO body	Length <20 mm	Reasonable to continue with wire used to cross proximal cap
	Length >20 mm or ambiguous course	Step down to a low penetration force wire or intermediate non-tapered wire

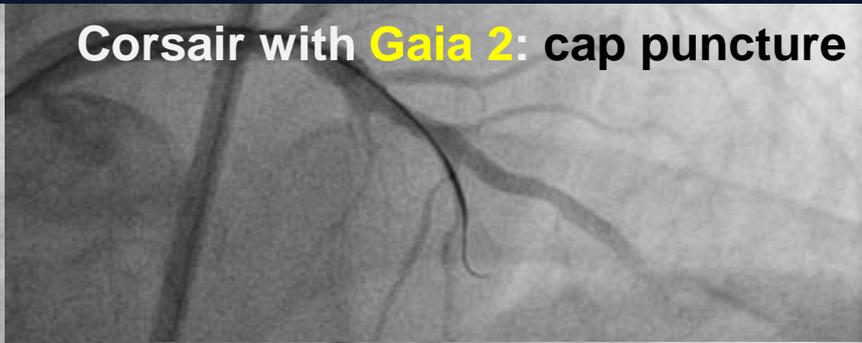
## Distal Cap

Escalation from softer more steerable wire to a higher penetration-force wire may be required.

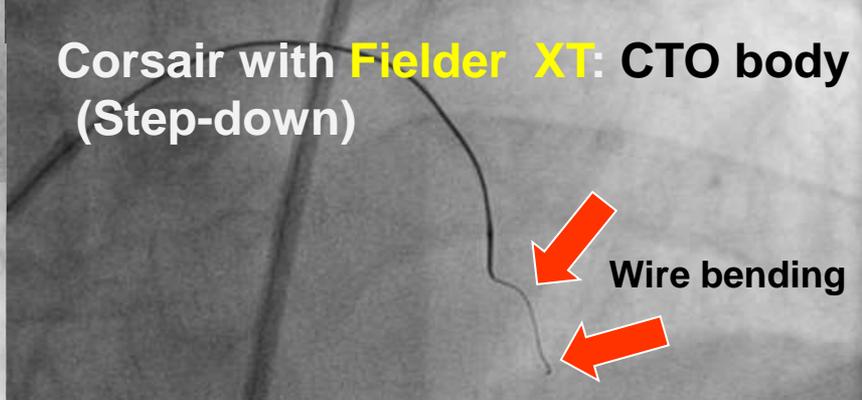
IVUS use



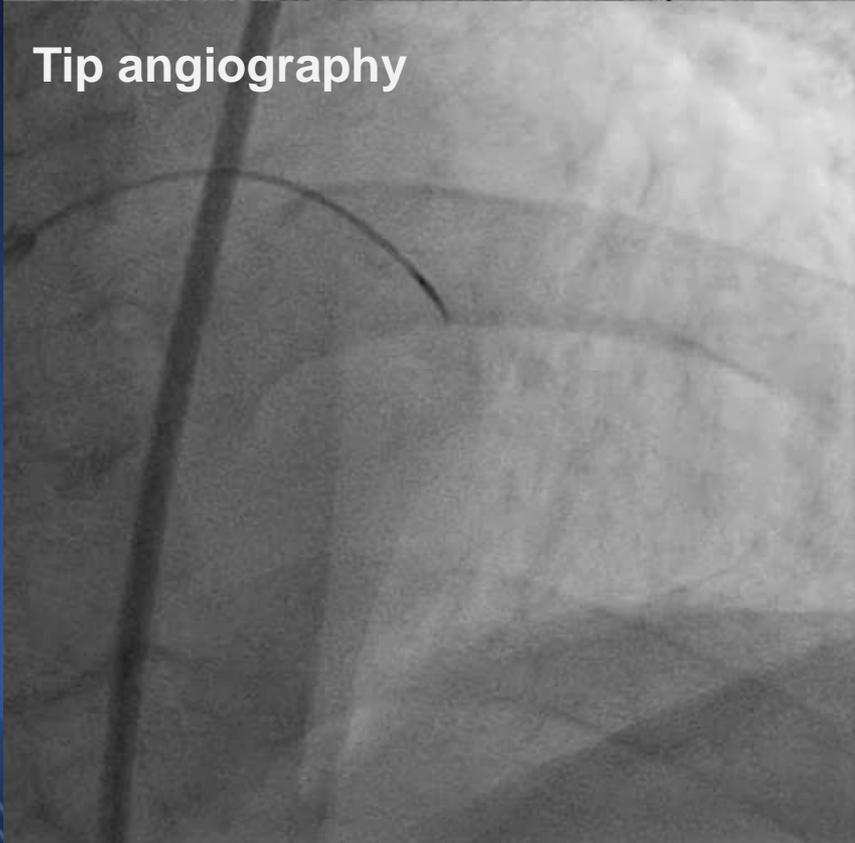
Corsair with **Gaia 2**: cap puncture



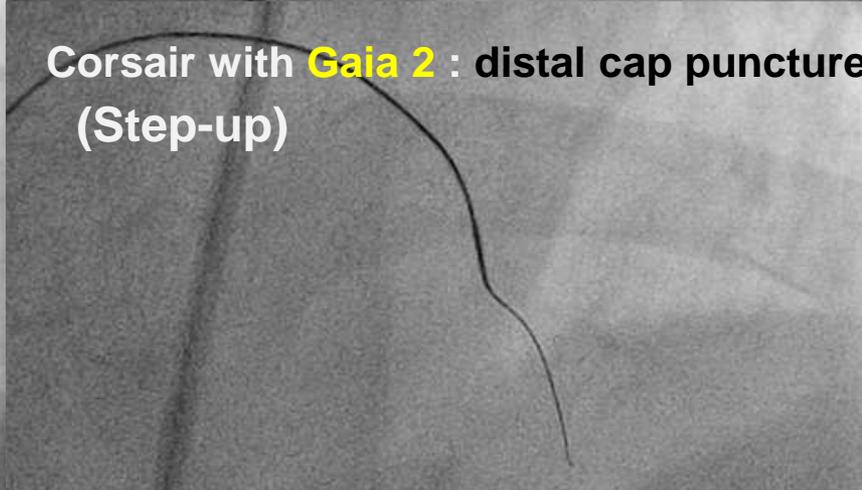
Corsair with **Fielder XT**: CTO body (Step-down)



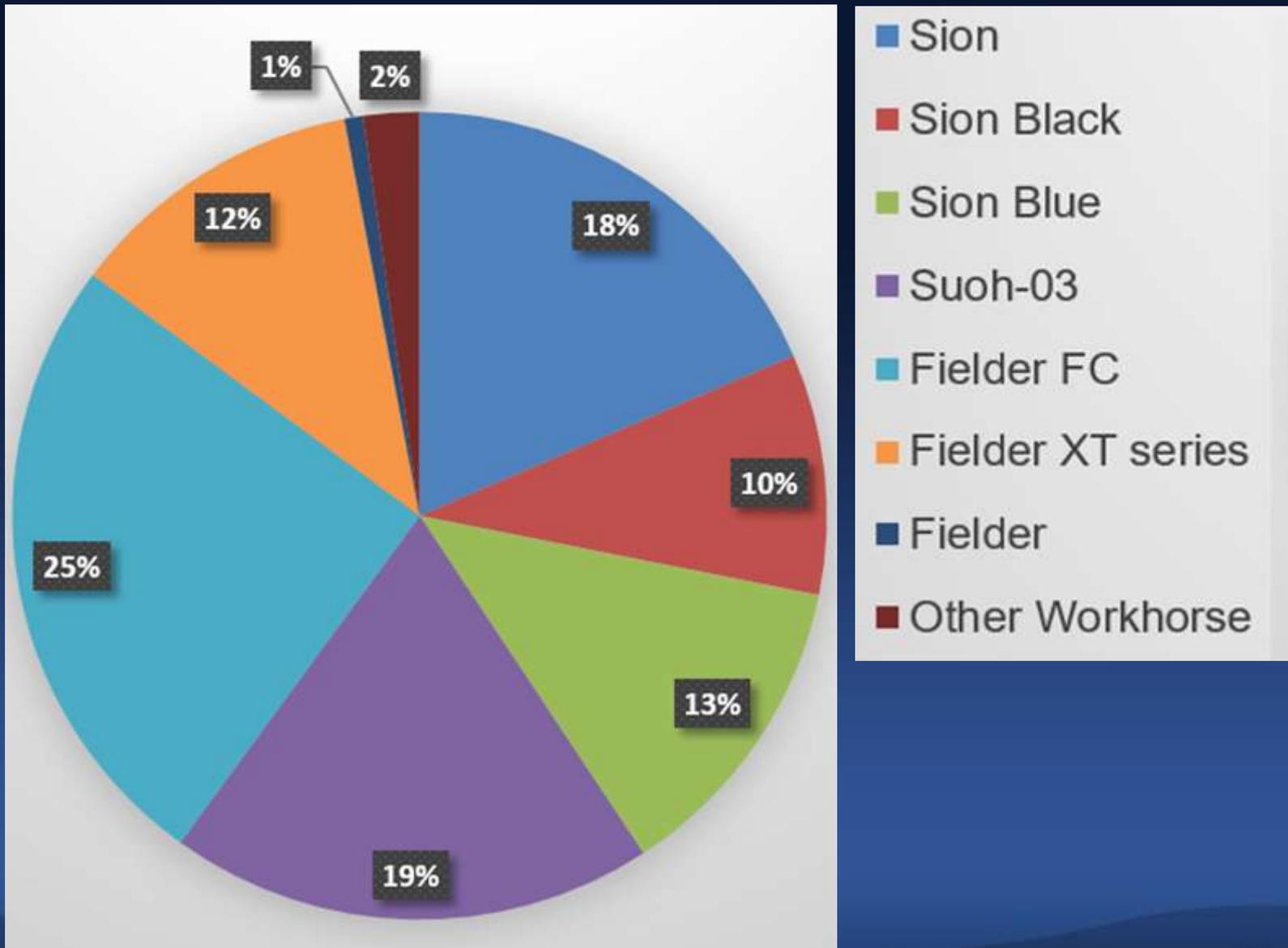
Tip angiography



Corsair with **Gaia 2**: distal cap puncture (Step-up)



# Soft wire use for retrograde channel



# Retrograde wire escalation for CTO crossing

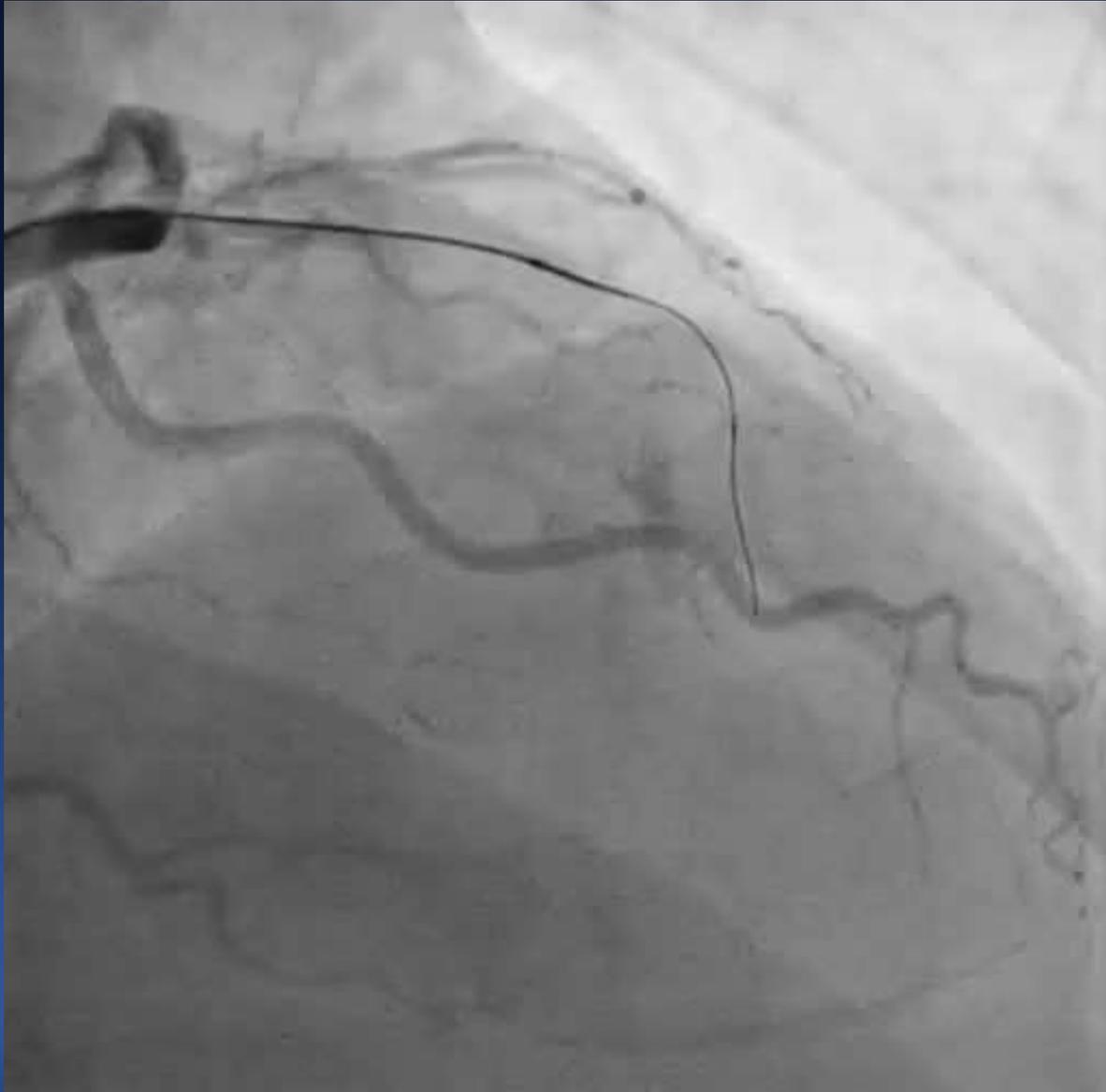
- **Poor torqueability** than antegrade wiring because of long working distance from Torque device.
- **Limited forward power** due to longer working distance than antegrade wiring
- **Poor rail support:** Difficult to maintain distance between MC and wire tip

# Mid LAD CTO

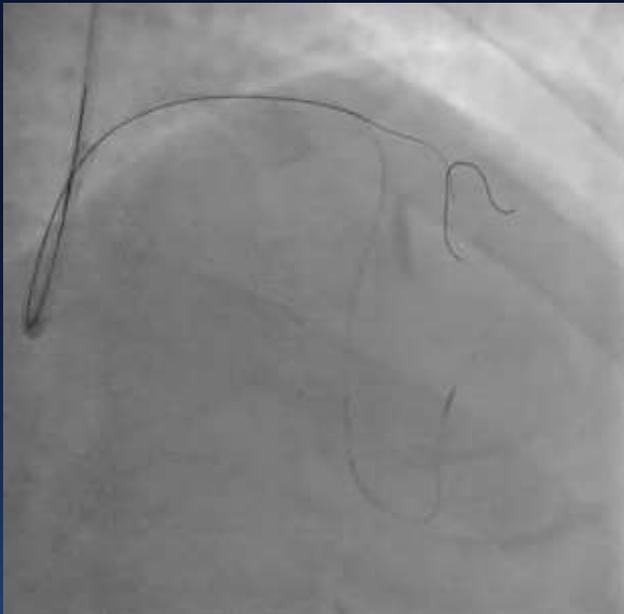
## Septal to septal channel



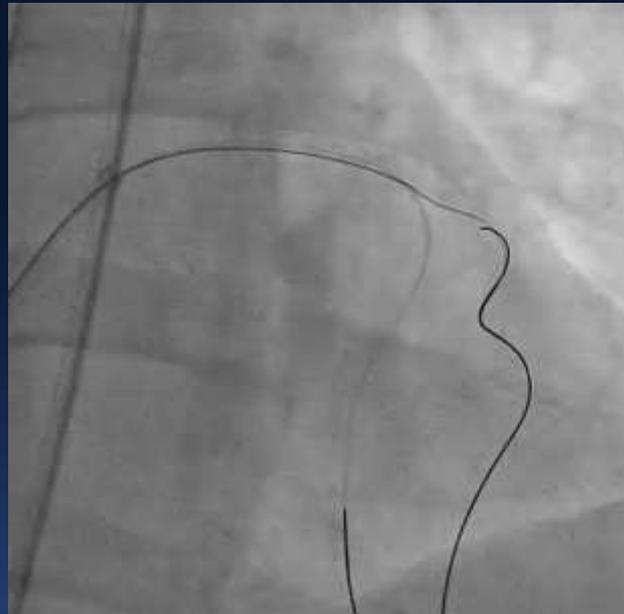
# Corsair, fielder XT: failed



**Caravel advance  
With Sion wire cross**



**Retrograde direct  
Wiring: UB3 wire**

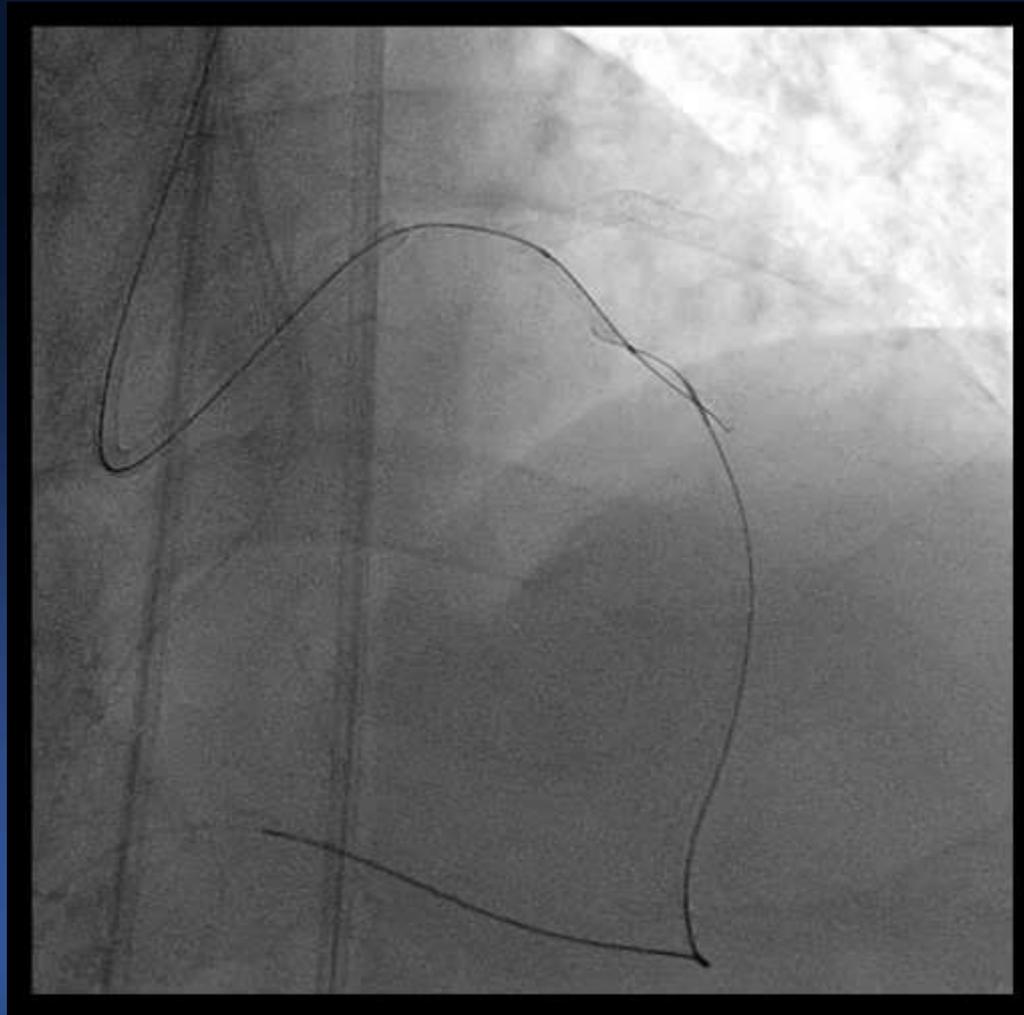


**Contralateral guiding  
Wiring (pingpong guiding)**



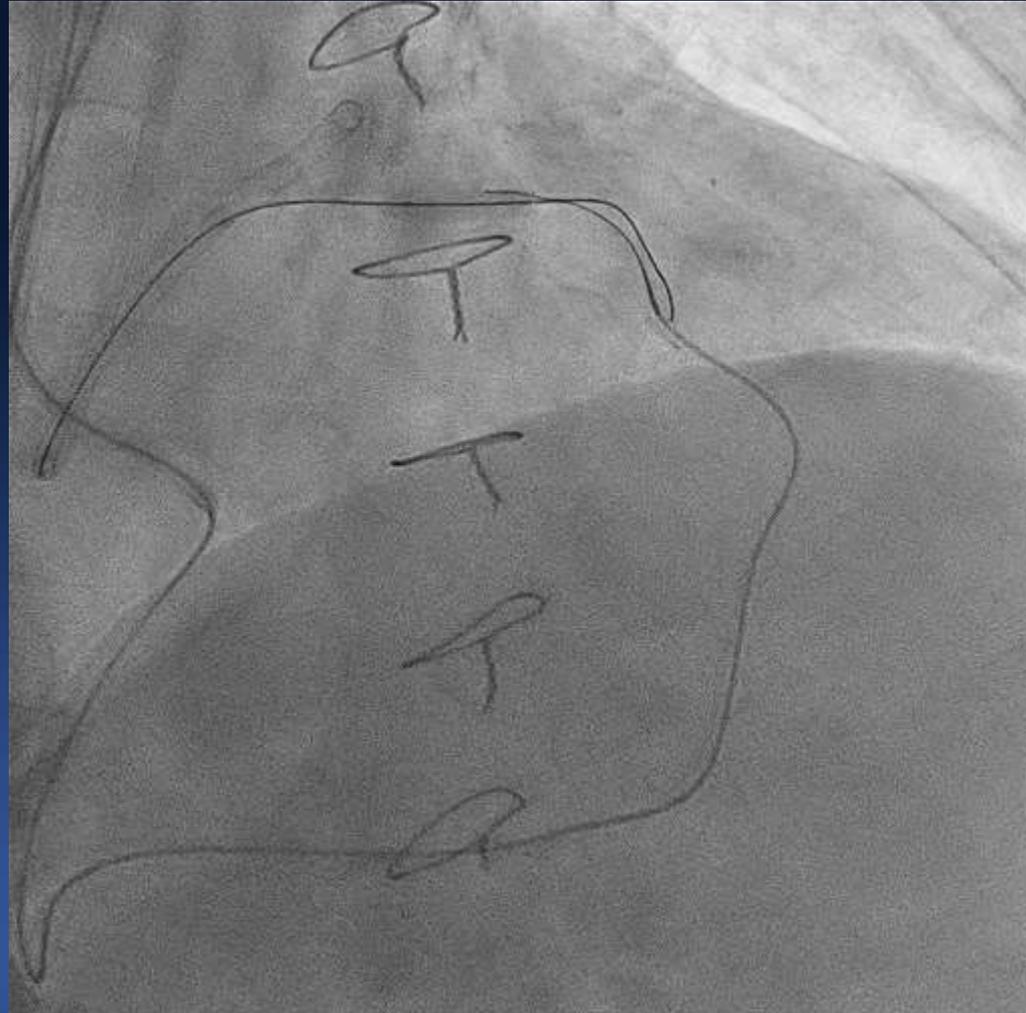
# Reverse CART

## Wiring: **Gaia 2 wire**



# Reverse CART

## Wiring: **Gladius wire**



# Retrograde wire escalation for CTO crossing

- **Poor torqueability** than antegrade wiring because of long working distance from Torque device: **Controllable Intermediate wire**
- **Limited forward power** due to longer working distance than antegrade wiring: **Higher penetration force Controllable Intermediate wire**
- **Poor rail support**: Difficult to maintain distance between MC and wire tip : **Higher rail support intermediate wire**
- Therefore, UB3, Pilot wire, Gladius, Gaia series is recommended

# Conclusions

- Guidewire could be classified into coating type, tapering, and stiffness.
- New guidewire is developed for improving penetration force/torque response with good flexibility/trackability and resistant to wire fracture (Fighter, Hornet series Gaia Next....)
- Suoh 03 (tip load 0.3g, preformed tip) is unique wire without tip core wire which enables tortuous channel tracking.
- Majority of new CTO wire is dual coil and tapered, so when you encounter new guidewire, you just check out coating type and stiffness for practical use.