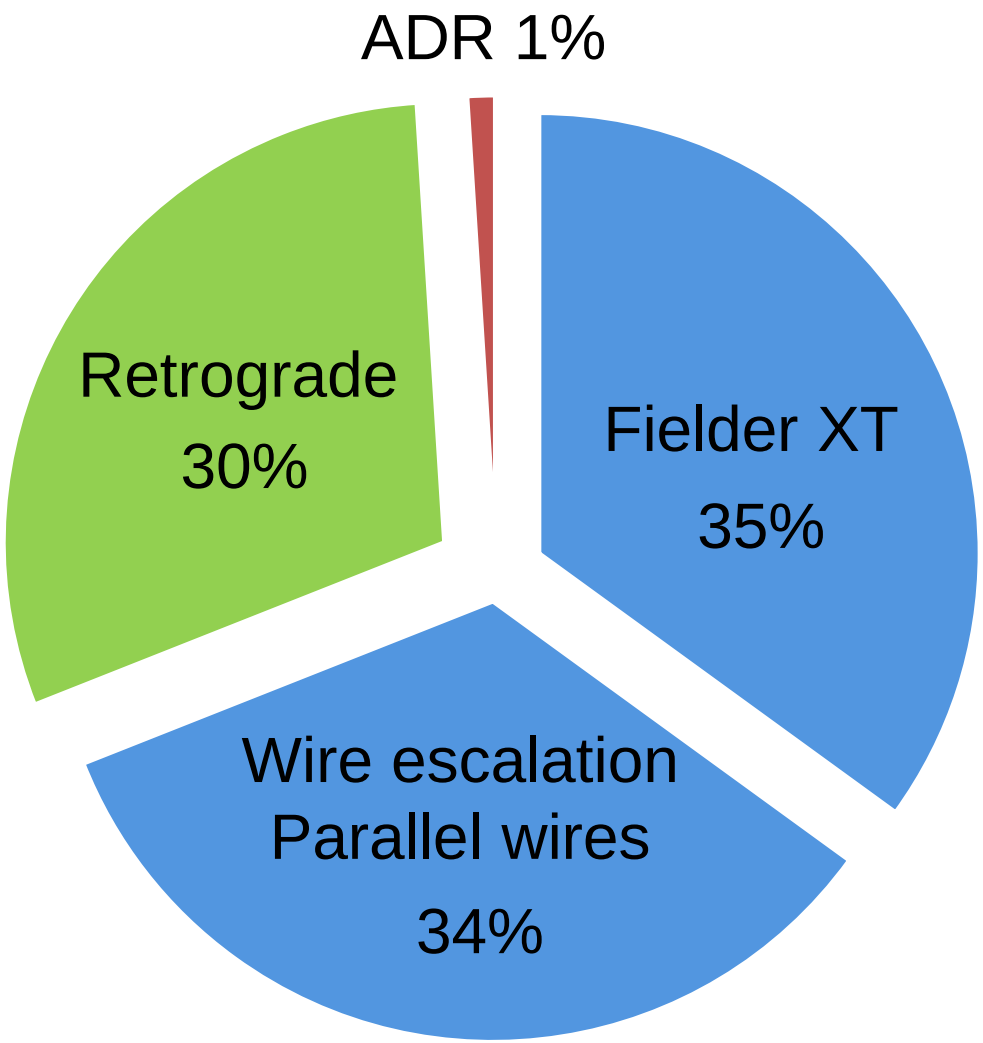
Beyond Wires and Microcatheters

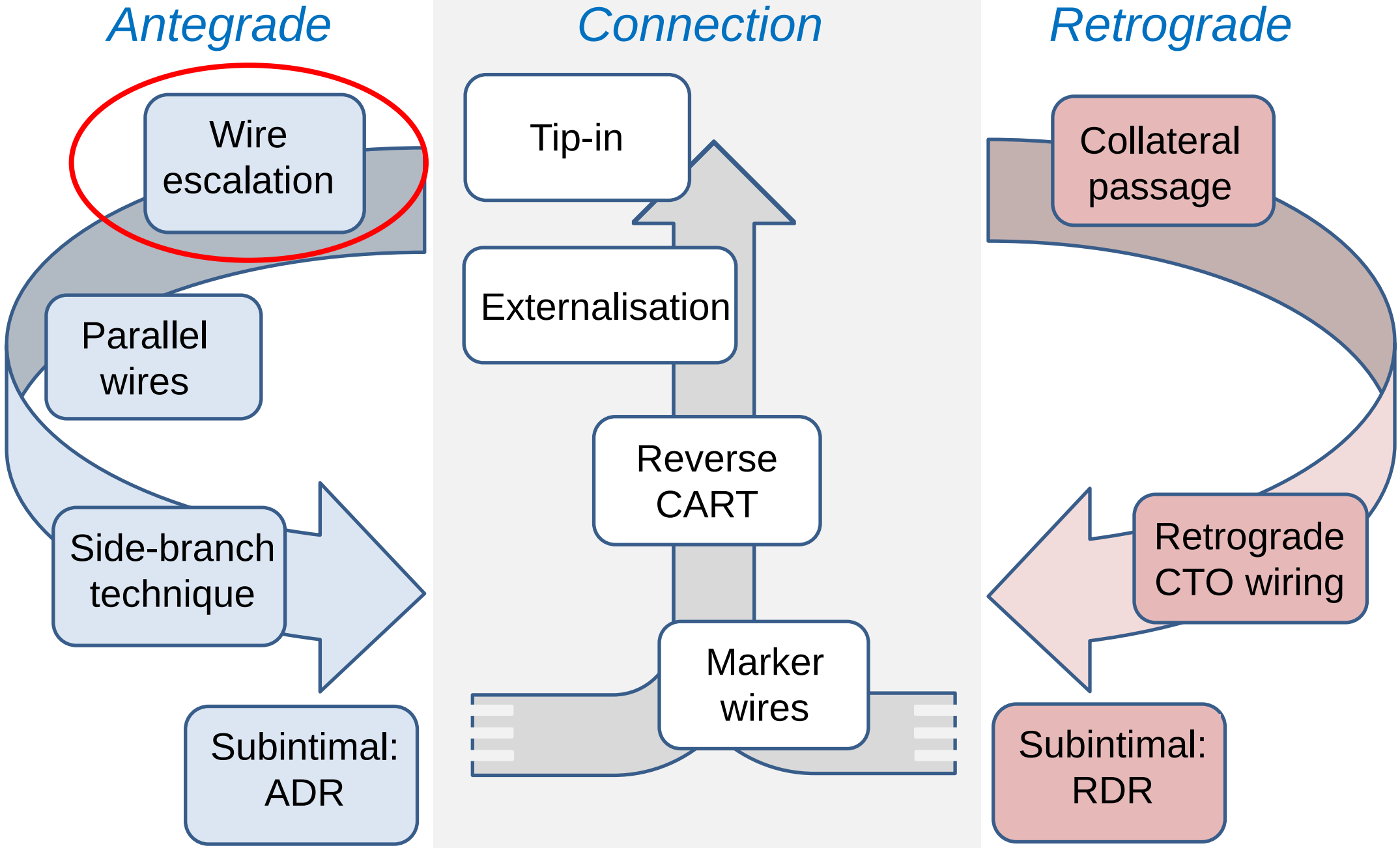
- Tips and tricks for CTO PCI -

Achim Büttner

LUCCA 3.0 - Lucerne, February 2024

My strategical benchmark




Antegrade
Connection
Retrograde
Wire escalation
Parallel wires
Side-branch technique
Subintimal: ADR
Tip-in
Externalisation
Reverse CART
Marker wires
Collateral passage
Retrograde CTO wiring
Subintimal: RDR

When to start from antegrade?

- „Always“

  - also after failed previous attempt

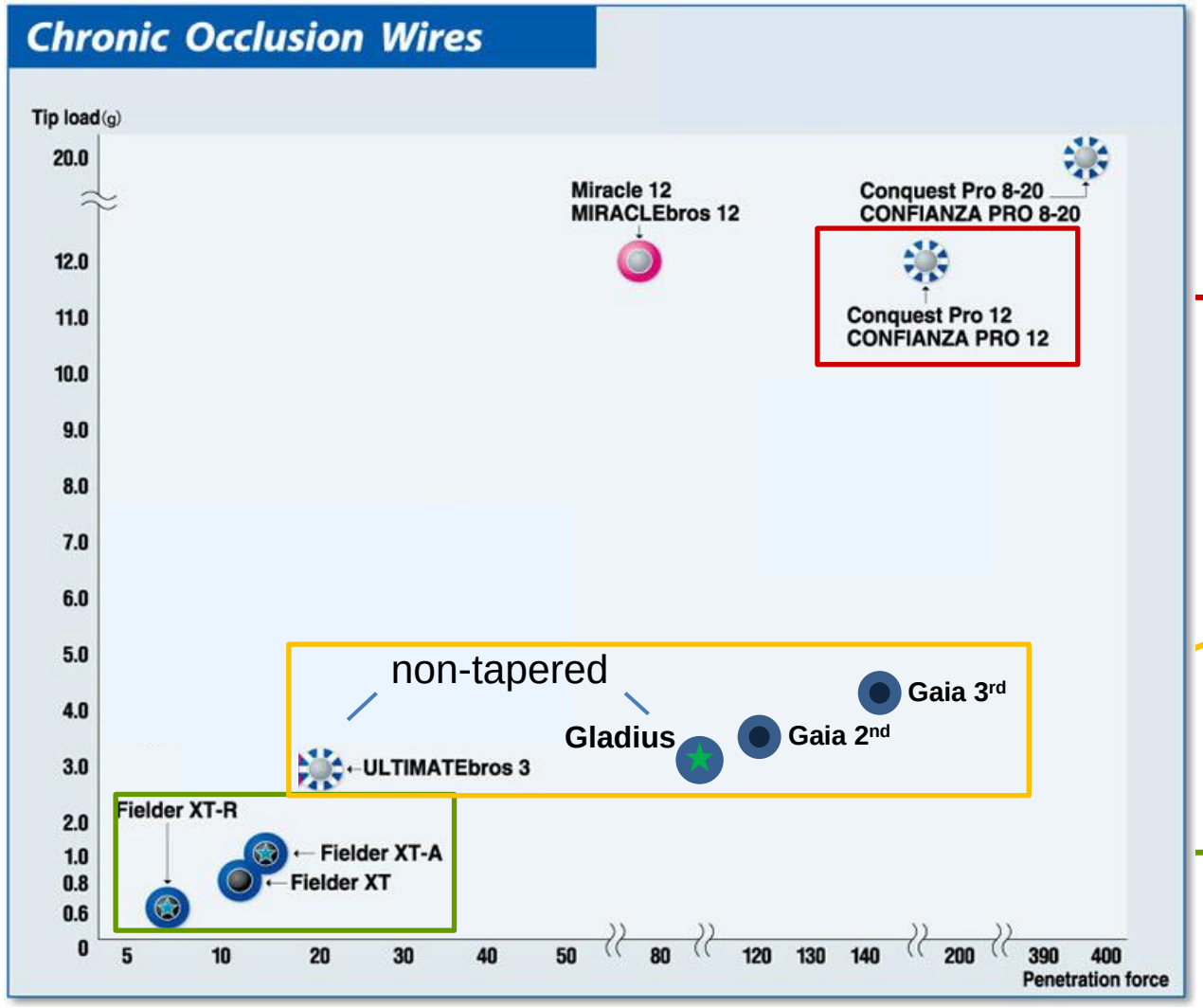
  - also with primary bidirectional strategy

- Exceptions: - Ambiguous proximal cap

  - Ostial CTO

Guidewire Tip Load and Penetration Force

(CTO Wires Asahi Intecc)



Hard (12g), tapered tip

Moderate (3 – 4.5g)

Soft (≤1g) polymeric tapered tip

Fielder XT Series (Asahi Intecc)

Polymer, tapered tip

Tip Ø [inch]

Tip load

Fielder XT

0.09

0.8 g

Fielder XT-R

0.10

0.6 g

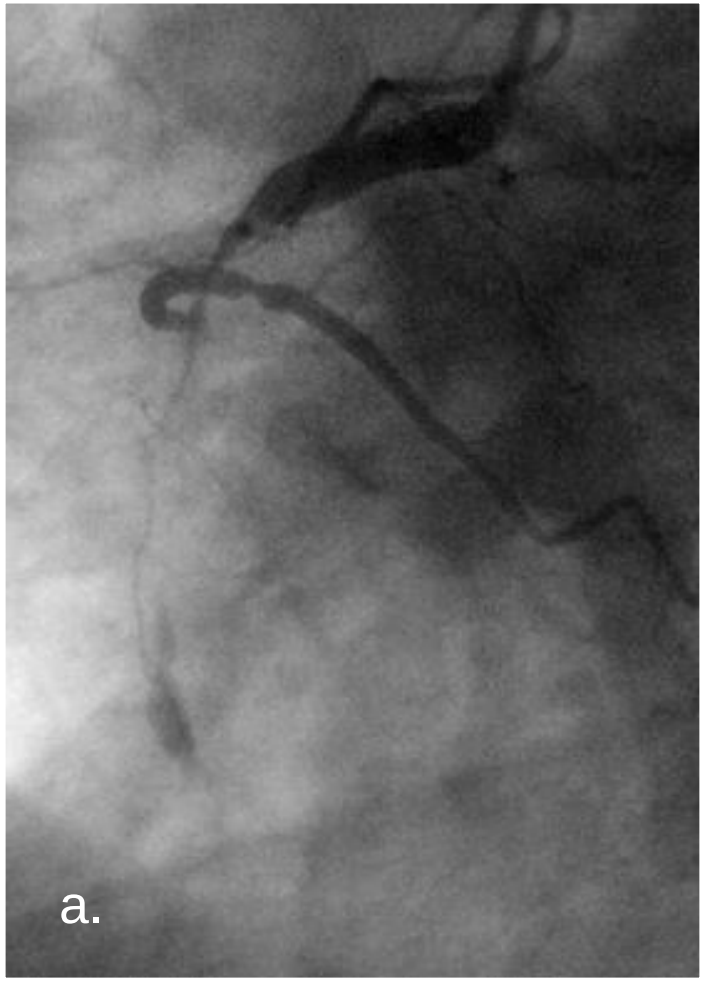
Dual coil = torque response

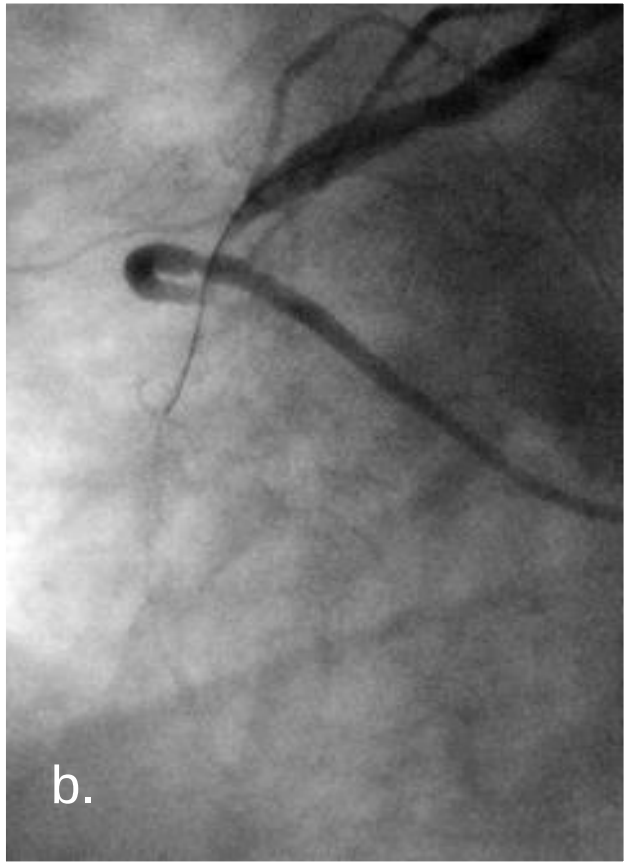
Fielder XT-A

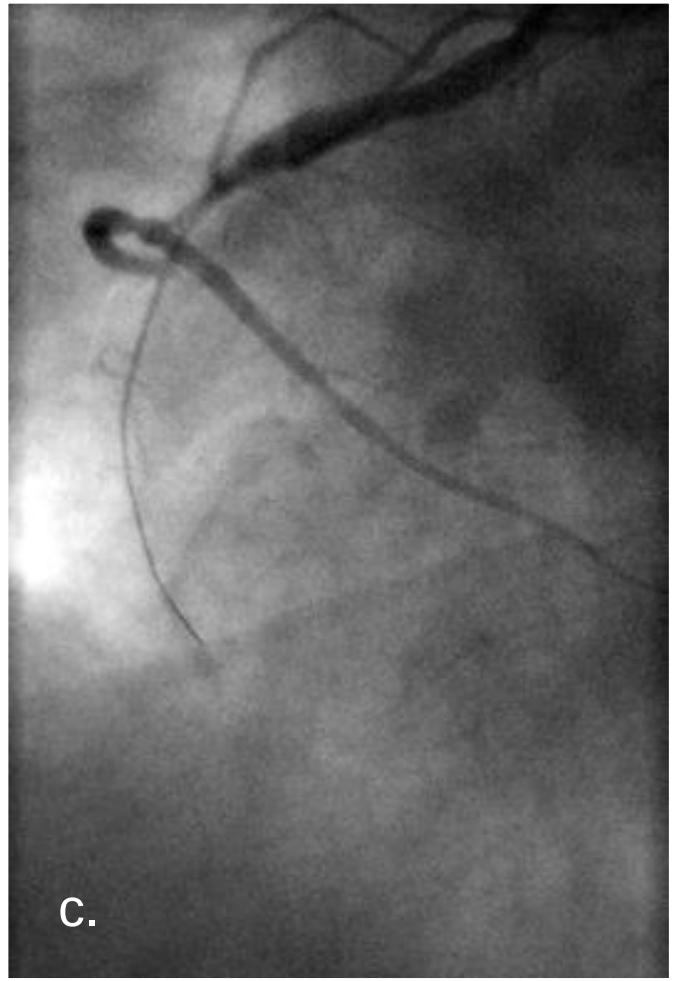
0.10

1.0 g

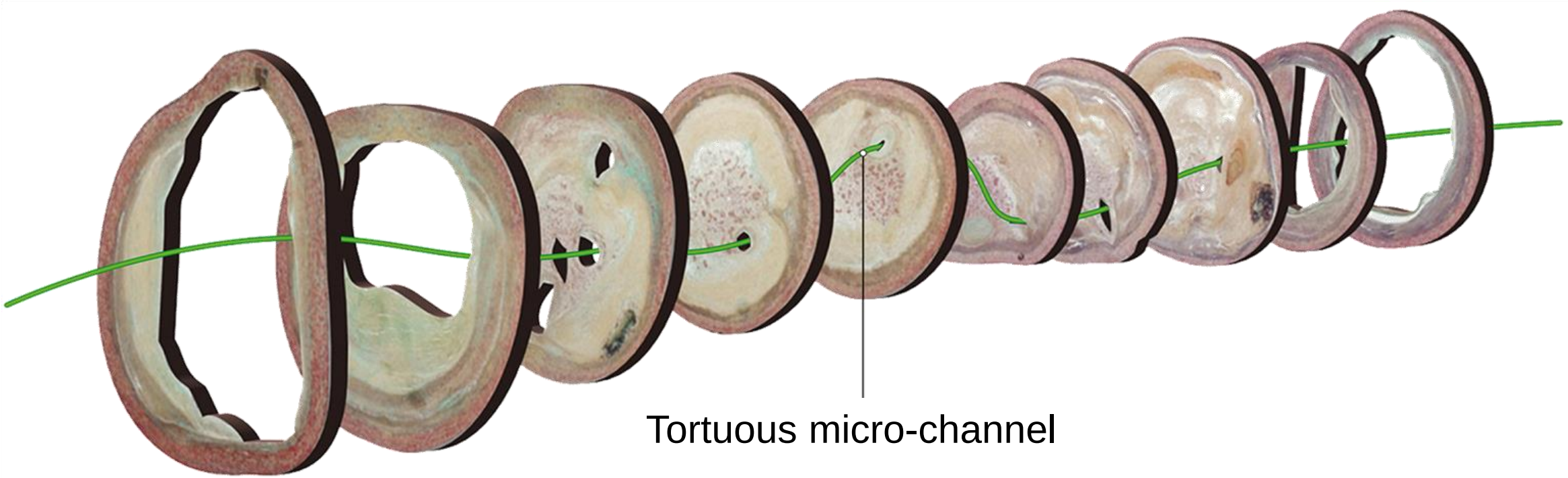
RCA CTO with microchannel: Wire Fielder XT



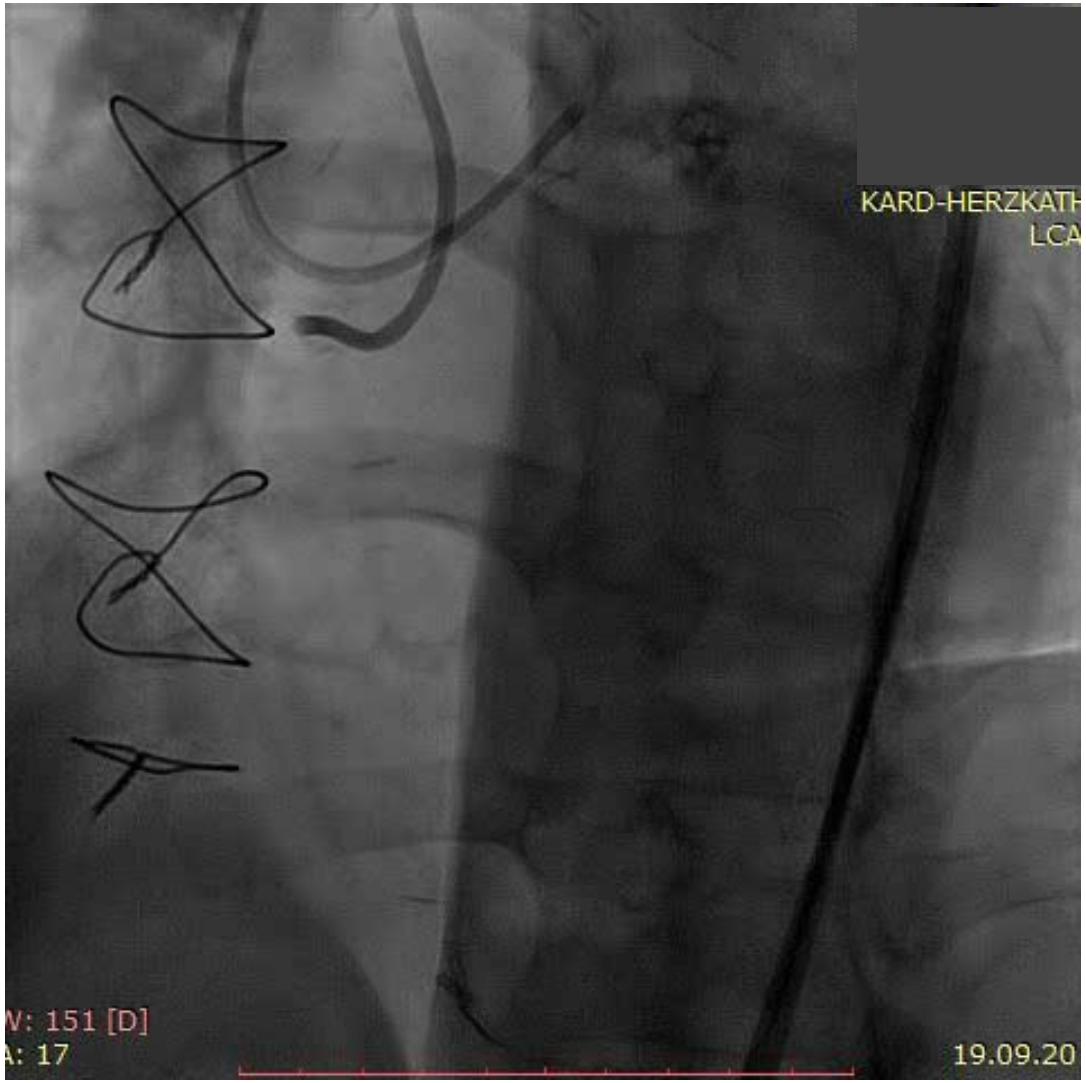




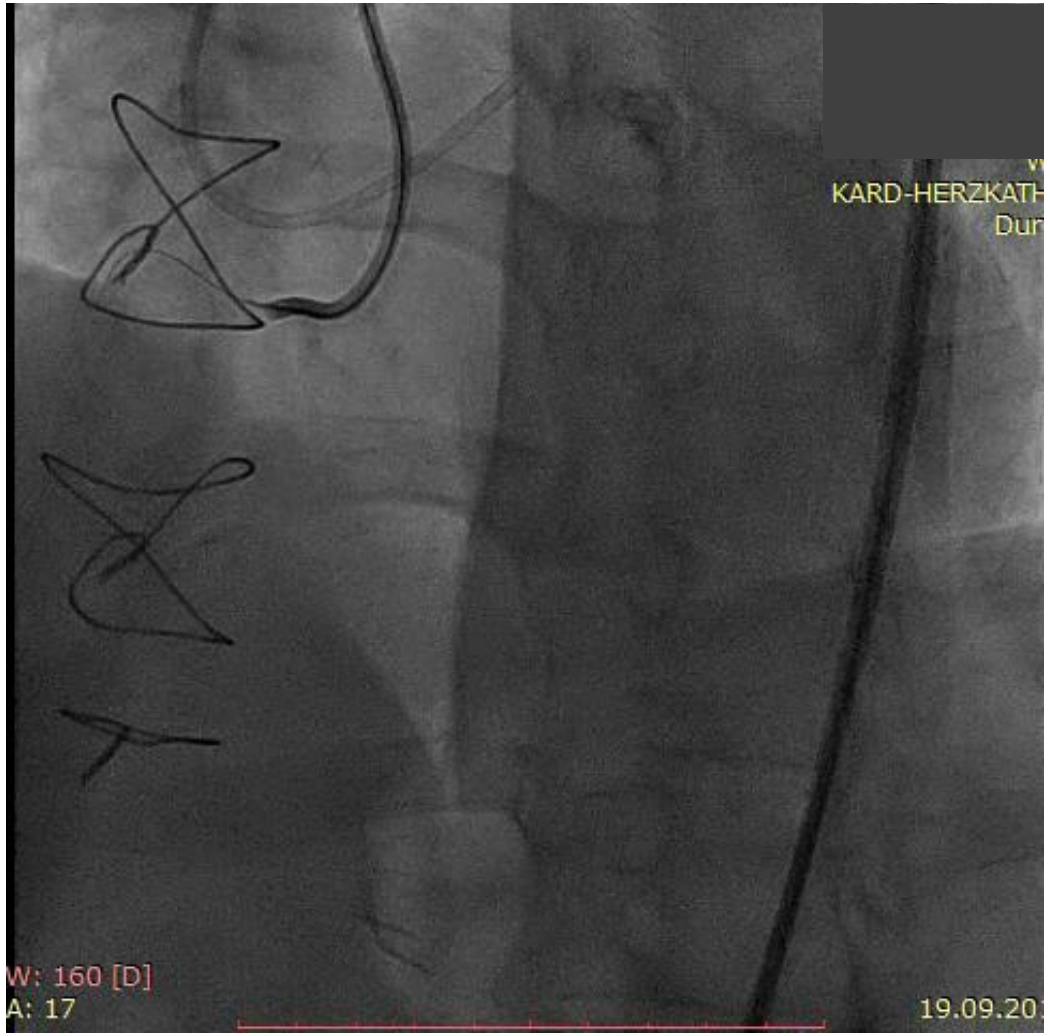
Micro Channels and soft tissue in CTO



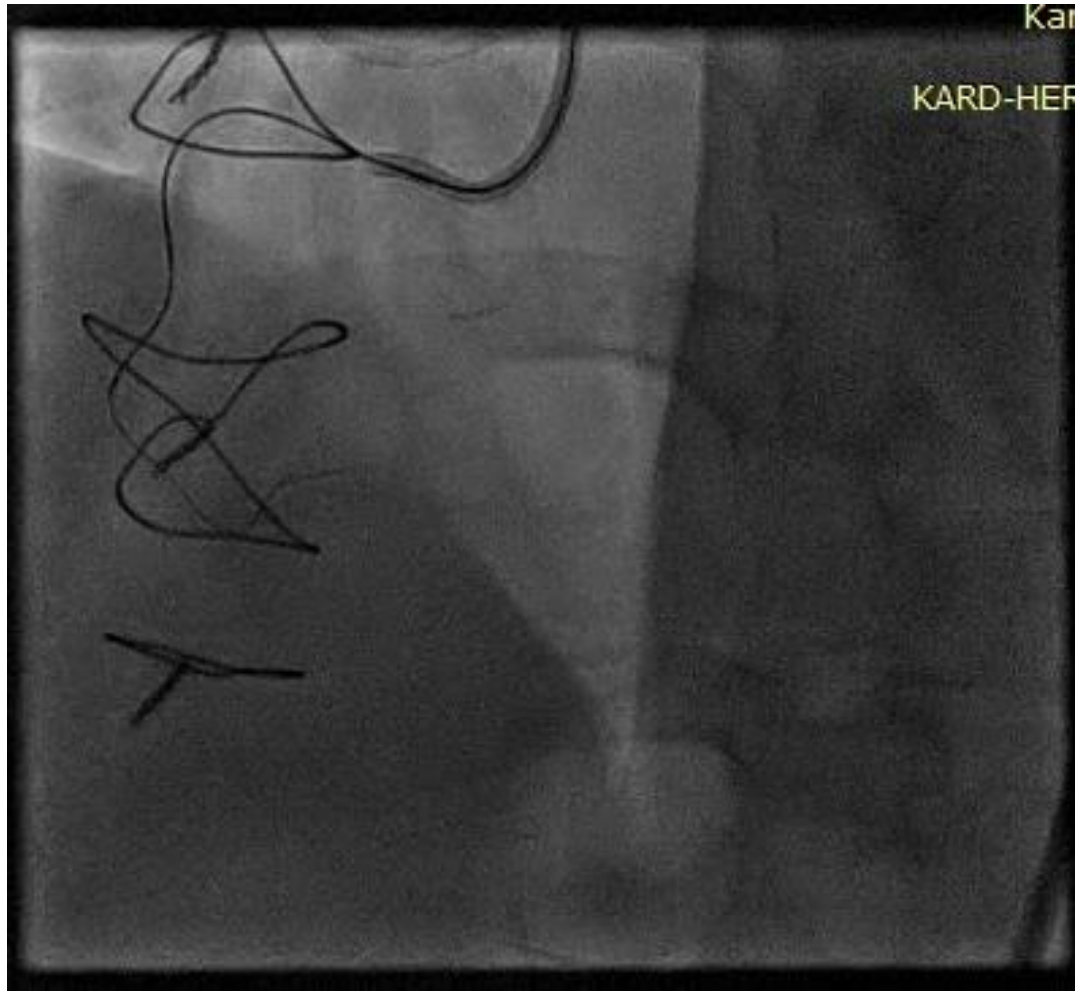
Calcified RCA CTO in a patient post CABG: Fielder XT-A



Courtesy of Florim Cuculi

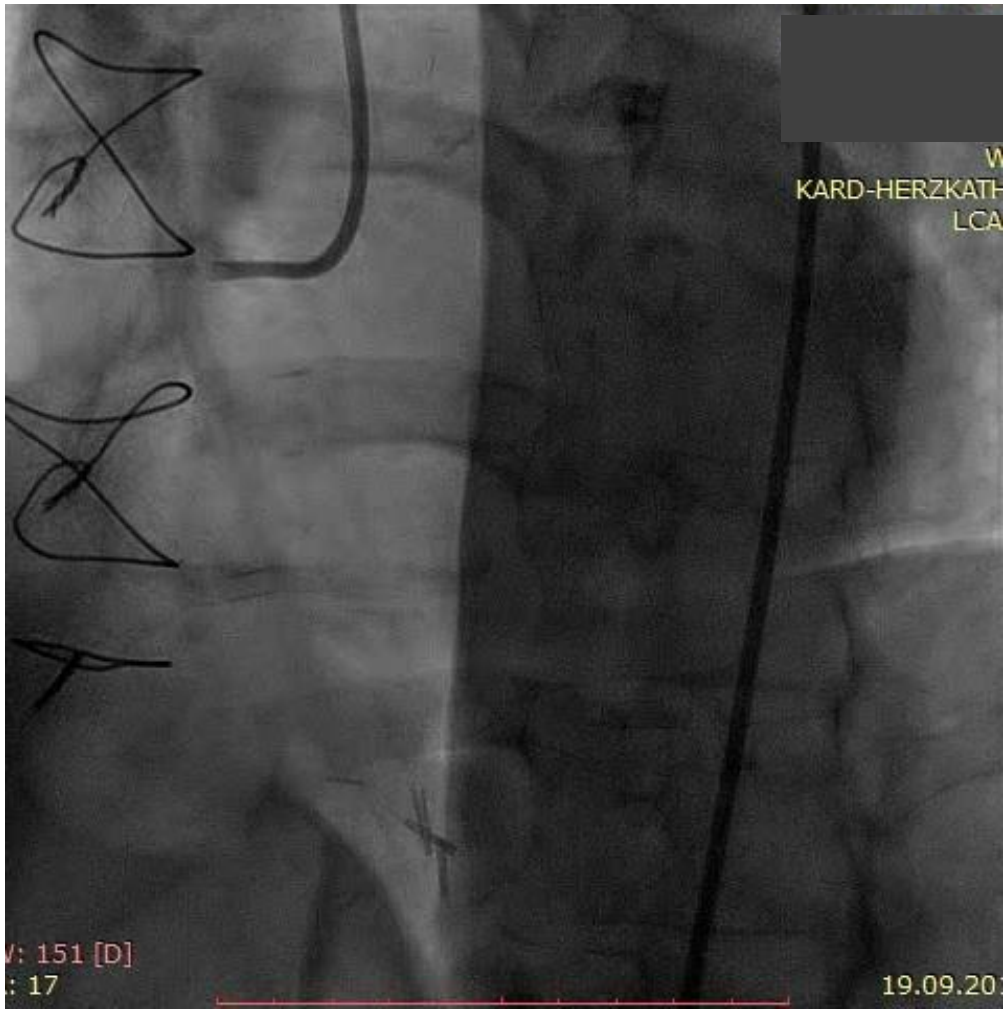


Wire: Fielder XT-A Microcatheter: Corsair


Kar
KARD-HER

Fielder XTA navigates the correct path around the calcium

Contra-lateral injection



After a lot of work …

Antegrade „Step-Up“ Recanalisation Guidewire Strategy

***Soft** tapered tip polymer*

- Fielder XT/A *0.8/1.0 g*

***Moderate** stiff tapered tip*

- Gaia Next 1st/2nd *2.0/4.0 g*

***Moderate** stiff polymer*

- Gladius *3 g*

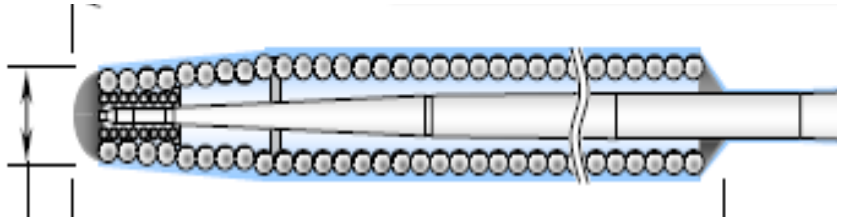
***Hard** tapered tip*

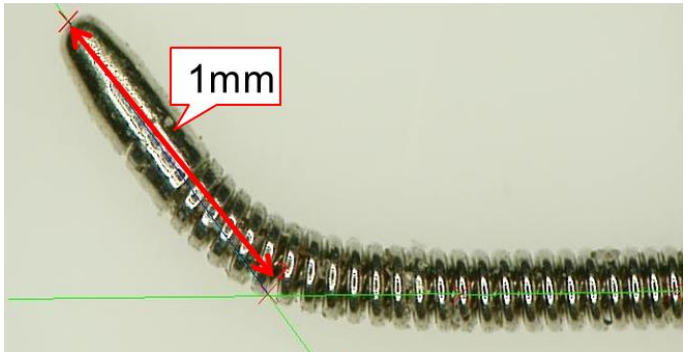
- Gaia Next 3rd *6.0 g*
- Confianza Pro *12 g*
- Hornet *14 g*

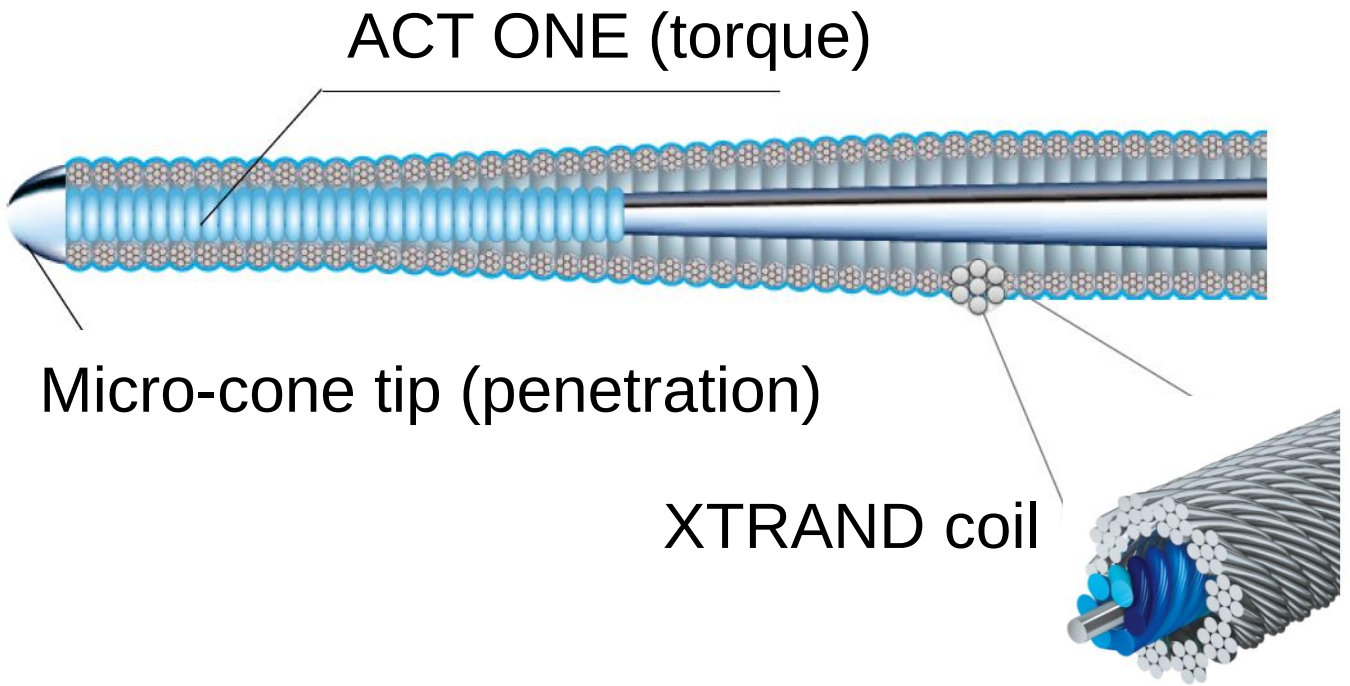
Less clear target

Clear target

Gaia vs. Gaia Next (Asahi Intecc)



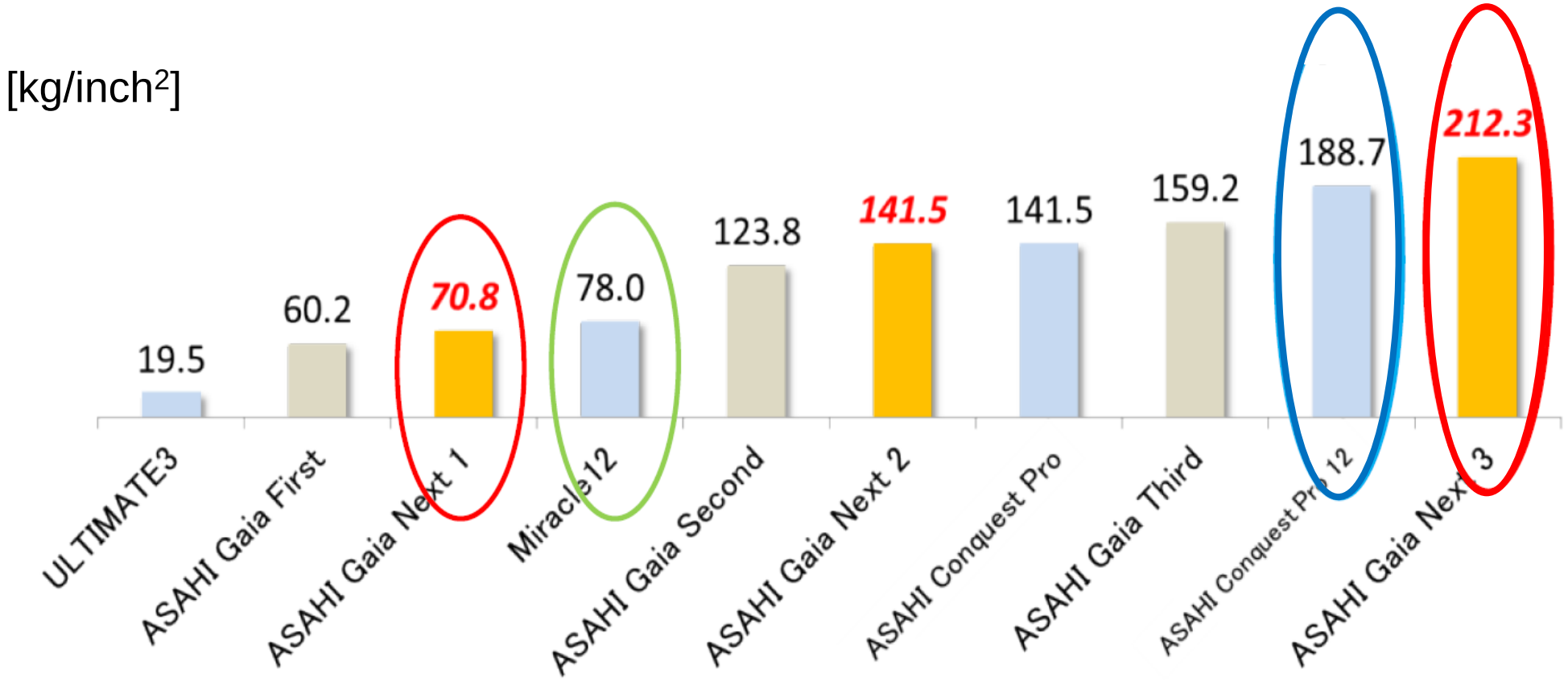




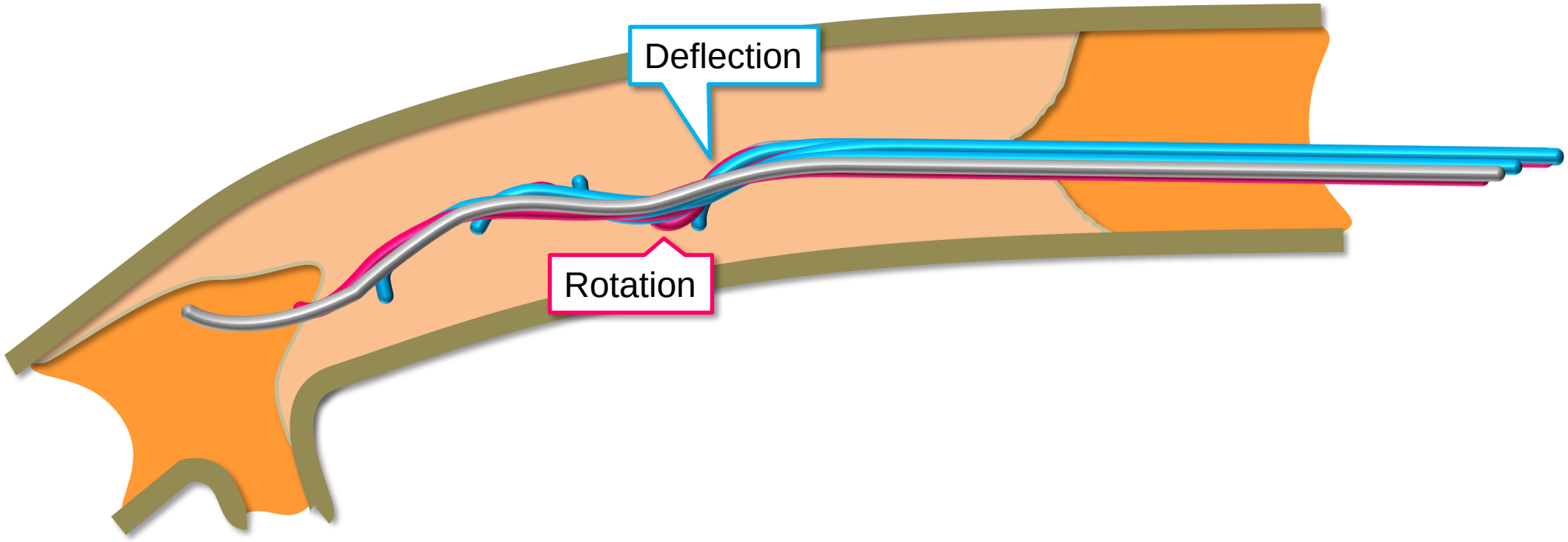
Gaia 1	1.7gf	0.010inch
Gaia 2	3.5g	0.011inch
Gaia 3	4.5gf	0.012inch

Gaia Next 1	2.0gf	0.011inch
Gaia Next 2	4.0gf	0.012inch
Gaia Next 3	6.0gf	0.012inch

Penetration force of guidewires

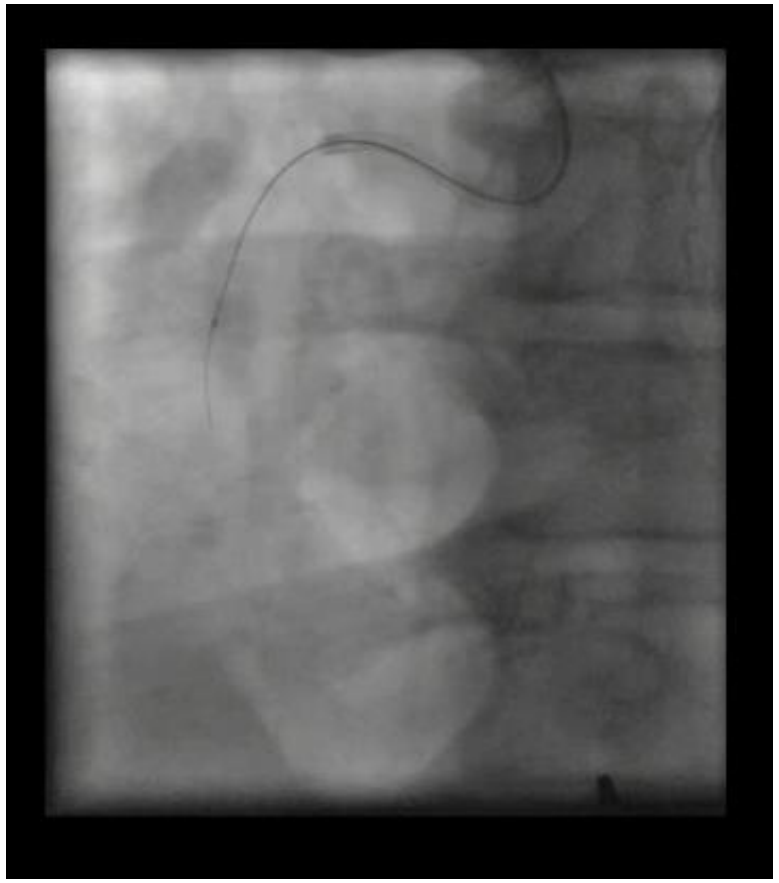


GAIA Concept: Rotation and directional control

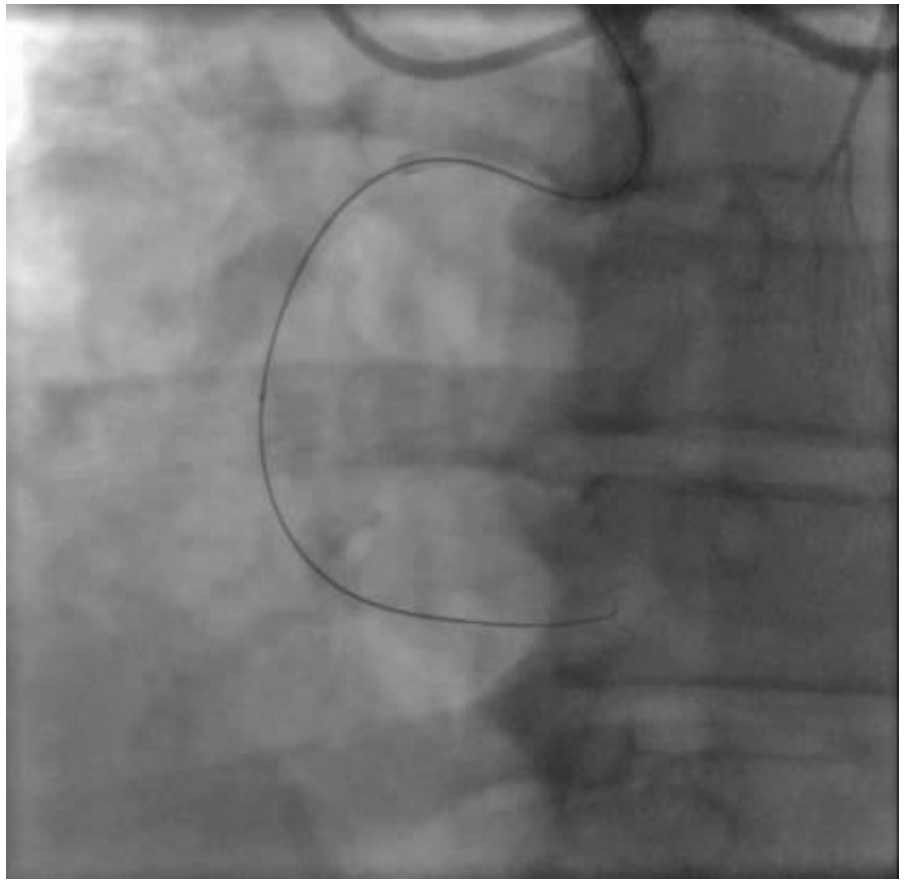


Antegrade Wire Escalation: Gaia 2nd/3rd

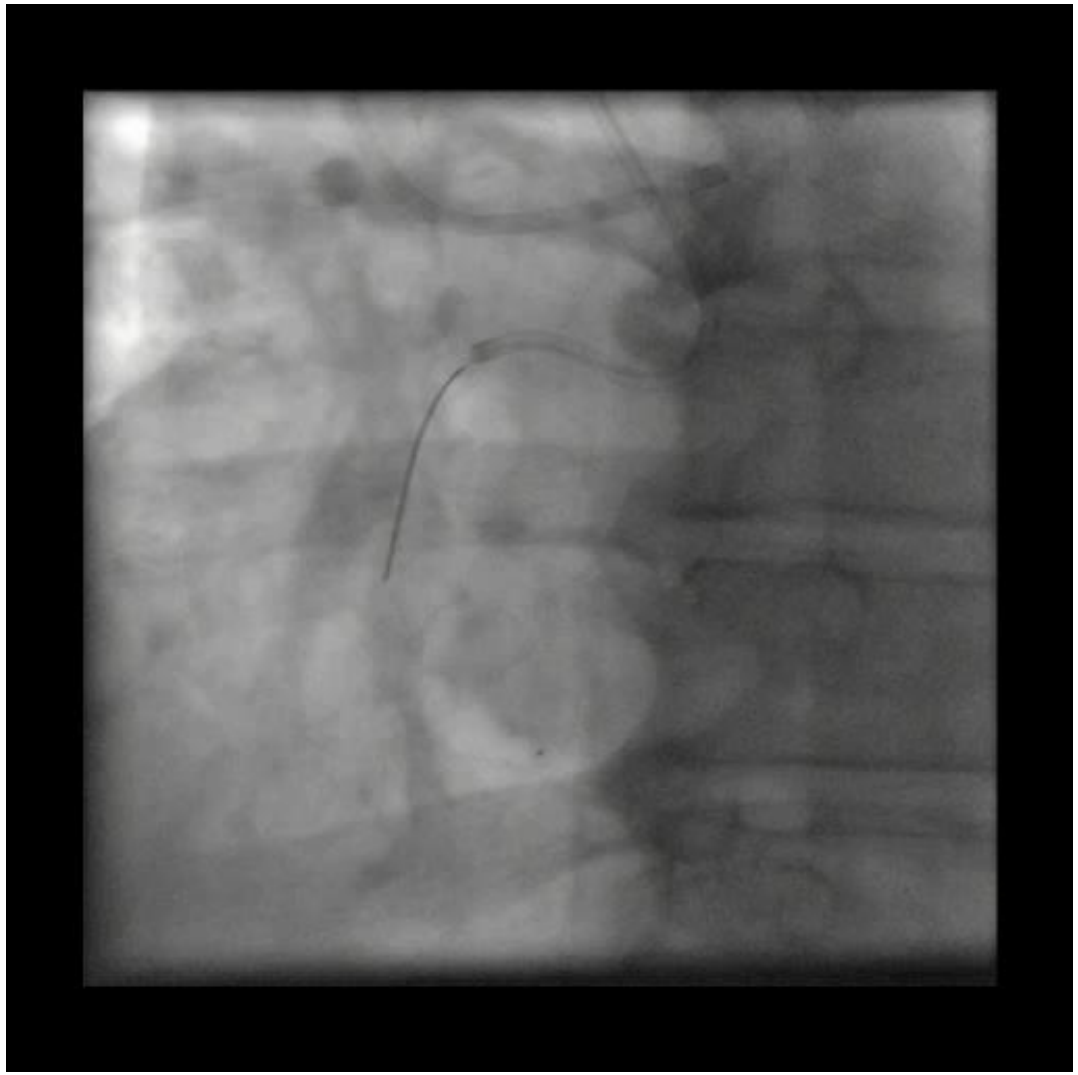
Soft → Intermediate



Fielder XT subintimal



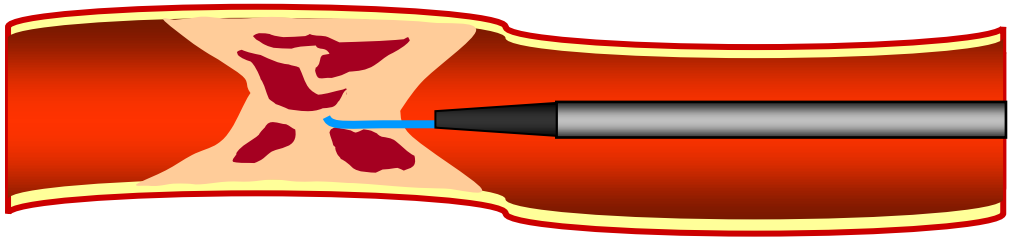
Gaia 2nd enters distal lumen



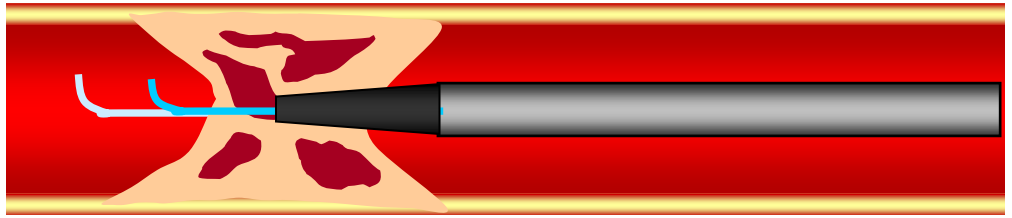
- Microcatheter follows
- Then exchange to extra-support floppy wire

Use of Microcatheters

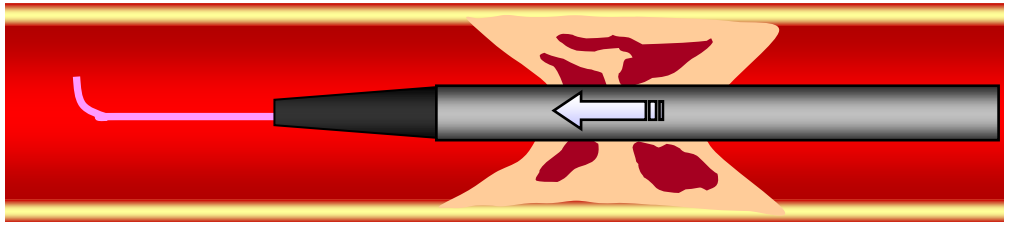
- Torque transmission
  and back-up support



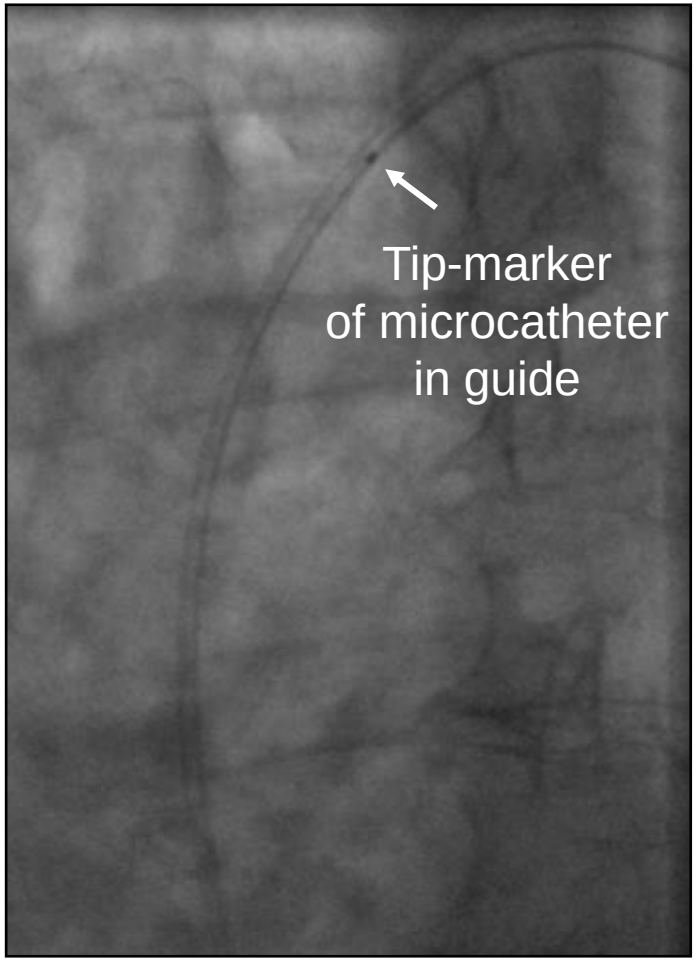
- Guidewire exchange
  or reshaping



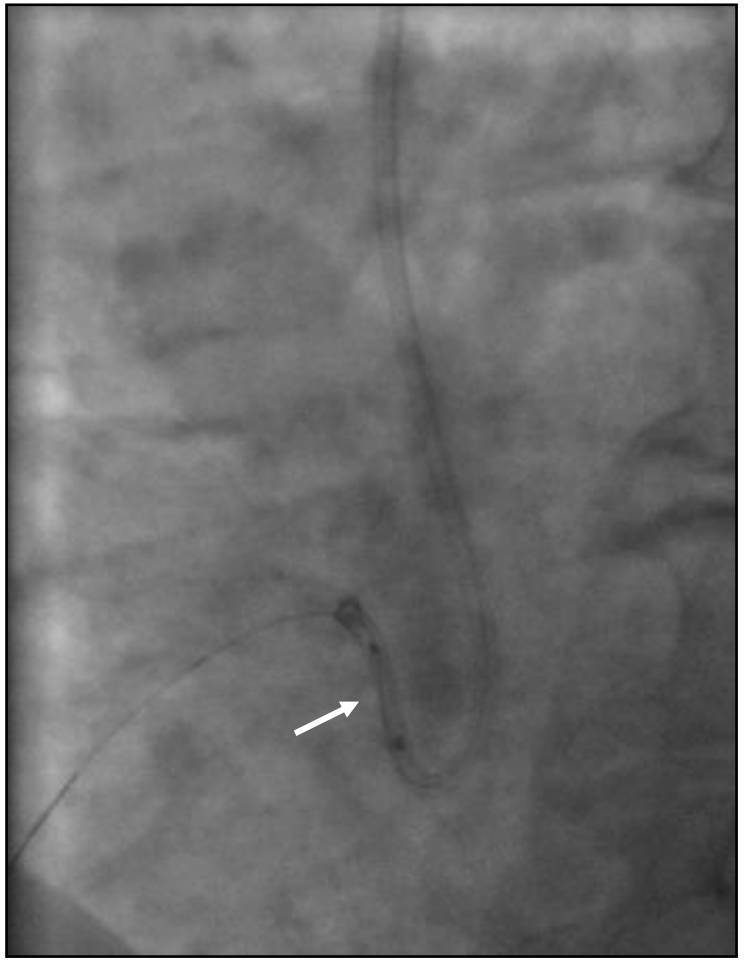
- Microcatheter passed occlusion
- Exchange to atraumatic wire



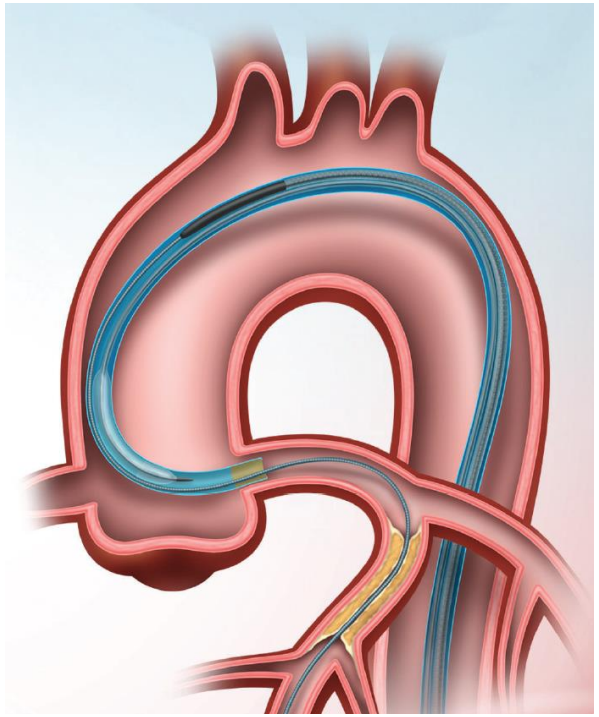
Trapping technique: Balloon secures wire position



Back-out of microcatheter
to proximal wire end

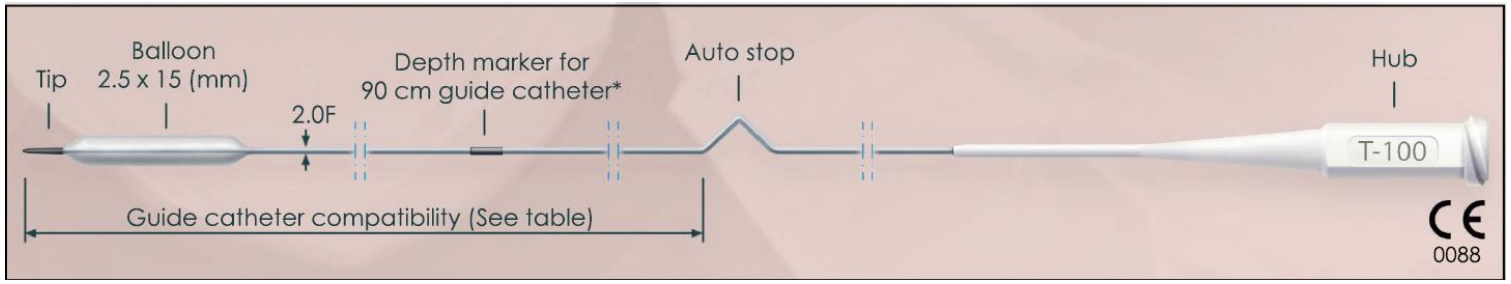


Balloon blockage of wire
in distal guide



Trap it (IMDS)

Small profile trapping balloon
for 6F – 8F guides

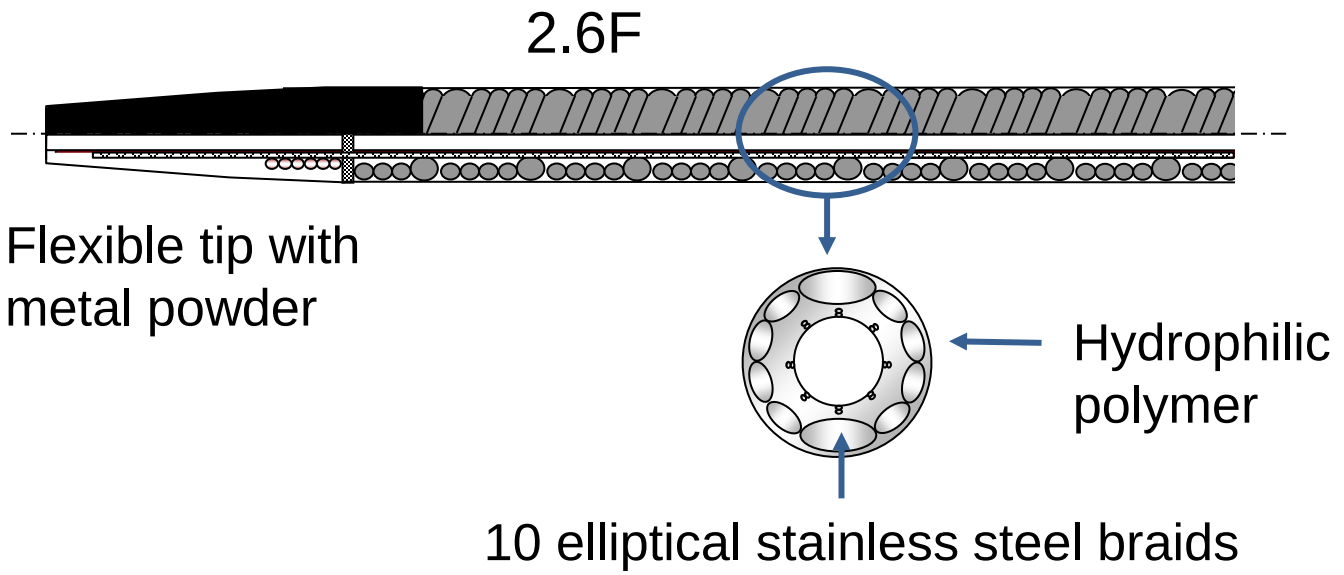


Flush-Out of Microcatheter

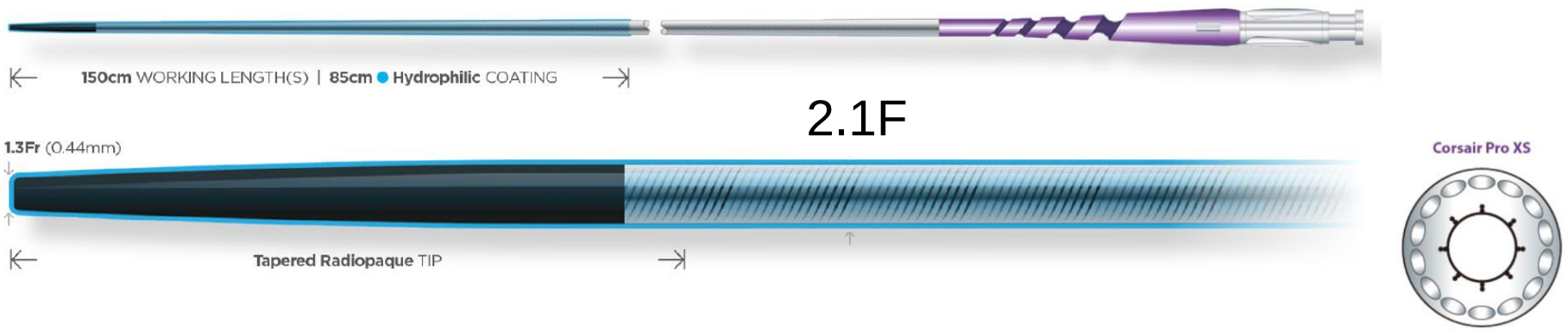
Counter-flush technique (20 atm)

Microcatheters ASAHI-INTECC

Corsair Pro



Corsair Pro XS



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***Hard** tapered tip*

- Gaia Next 3rd *6.0 g*
- Confianza Pro *12 g*
- Hornet *14 g*

Less clear target

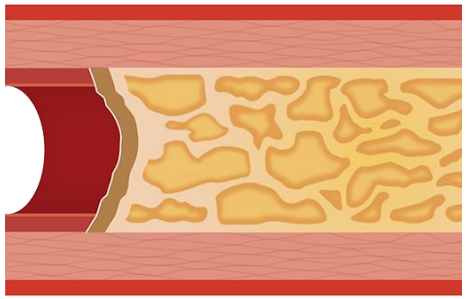
Clear target

ASAHI Gladius EX

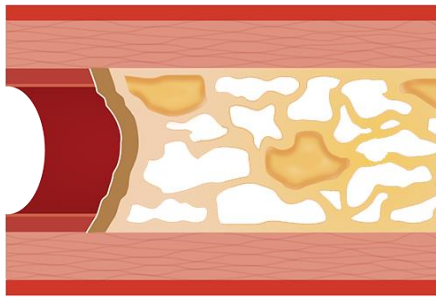
Long polymer jacket +
hydrophilic coating

3gf Tip Load

- Low penetration force
- High lubricity
- Superior torque
- Sliding technique within moderately calcified lesions



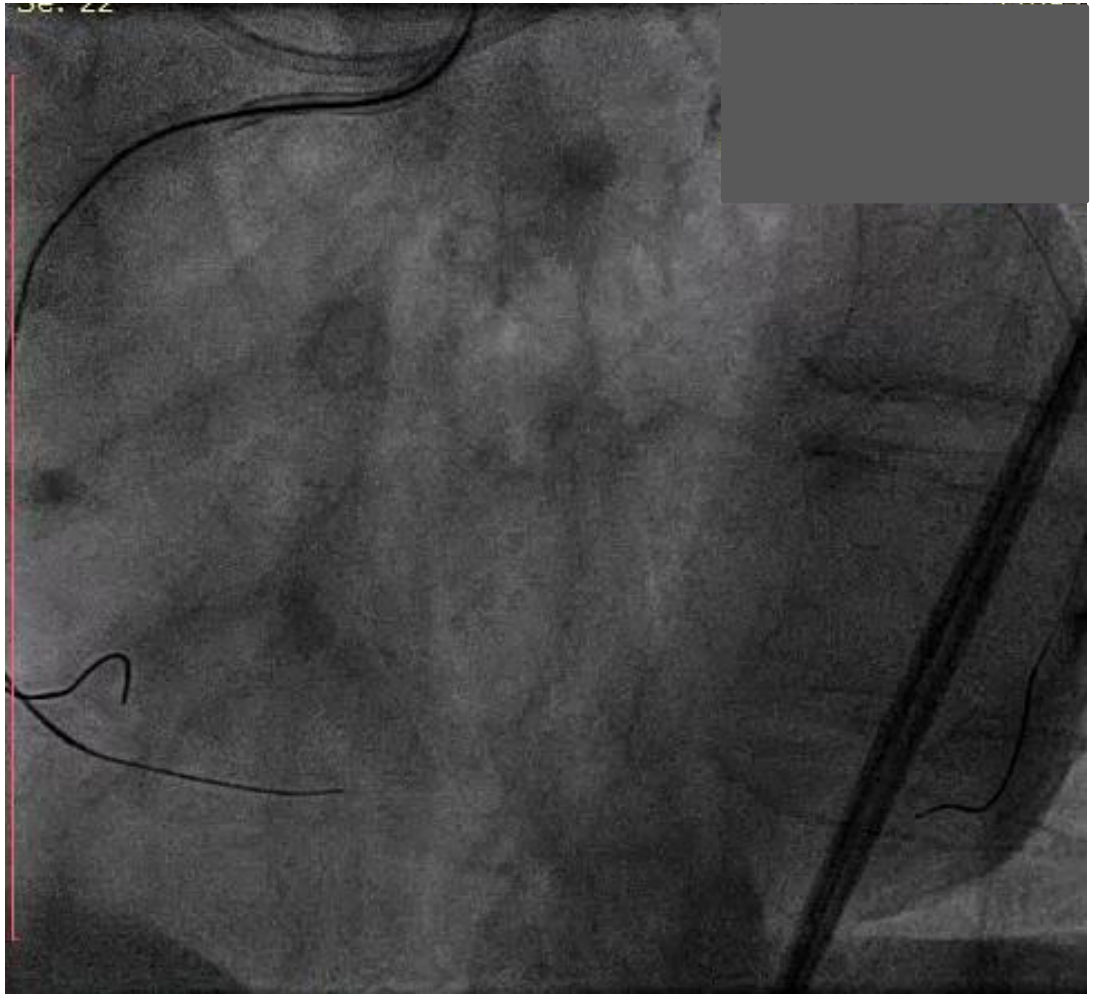
Fibrous plaque



Moderate calcification

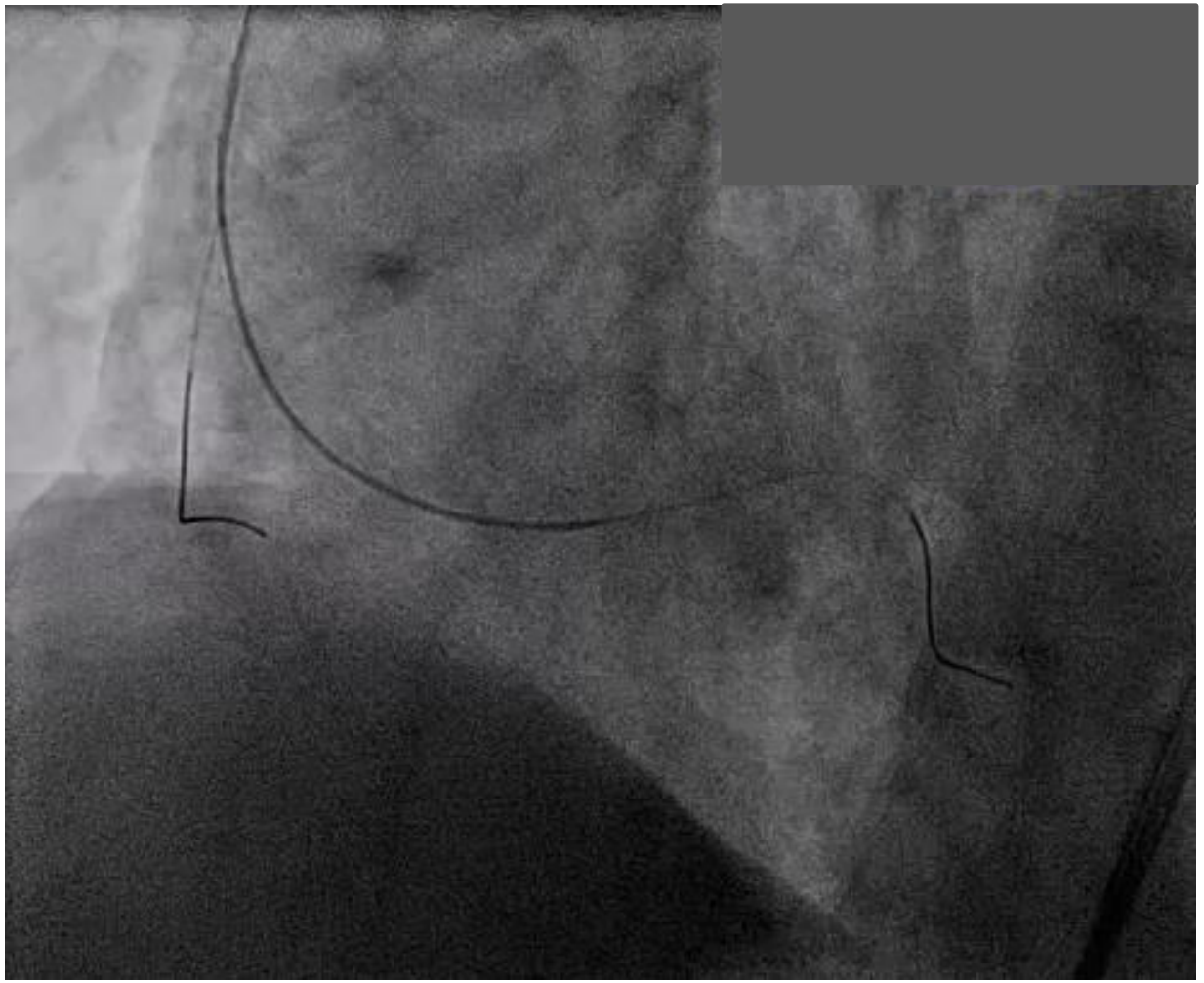
RCA CTO: Gladius as third choice

RCA CTO: Gladius as third choice

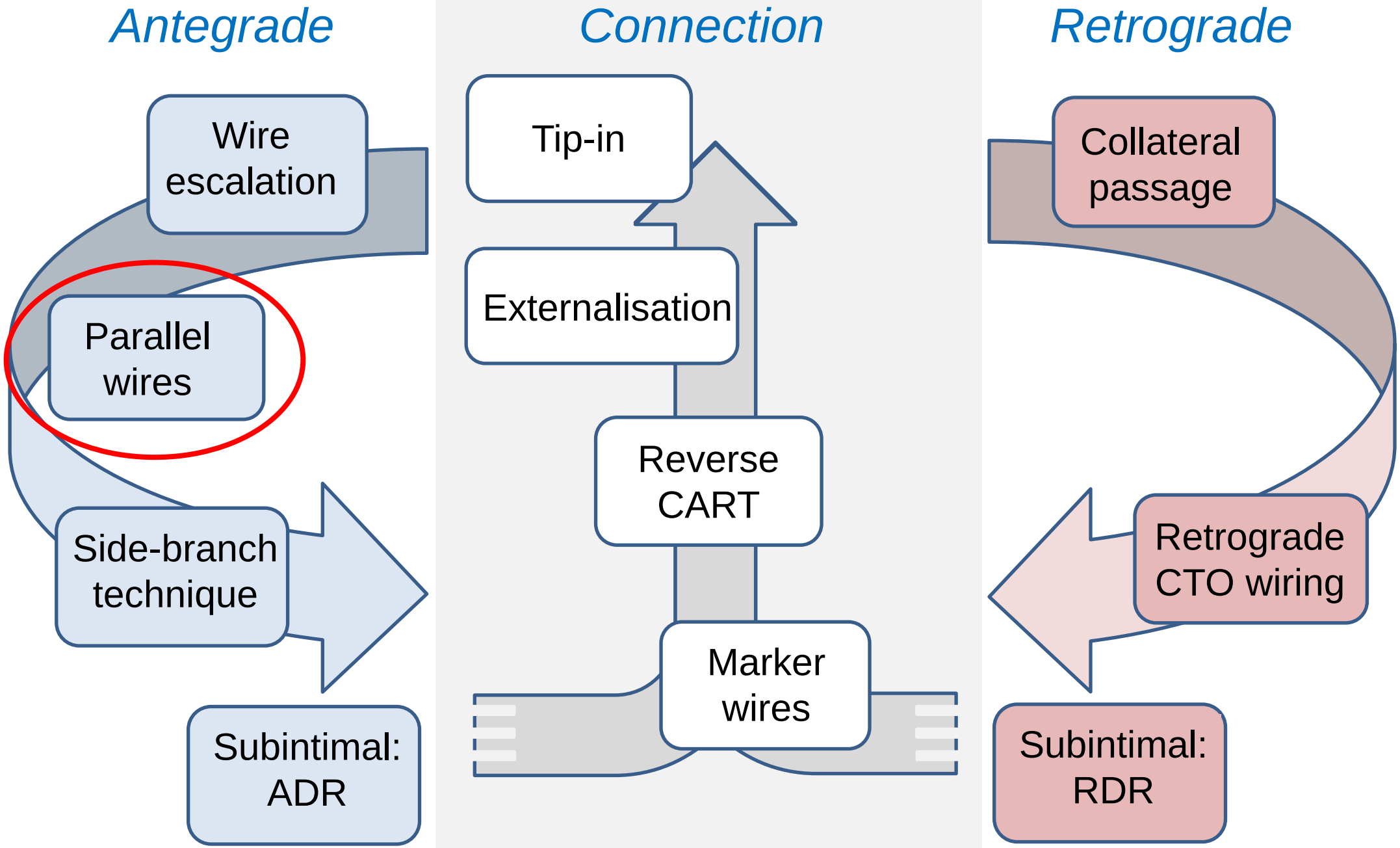


Multiple failed attempts with Gaia 3rd at crux
-> problem more proximal

RCA CTO: Gladius as third choice



Gladius from proximal occlusion point into true distal lumen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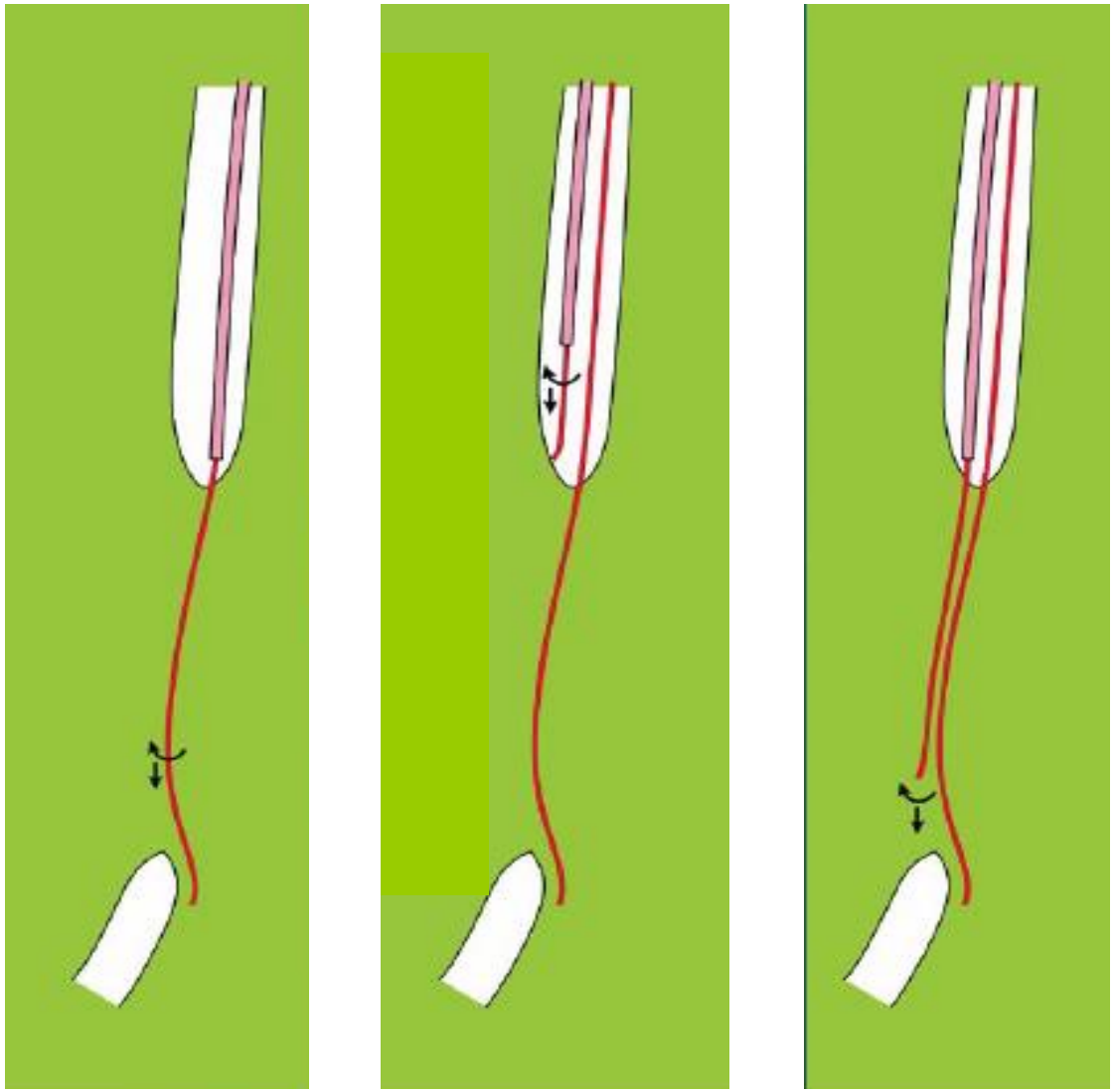
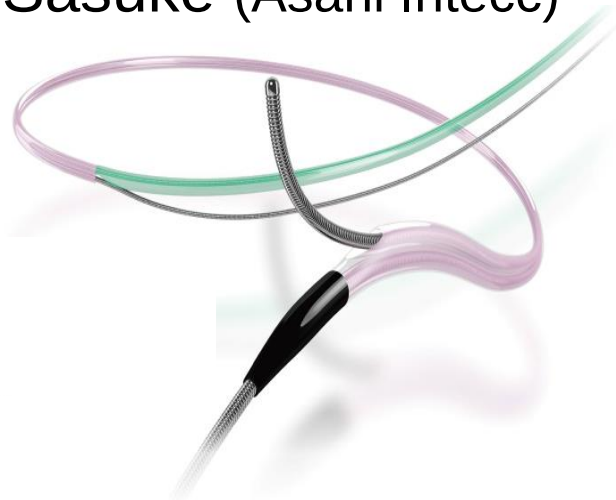
Parallel wire technique



Sasuke (Asahi Intecc)

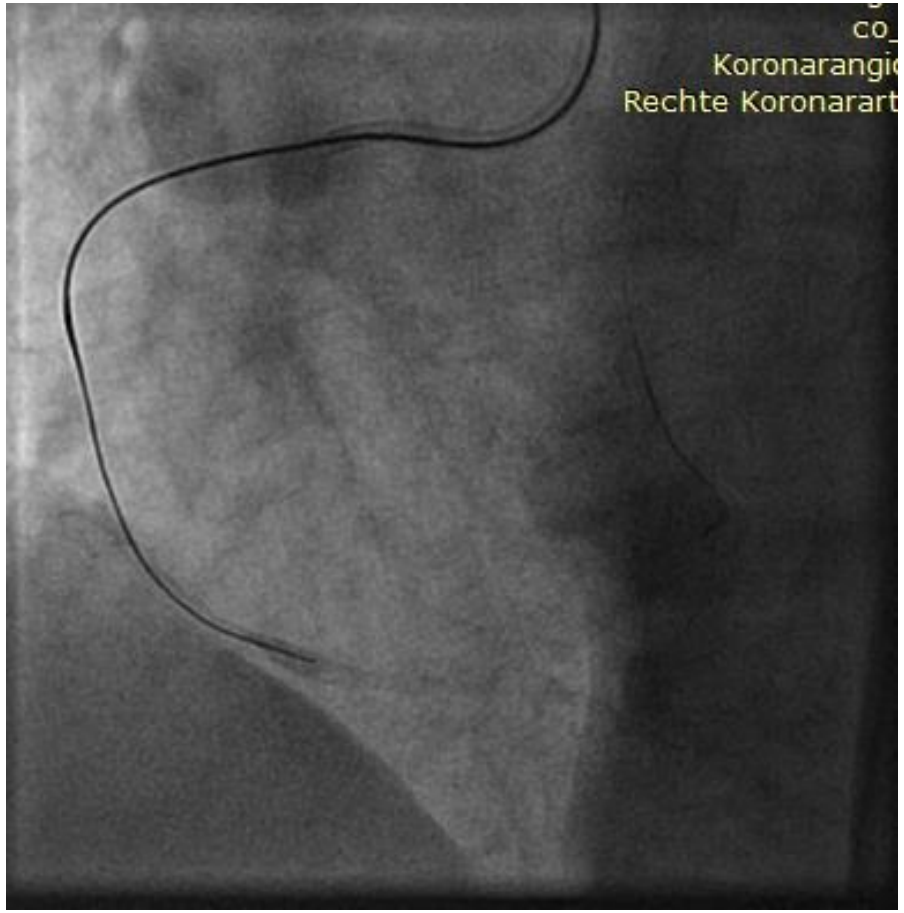


With dual lumen microcatheter

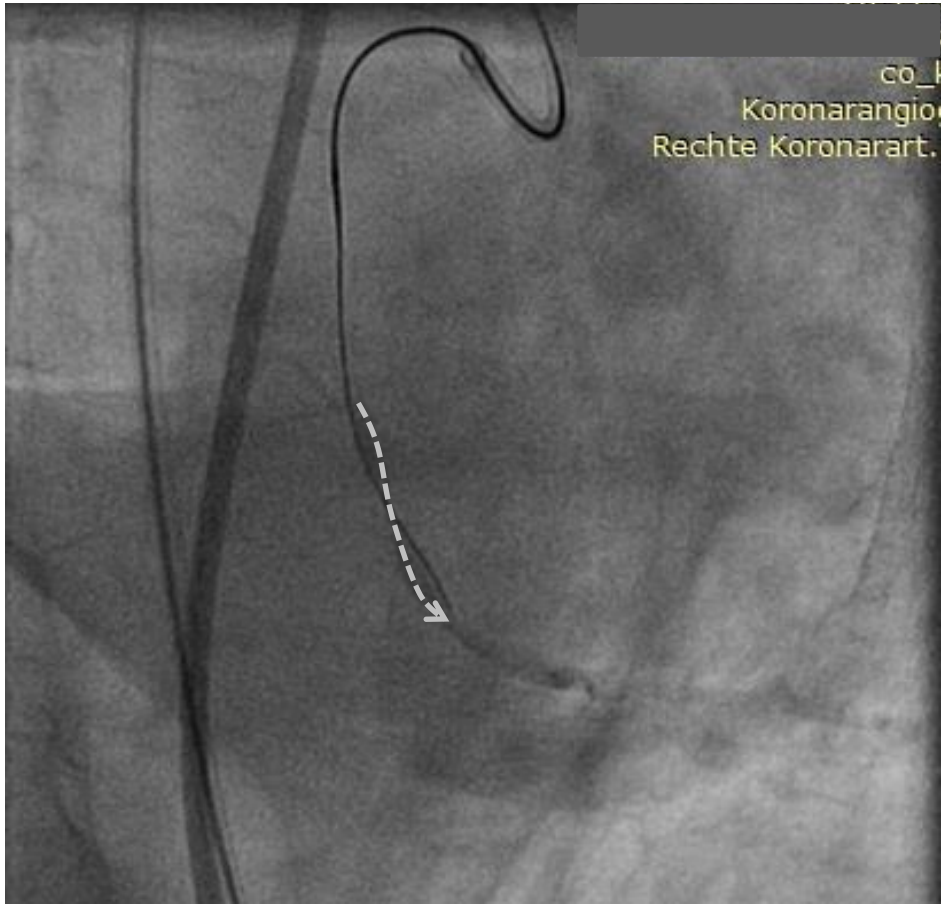
From Oreglia JA et al. Cardiovascular Revascularization Medicine 2017

Parallel wire technique in RCA: Contra-lateral injection

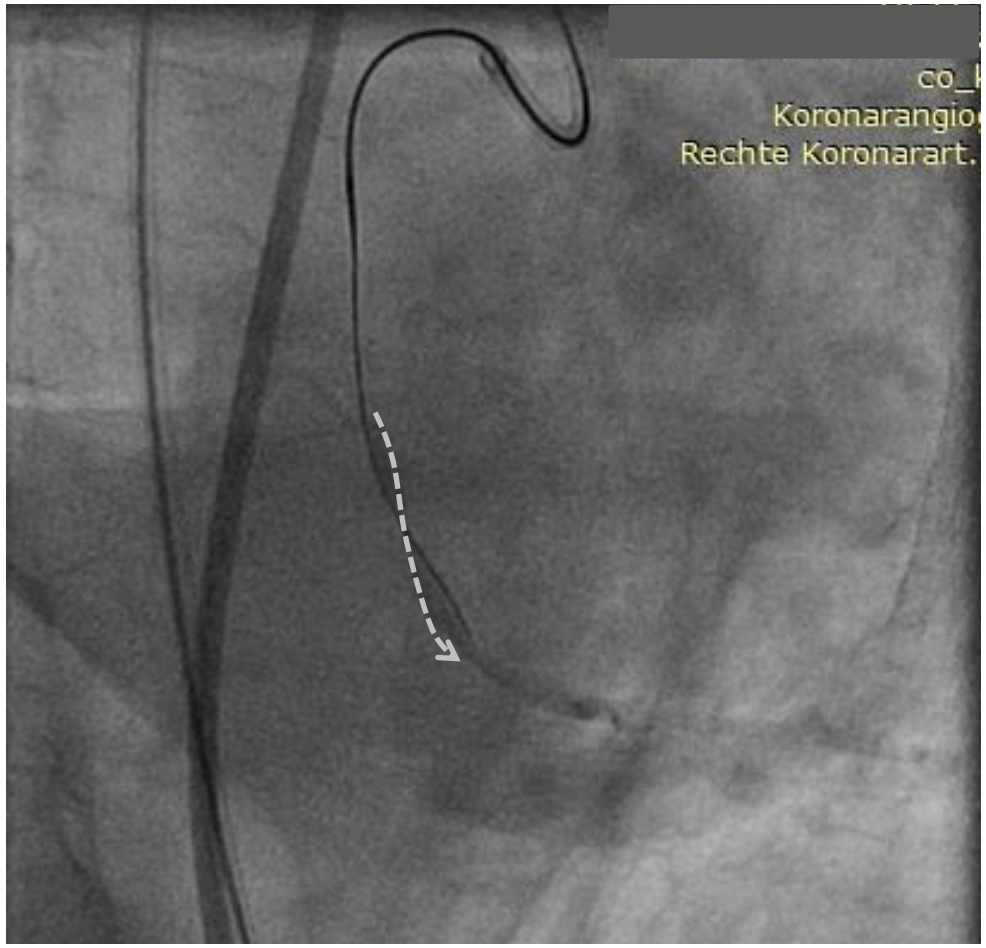
1st wire subintimal= roadmap for 2nd wire

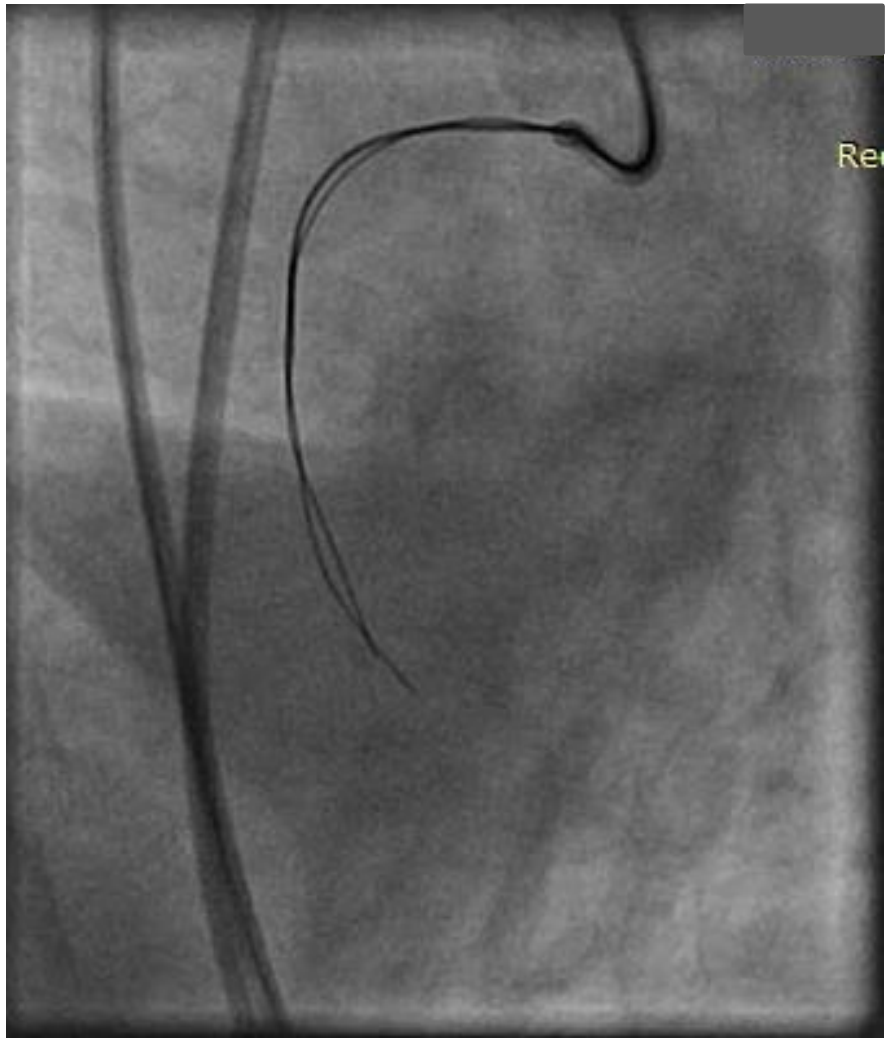


LAO

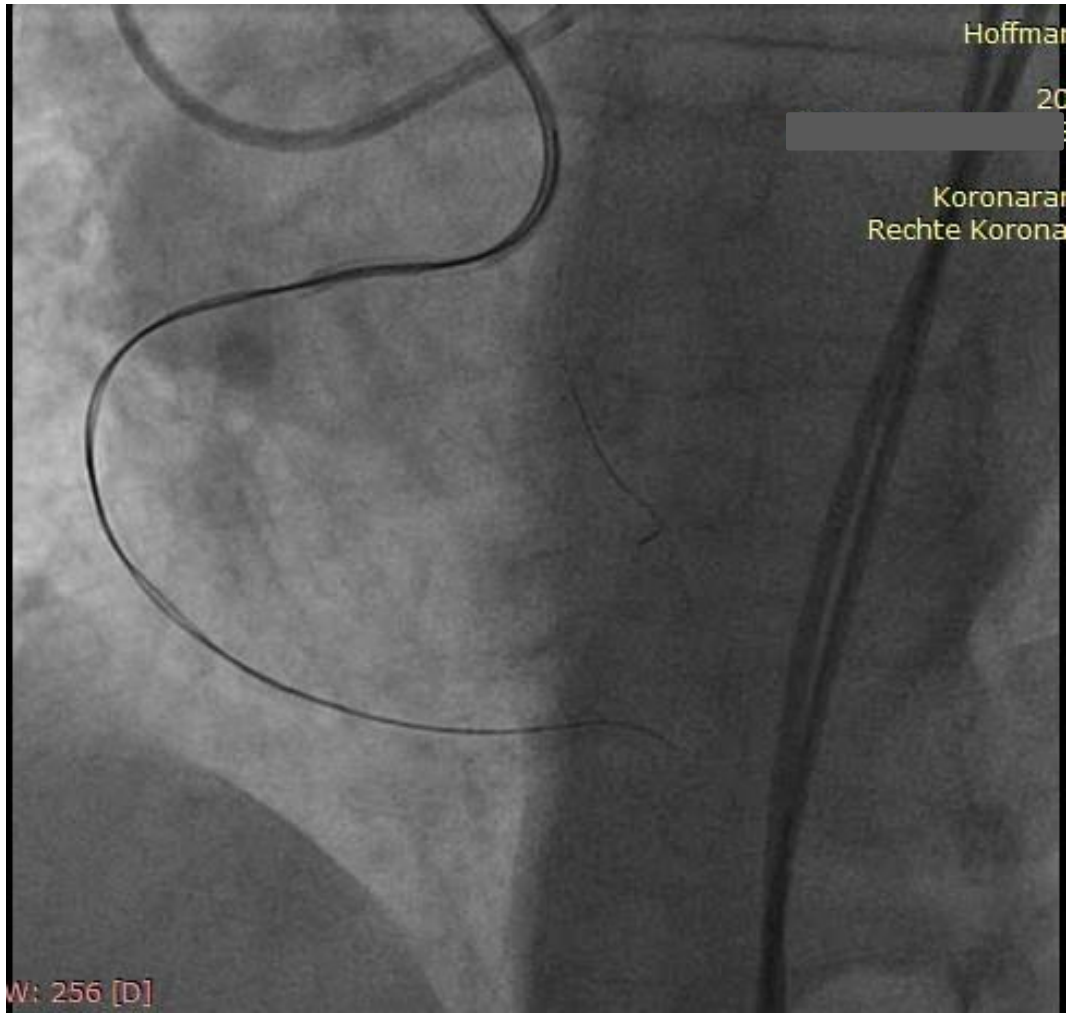


RAO

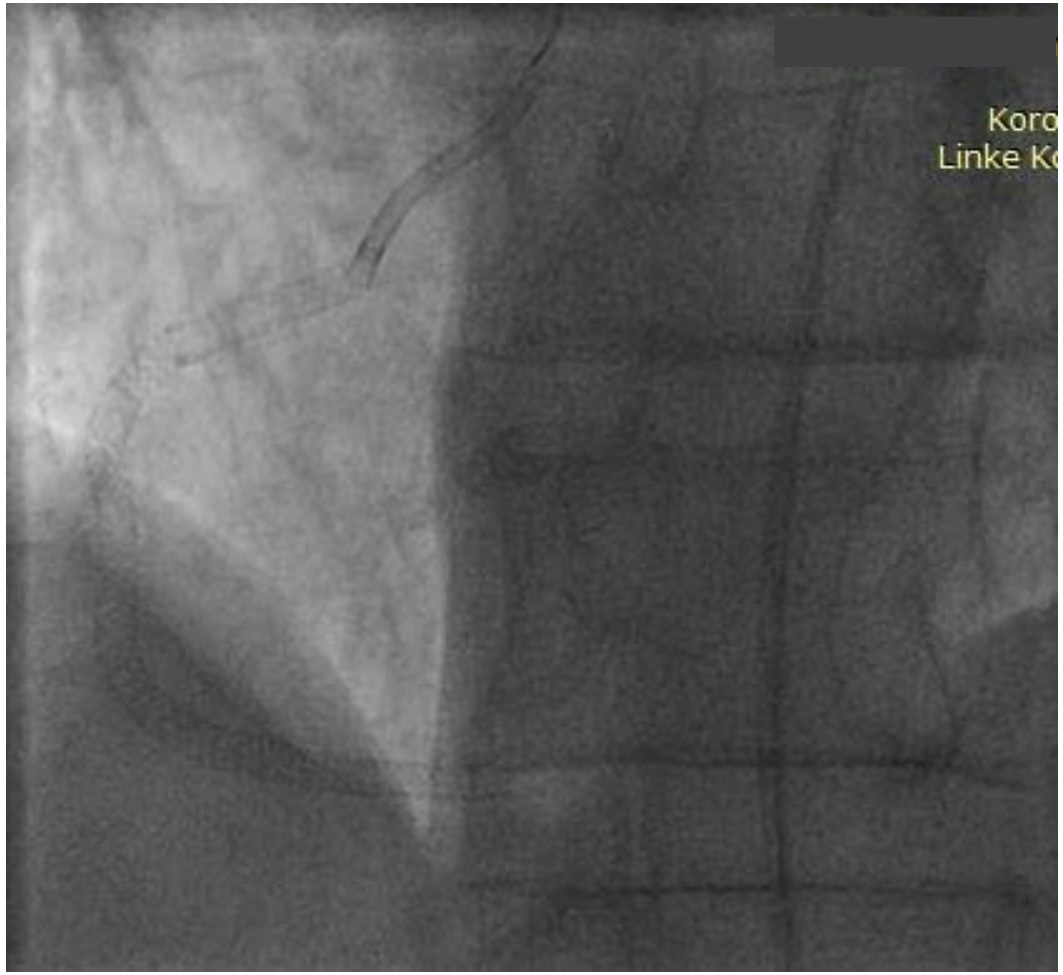




ROA: 2nd wire = Gaia 3rd



Wire in true lumen



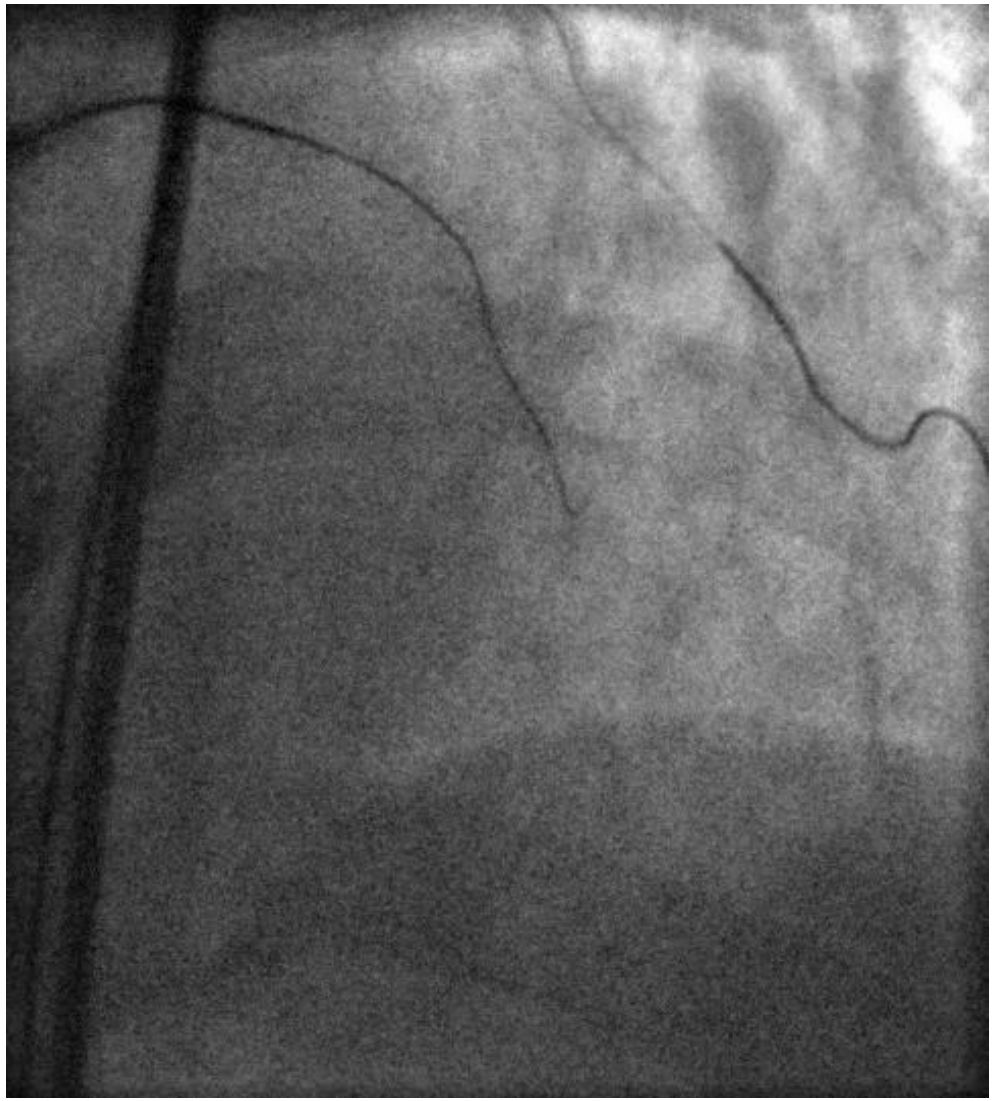
Final result

Parallel wire technique with dual lumen microcatheter

CTO of LAD

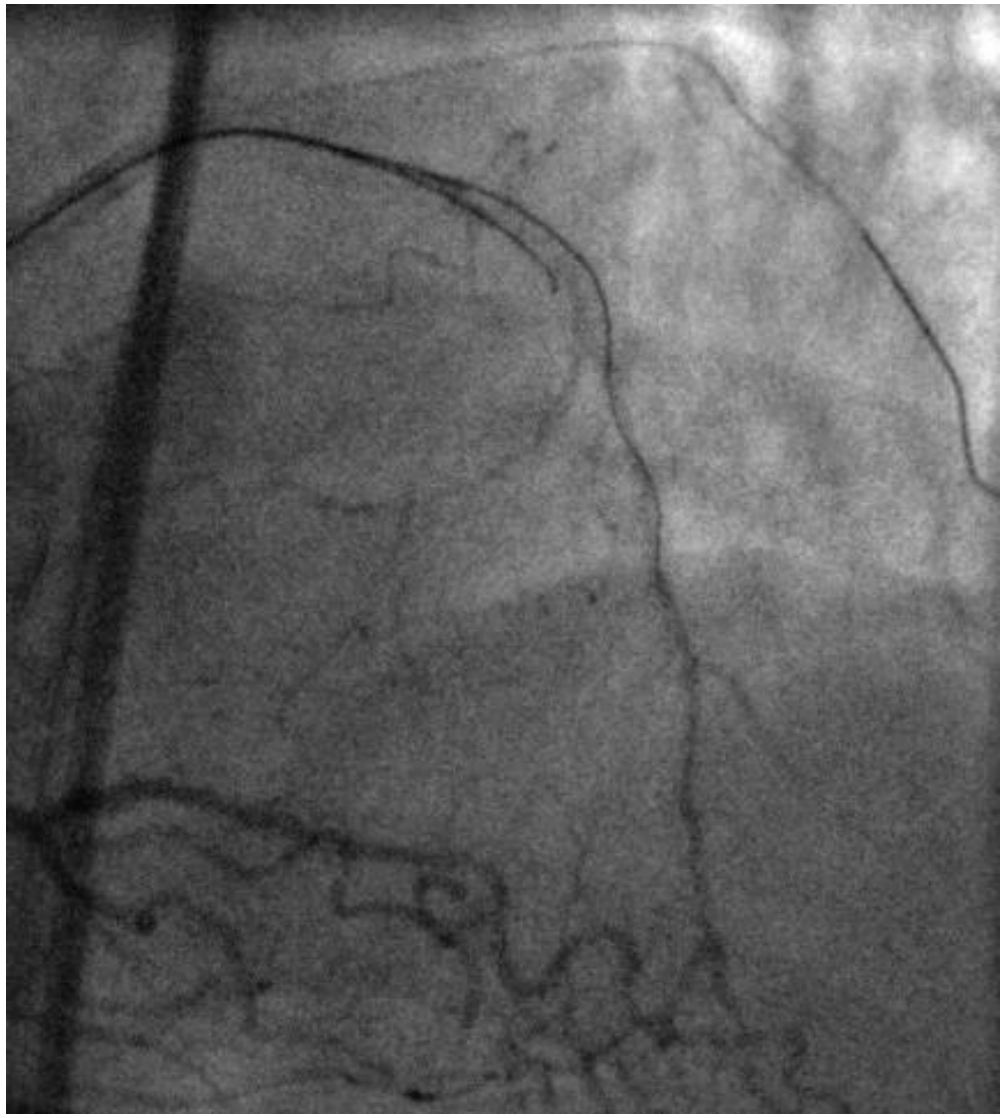
Gaia 2nd and Corsair from antegrade

Subintimal wire position

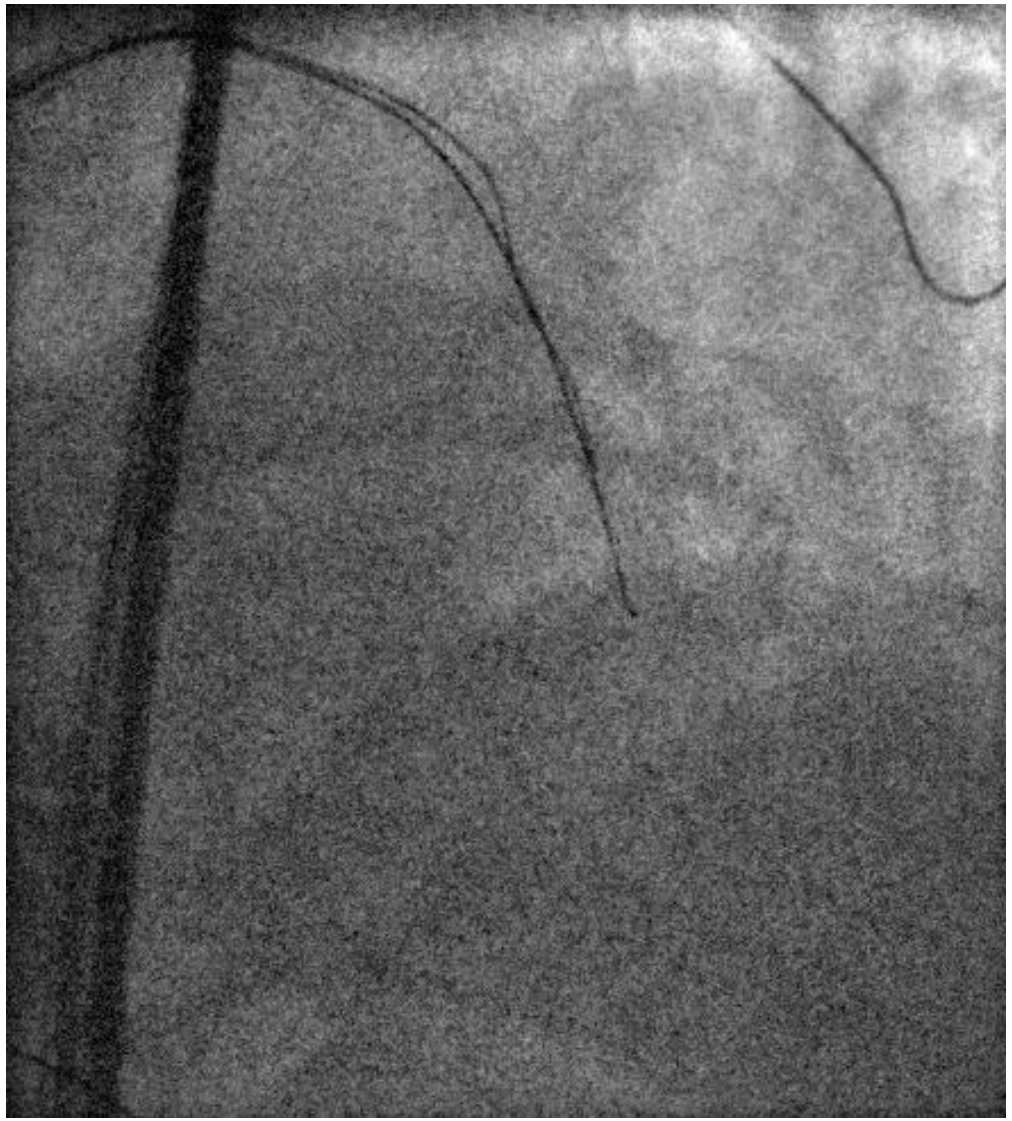


Courtesy of Kambis Mashayekhi

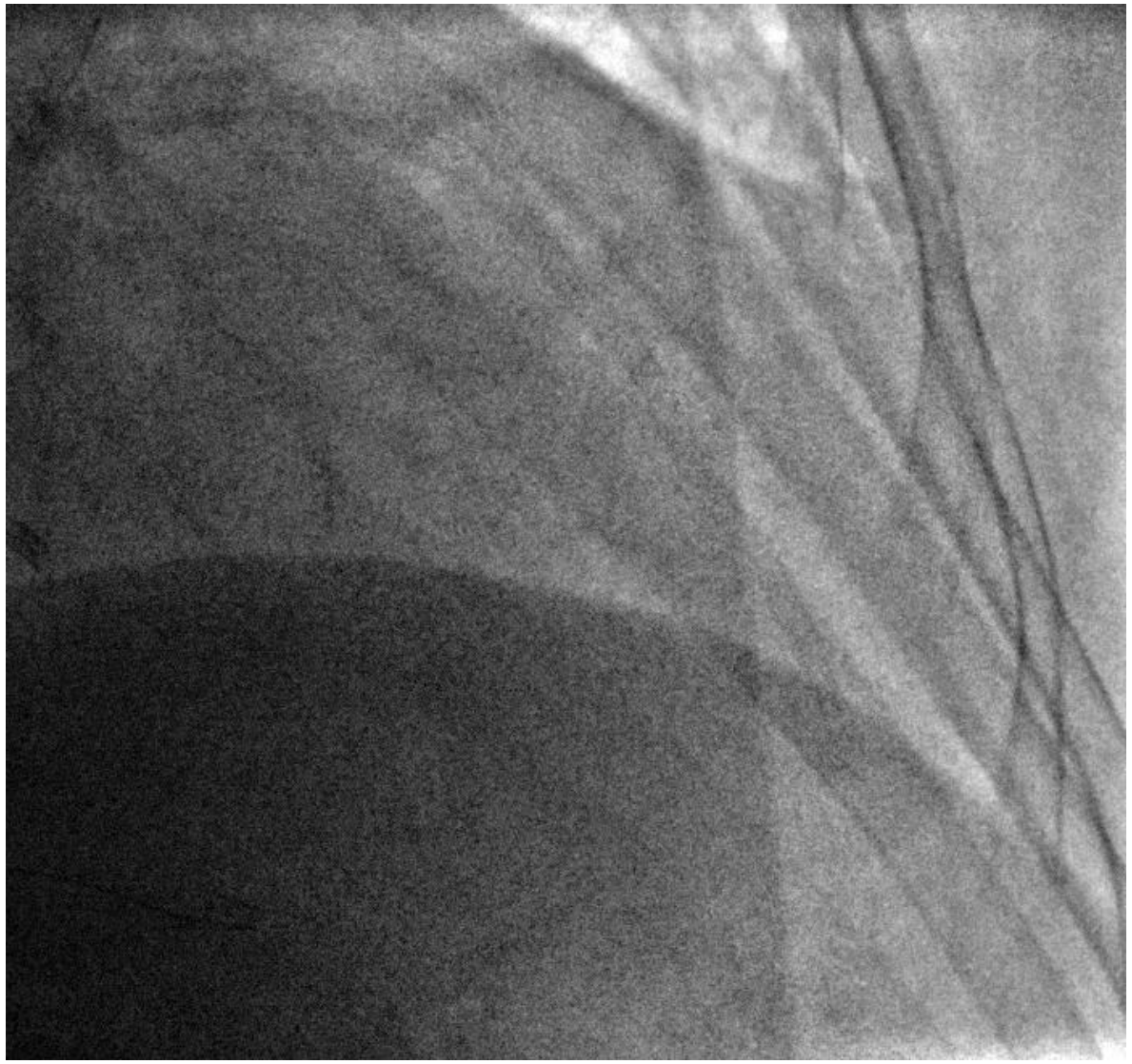
Parallel wire = Gaia 3rd over side-port of dual lumen microcatheter

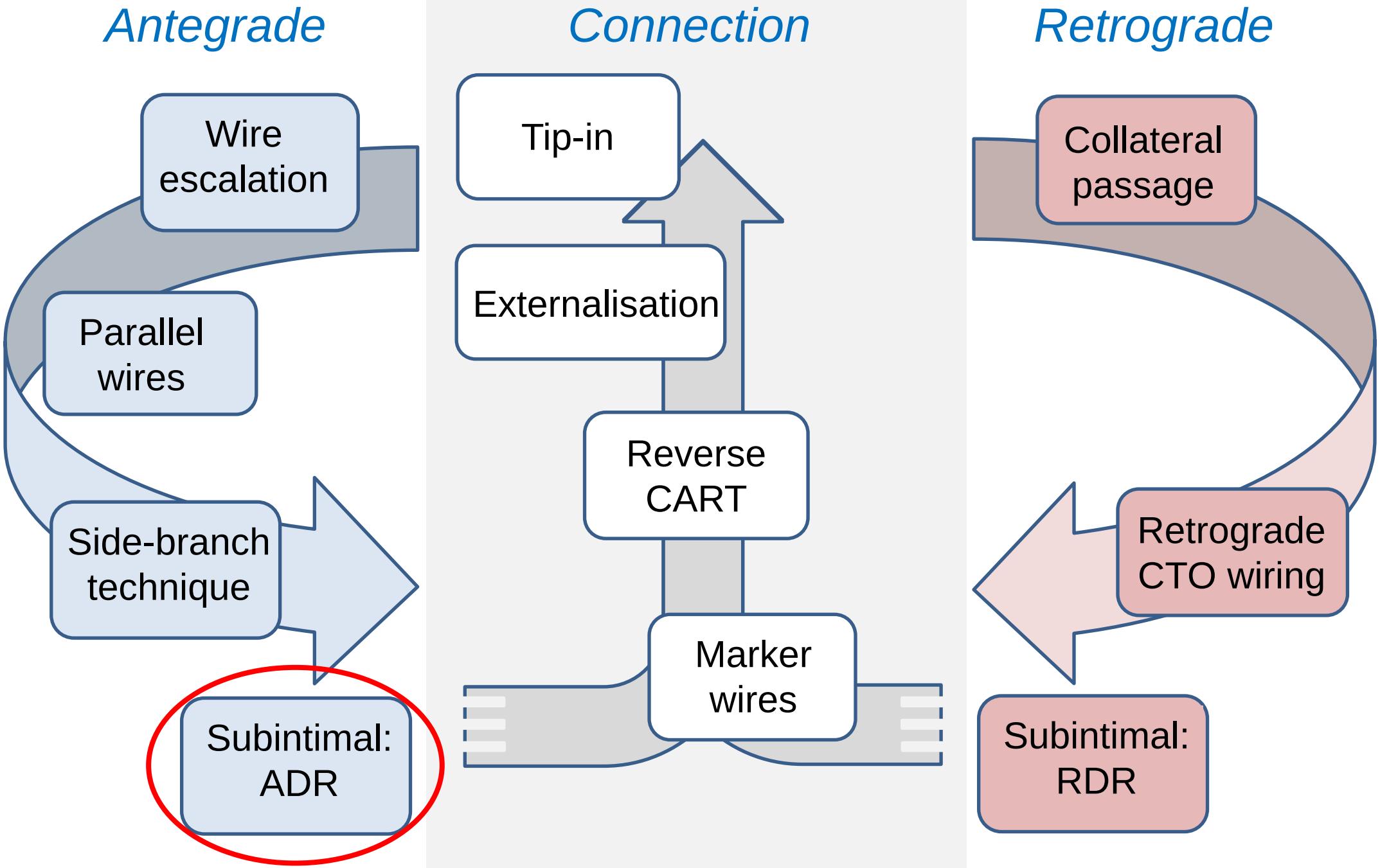


Gaia 3rd – true lumen



Final result

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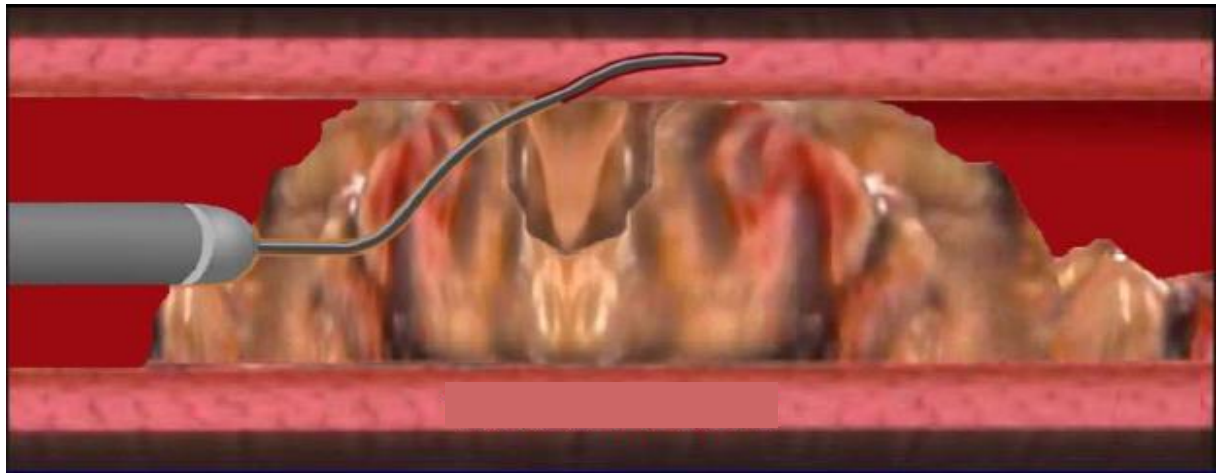
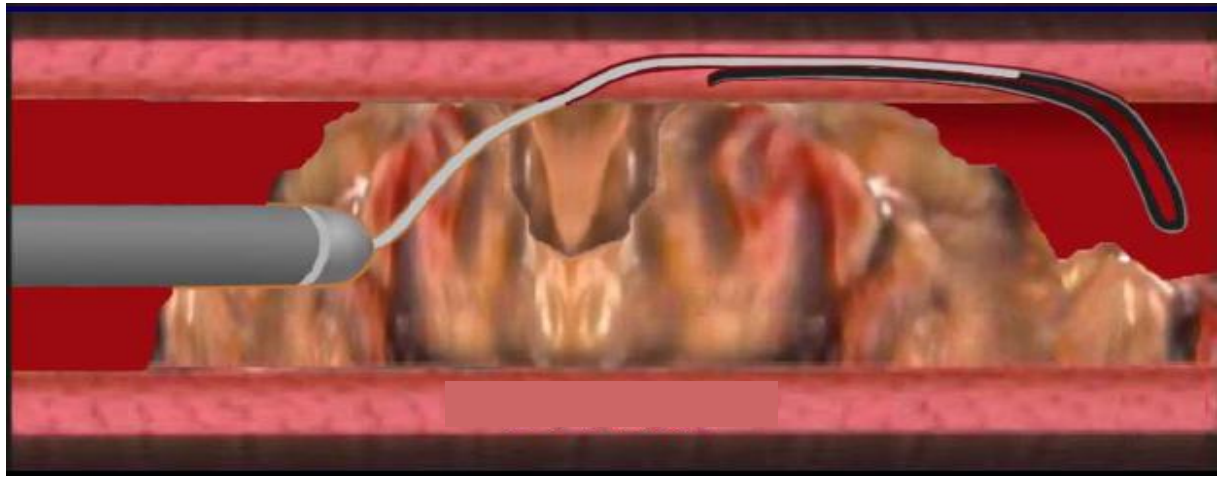
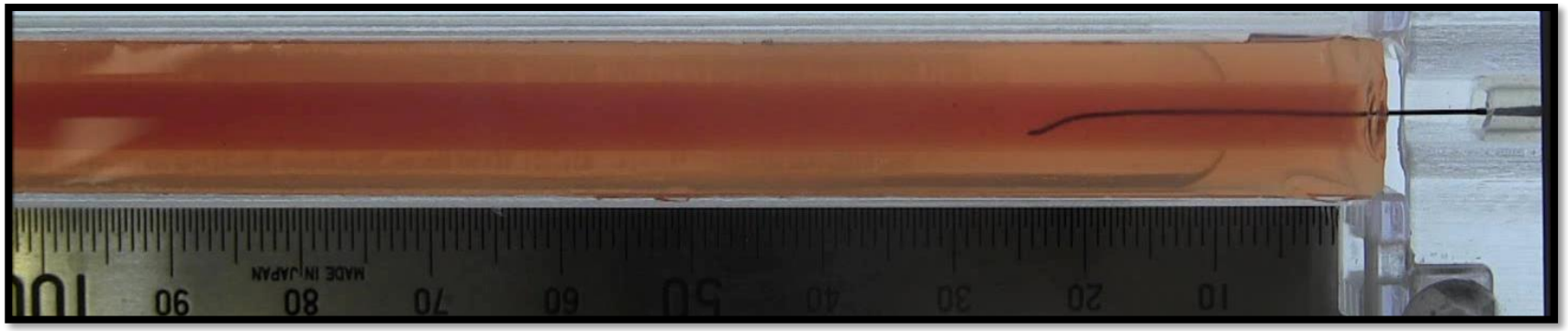
Knuckle Technique

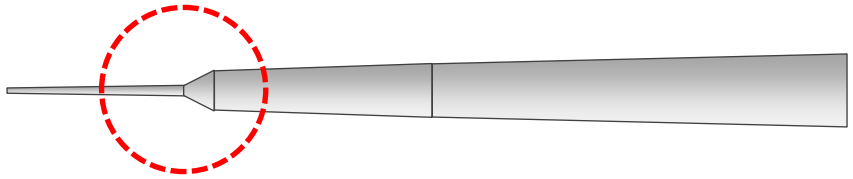




Galassi A, TCT 2010

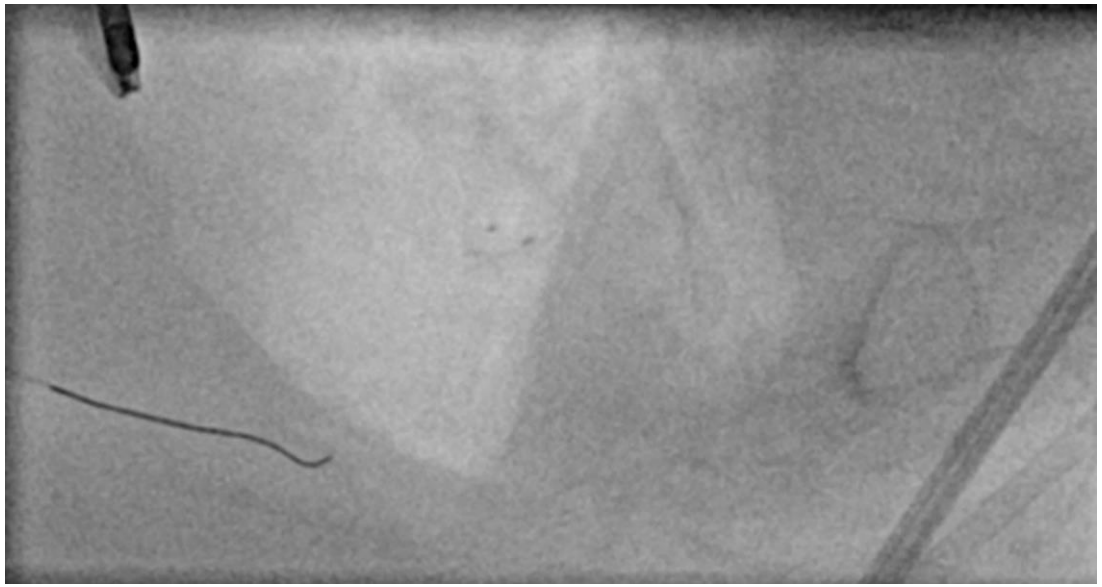
ASAHI Gladius MG: Narrow loop for knuckle technique



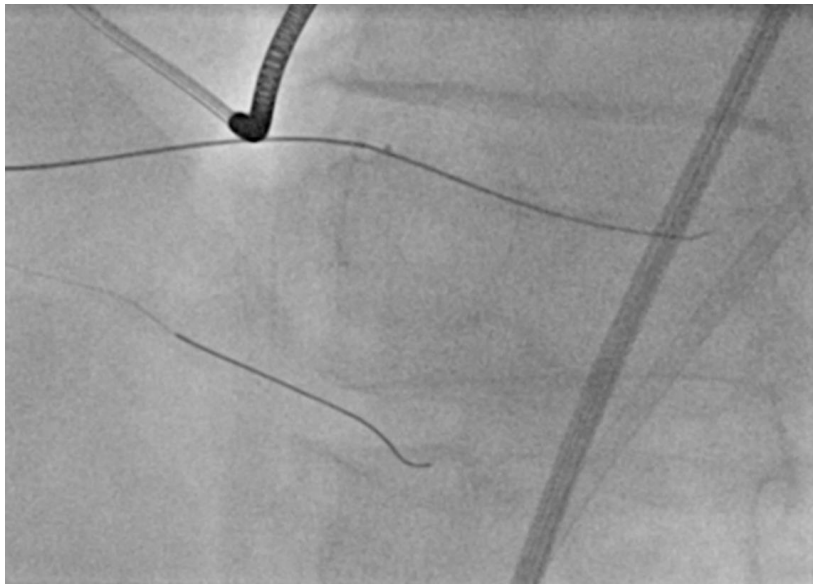


Modified distal core

Antegrade Dissection Reentry (ADR): Stingray for reentry

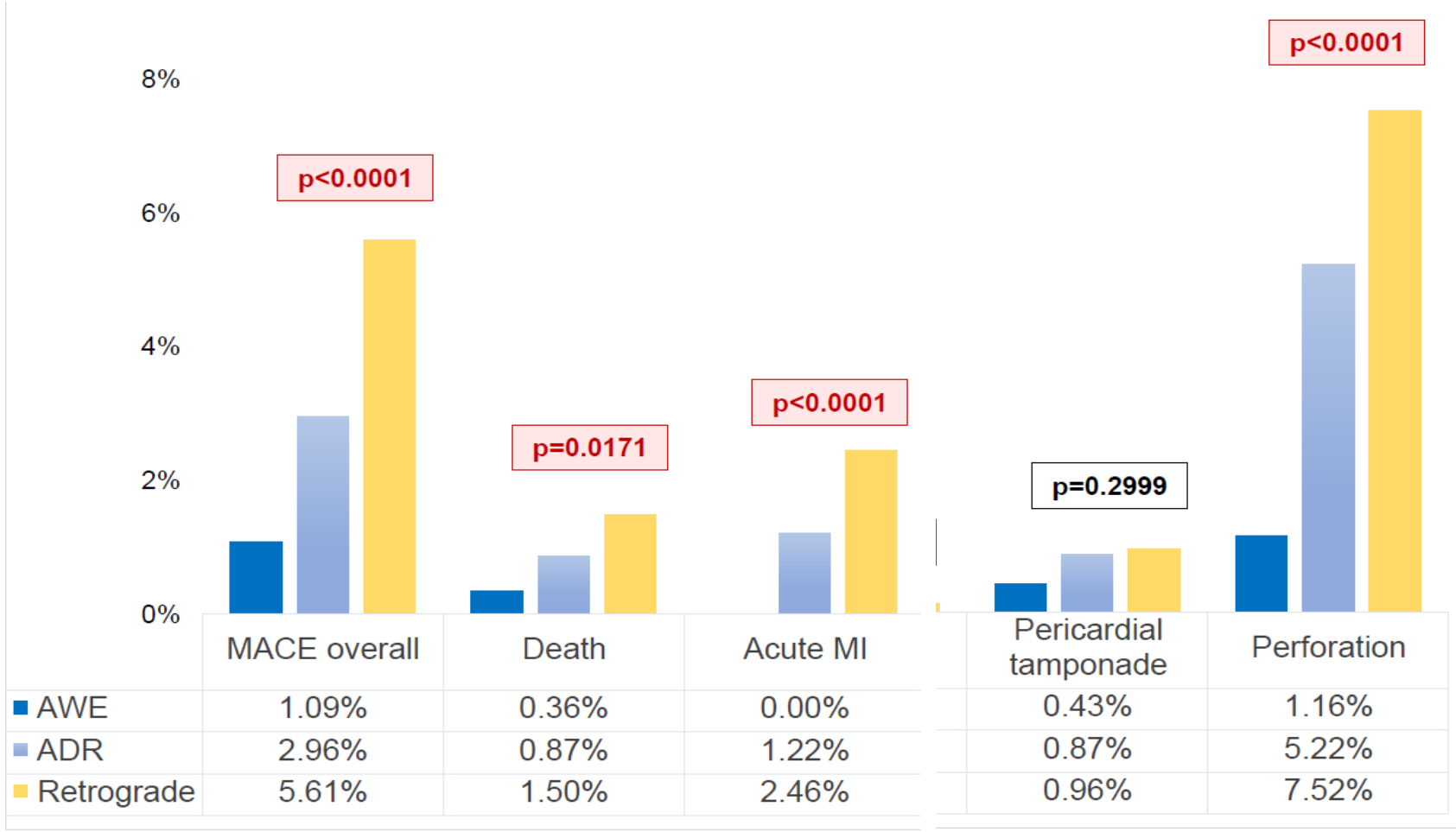


After knuckle with Fielder XT
a Stingray was placed (two markers)



Puncture through Stingray
with ConfianzaPro 12g
into distal lumen

PROGRESS CTO Registry: Procedural Complications



	MACE overall	Death	Acute MI	Pericardial tamponade	Perforation
AWE	1.09%	0.36%	0.00%	0.43%	1.16%
ADR	2.96%	0.87%	1.22%	0.87%	5.22%
Retrograde	5.61%	1.50%	2.46%	0.96%	7.52%

AWE = Antegrade Wire Escalation

ADR = Antegrade Dissection Reentry

Retrograde

Presentation Tajti P, SCAI 2018

Side-branches and small vessels supply the myocardium

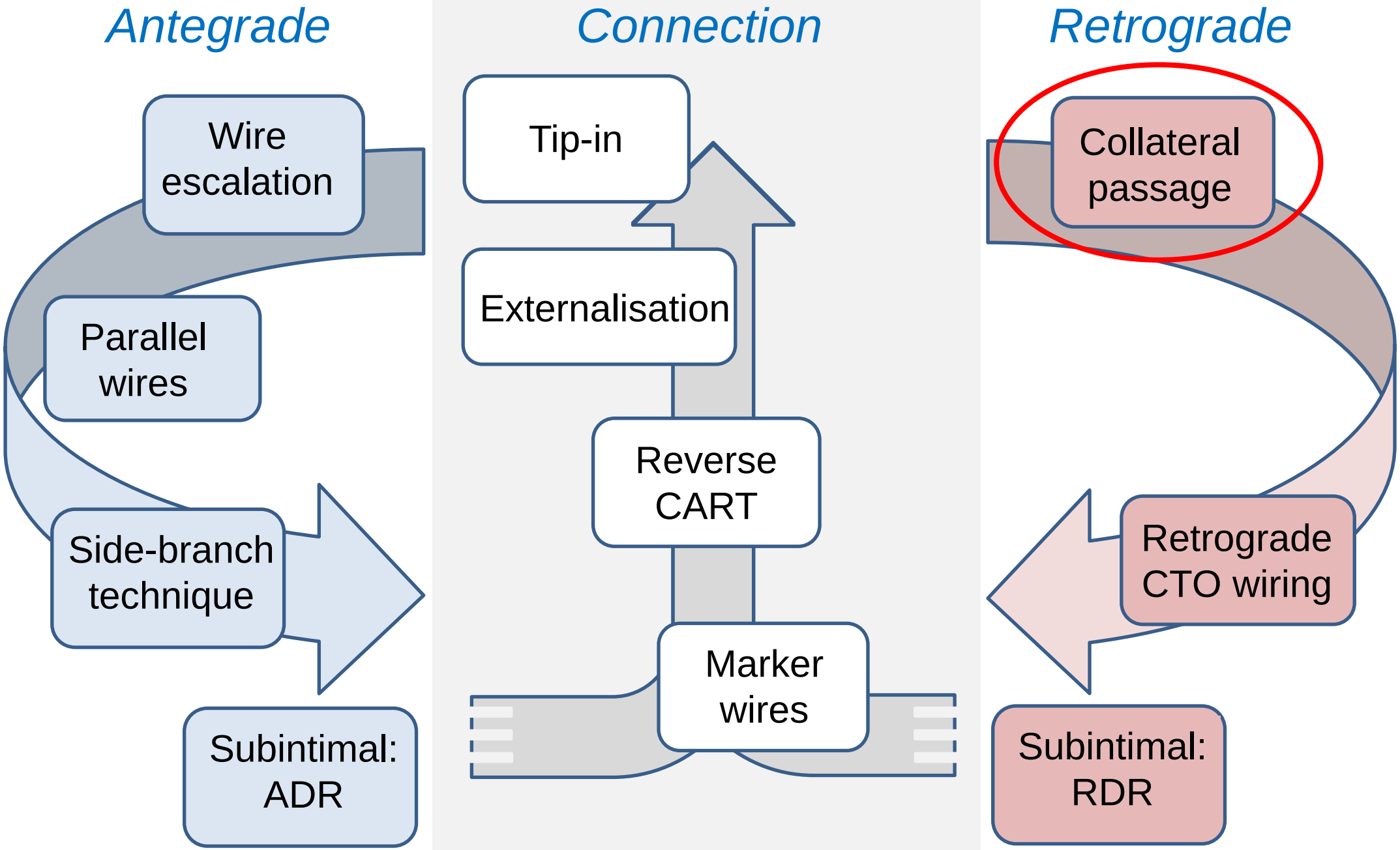
Main vessels are only conduits

Anatomic collection Zürich, Switzerland

Antegrade approach: Tips

- Always* start from antegrade and always with a Fielder XT/-A
- Have a structured approach to antegrade wire escalation:
  - Fielder XT/-A → Gaia Next 1/2/3 ⟷ Gladius
- Use Parallel Wire Technique: elegant and effective
- Try to work intra-plaque and use retrograde options before proceeding to antegrade dissection-reentry (ADR)

*few exceptions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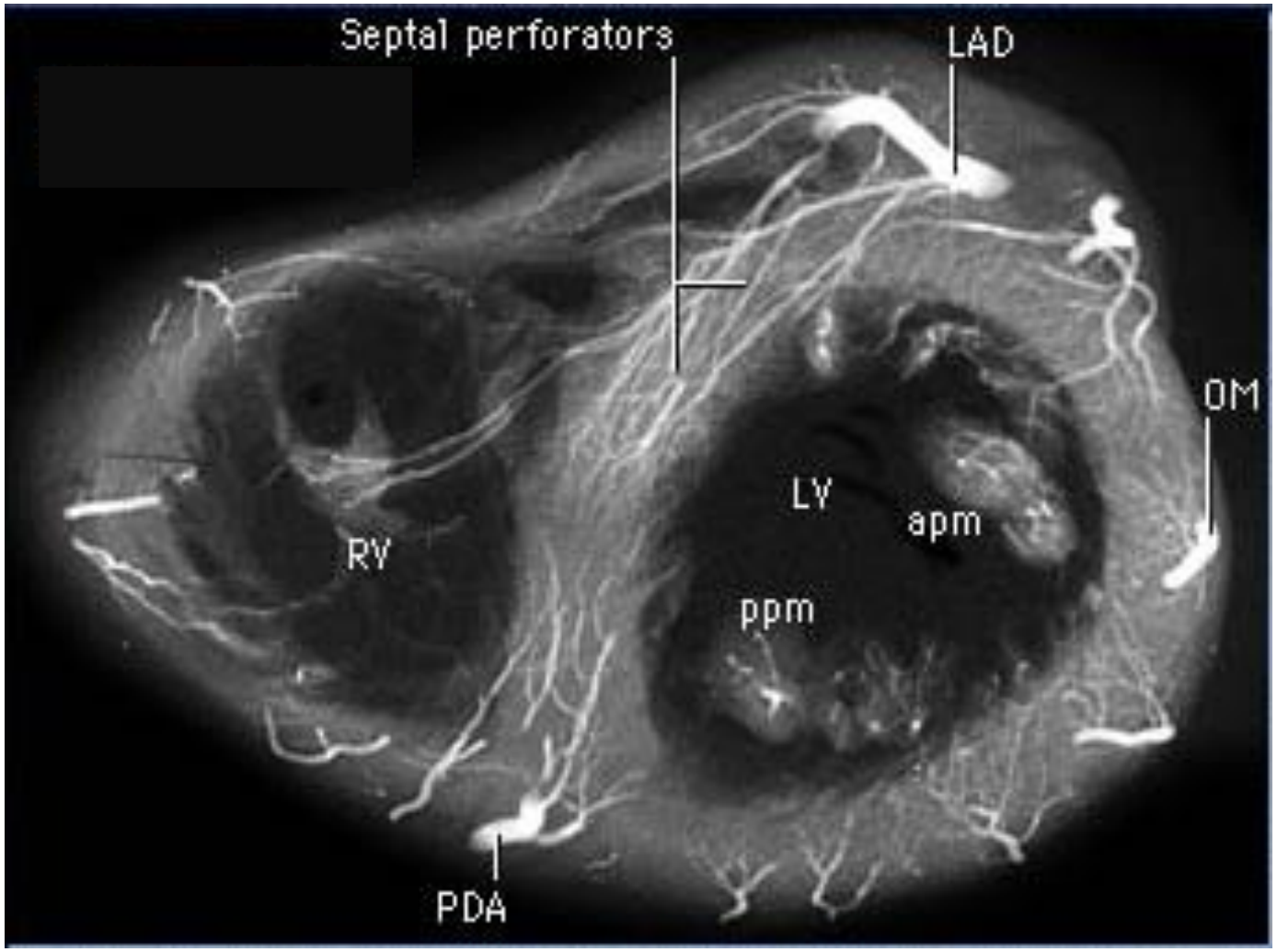
Retrograde CTO wiring
Subintimal: RDR

Course of collaterals : septal, epicardial, posterolateral



Wires for collateral passage

Navigate microcatheter
into collateral donor artery

Floppy wire

Usual curve
3-5mm

Micro
-catheter

Septal collaterals

- **Sion Black** ***0.8 g***
- SUOH 03 *0.3 g*

Epicardial collaterals

- **SUOH 03** ***0.3 g***
- Sion Black *0.8 g*

Sion Black

Very small bend

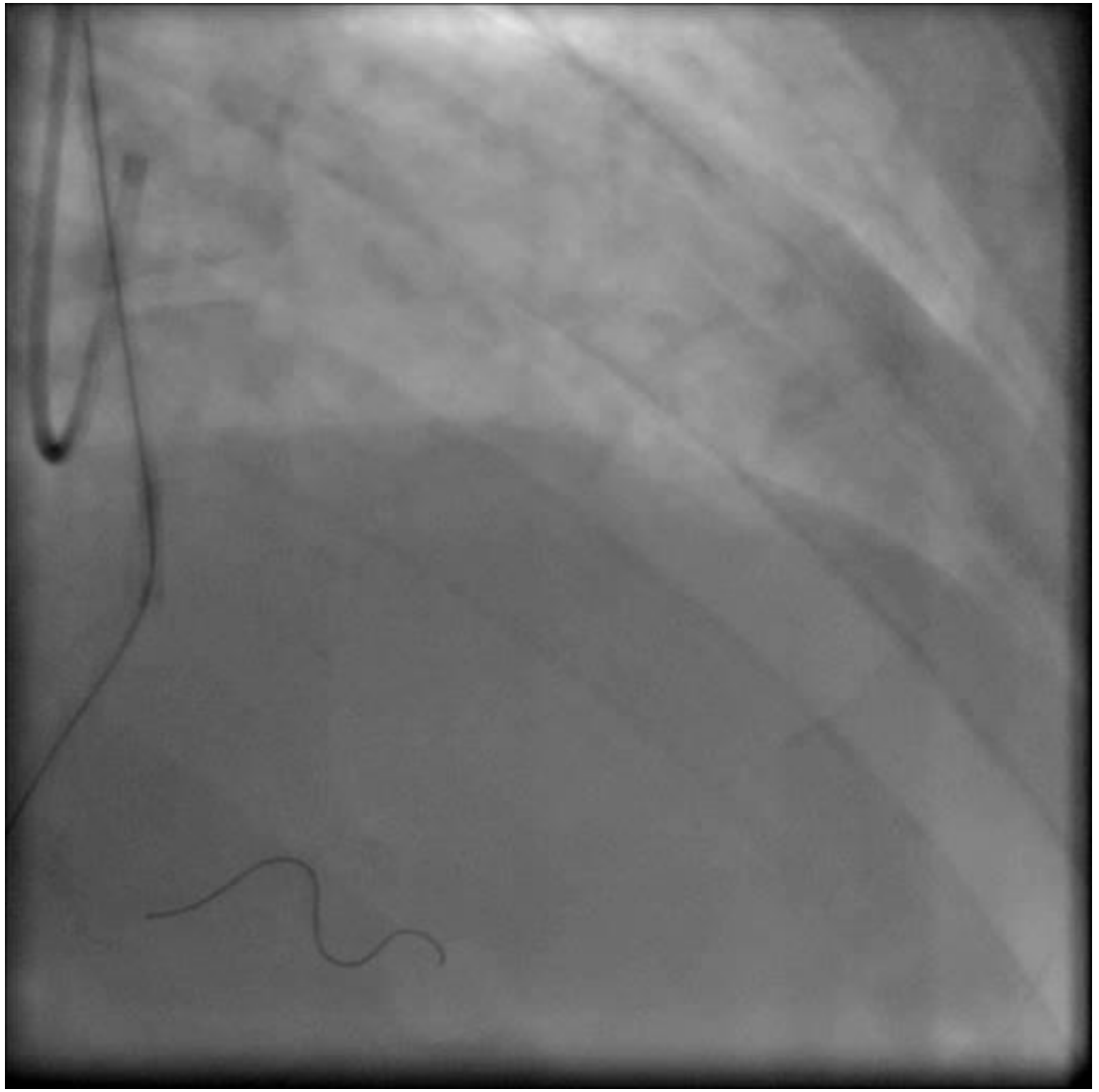
2mm 90°

SUOH 03

Pre-shaped
mini-bend

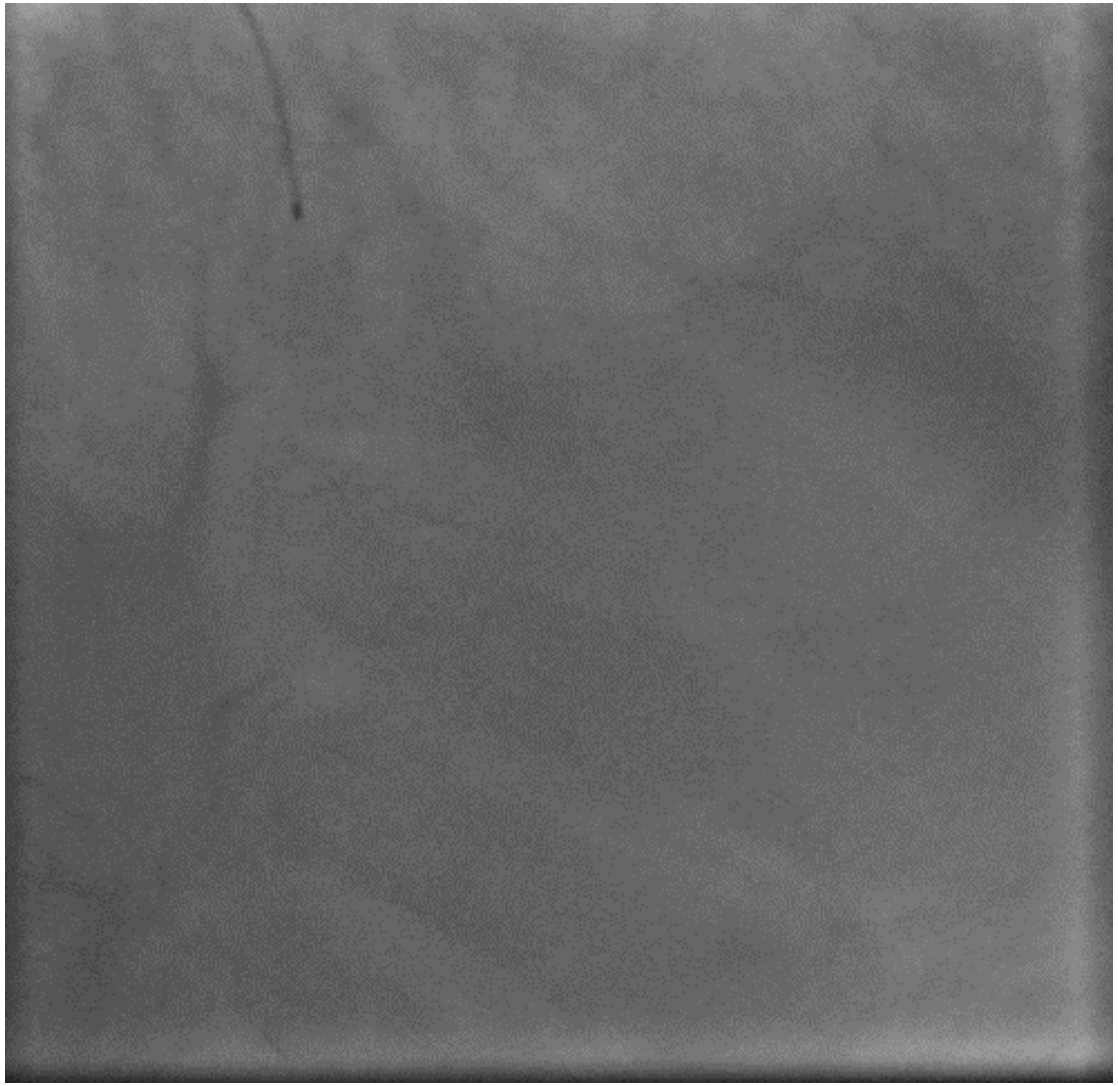
45°

RCA CTO: Septal collaterals from LAD

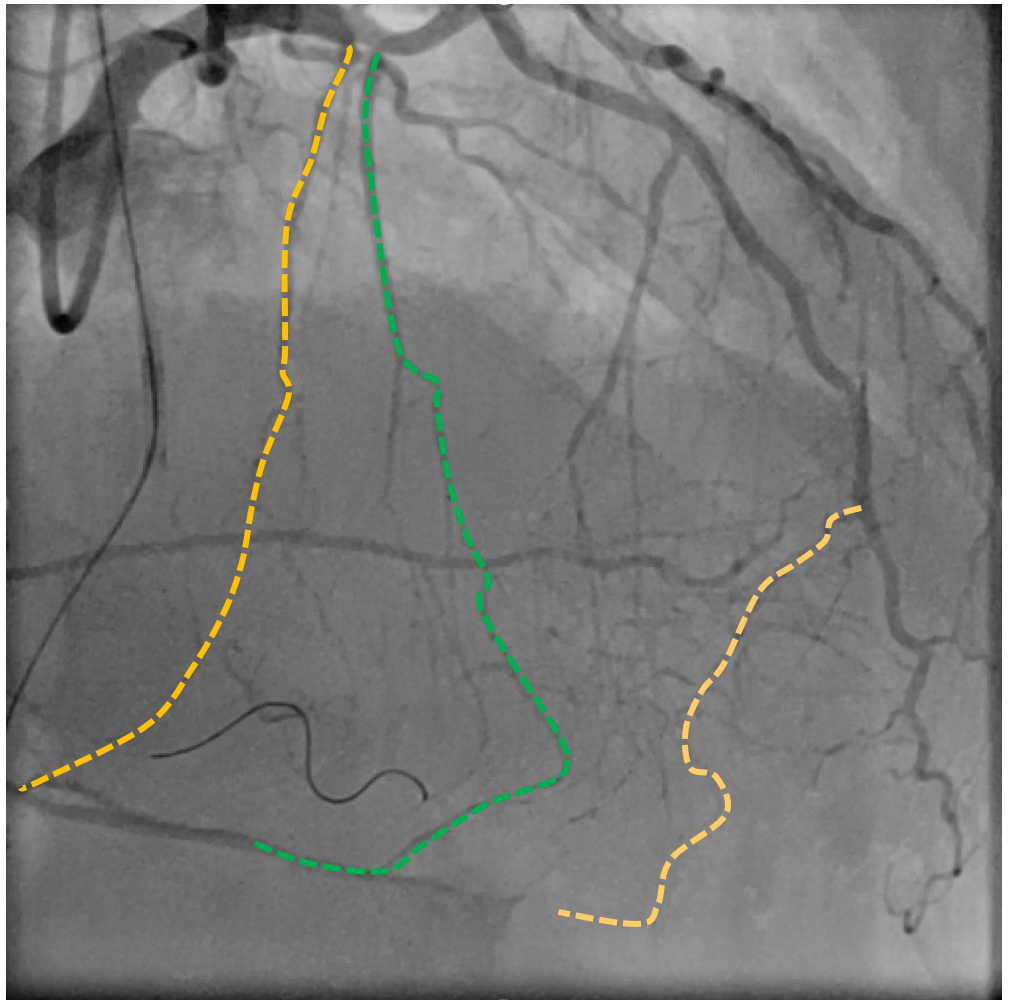


15 frames/sec

RCA CTO: Super-selective injection in septal branch

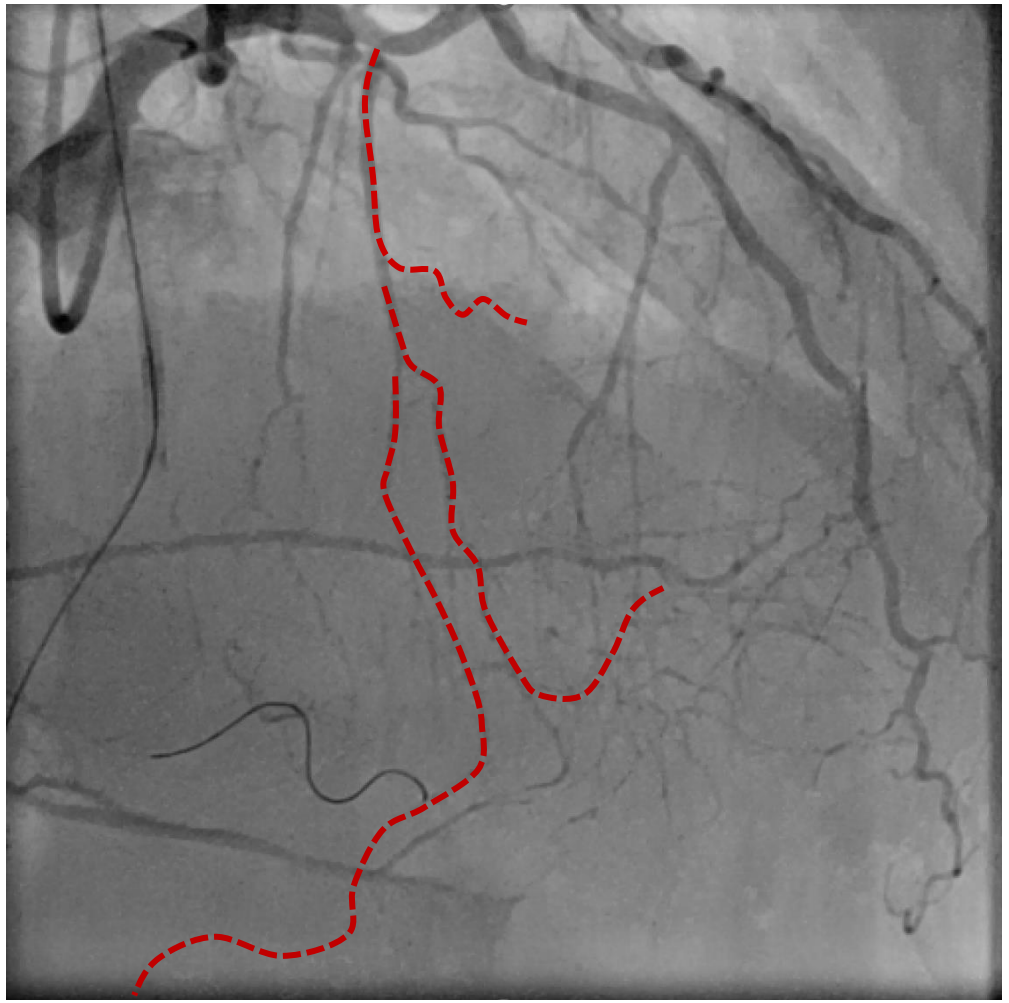


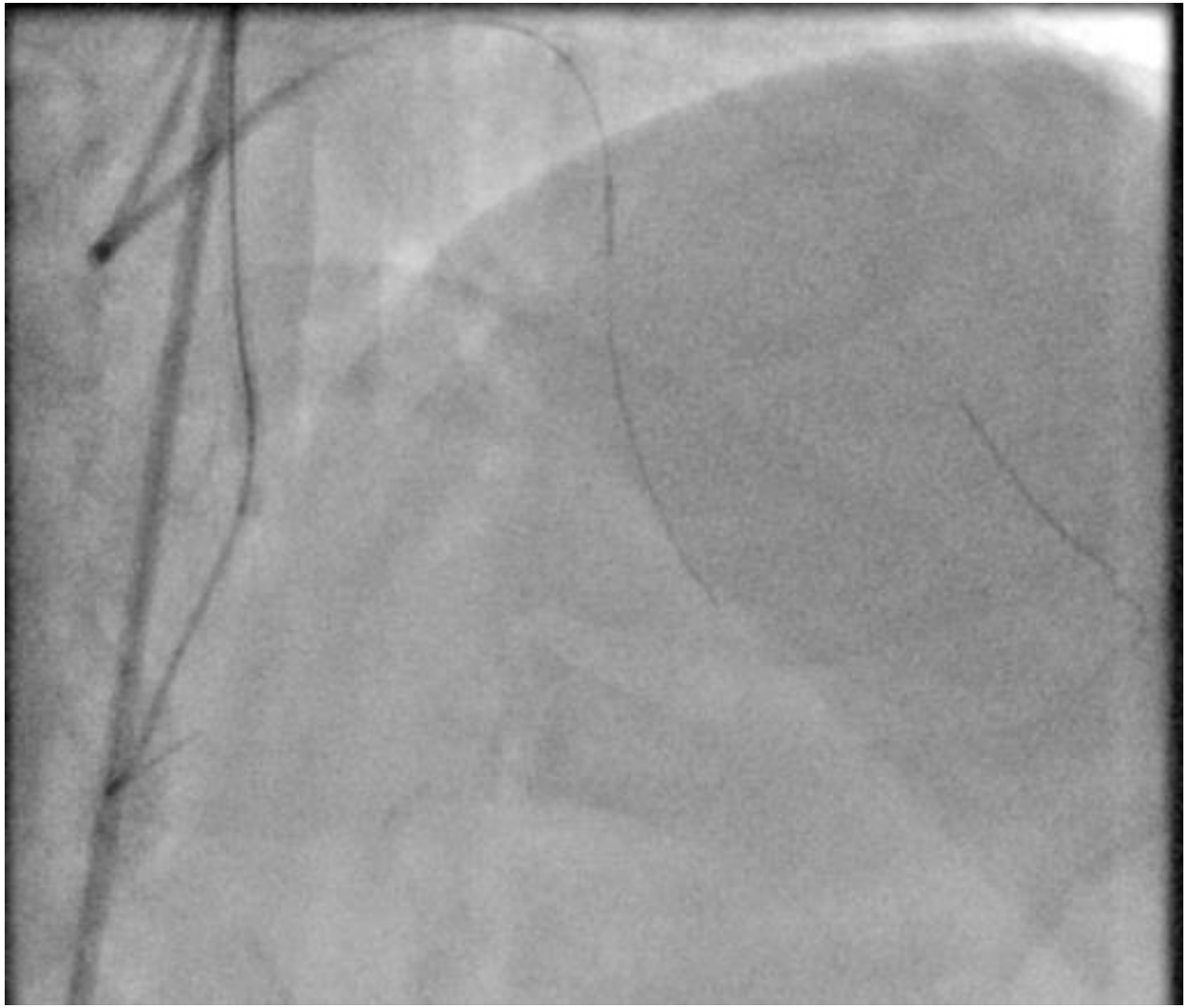
Septal tracks that lead into the RCA-PDA …



… and tracks

that don`t work



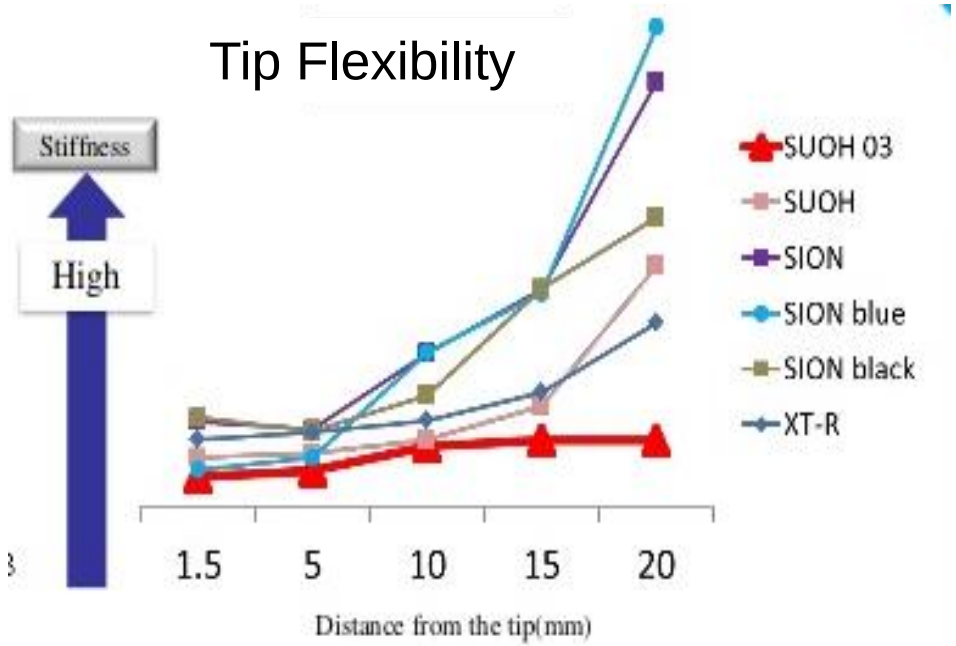


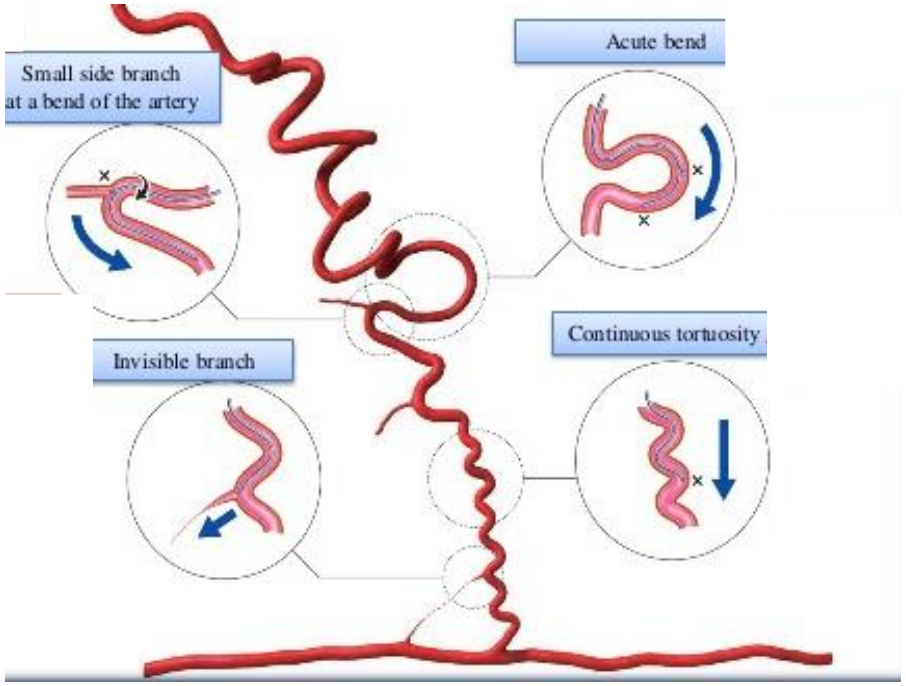
Courtesy of Aurel Toma

Wire crossing: septal channel

1. RAO cranial
2. Sion Black as 1st choice
1. MC may follow with distance

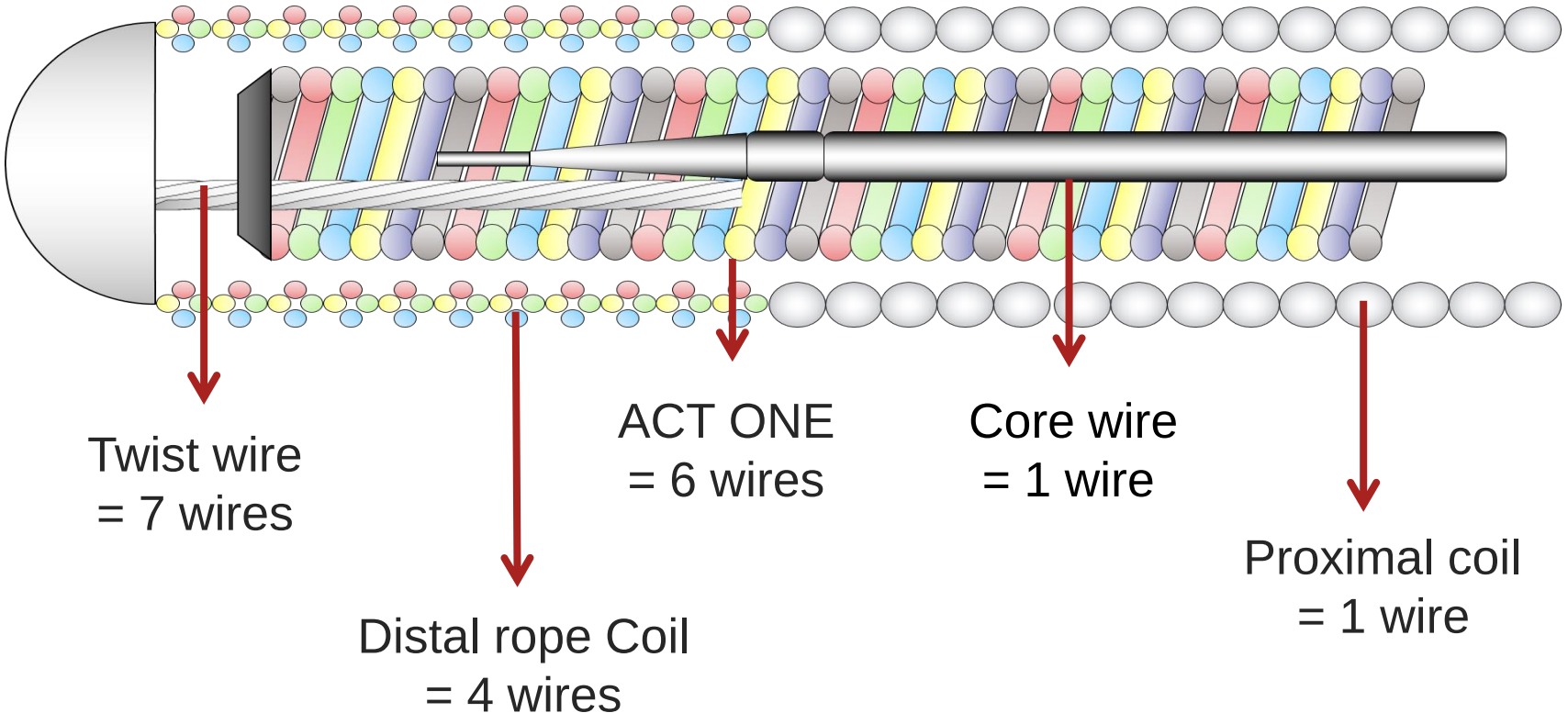
Epicardial collateral passage: ASAHI SUOH 03





Tip flexibility for navigation through collateral

ASAHI SUOH 03: Components of 19 wires



Wire crossing: epicardial channel

SUOH 03 as 1st choice

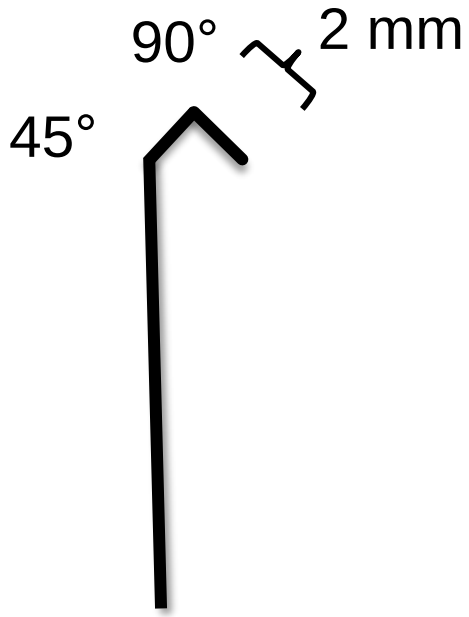
Courtesy of Aurel Toma

Wire crossing: epicardial channel

SUOH 03

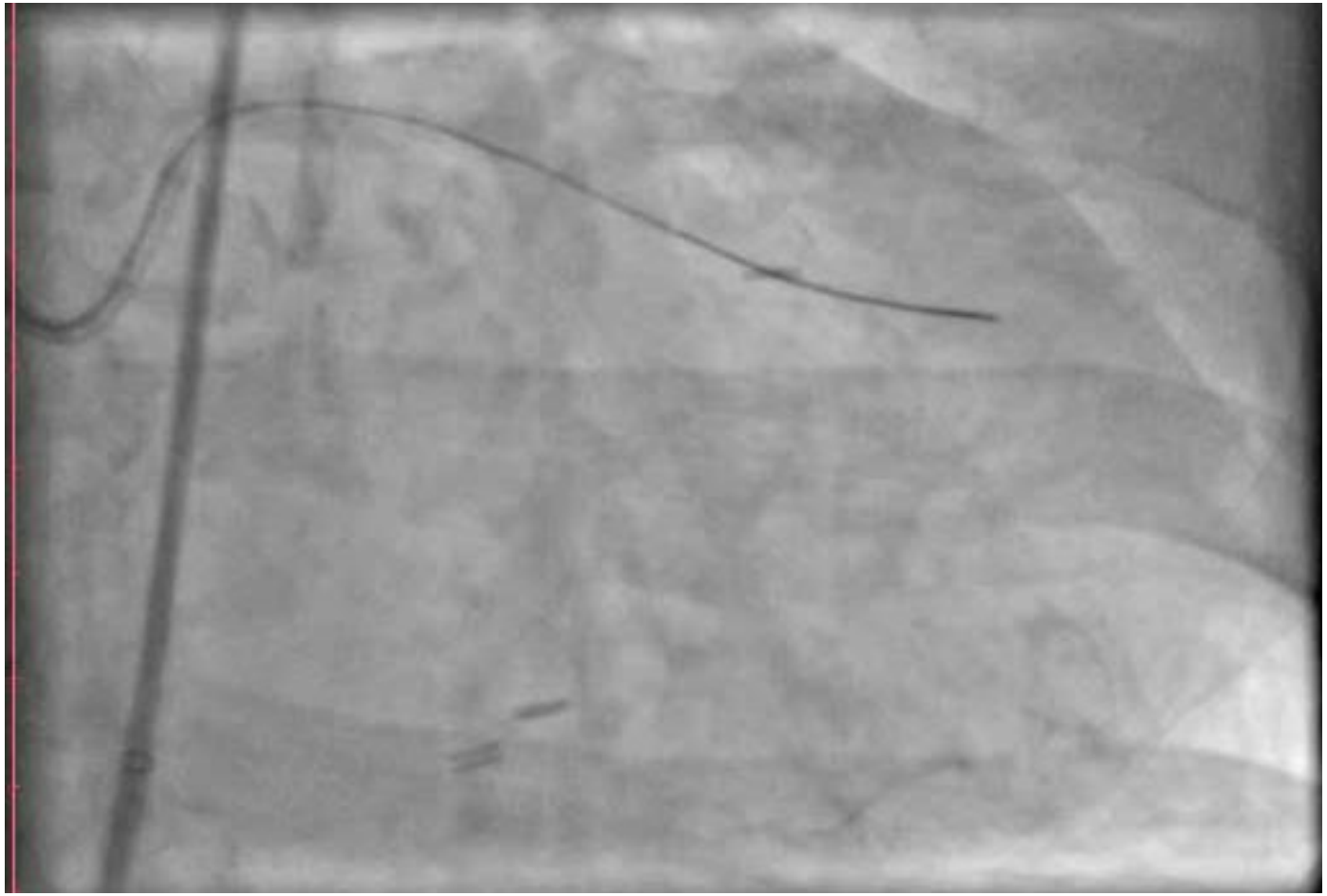
If the SUOH 03 does`t work: Sion Black bent double

180° curve with side branch
in CC2 collateral

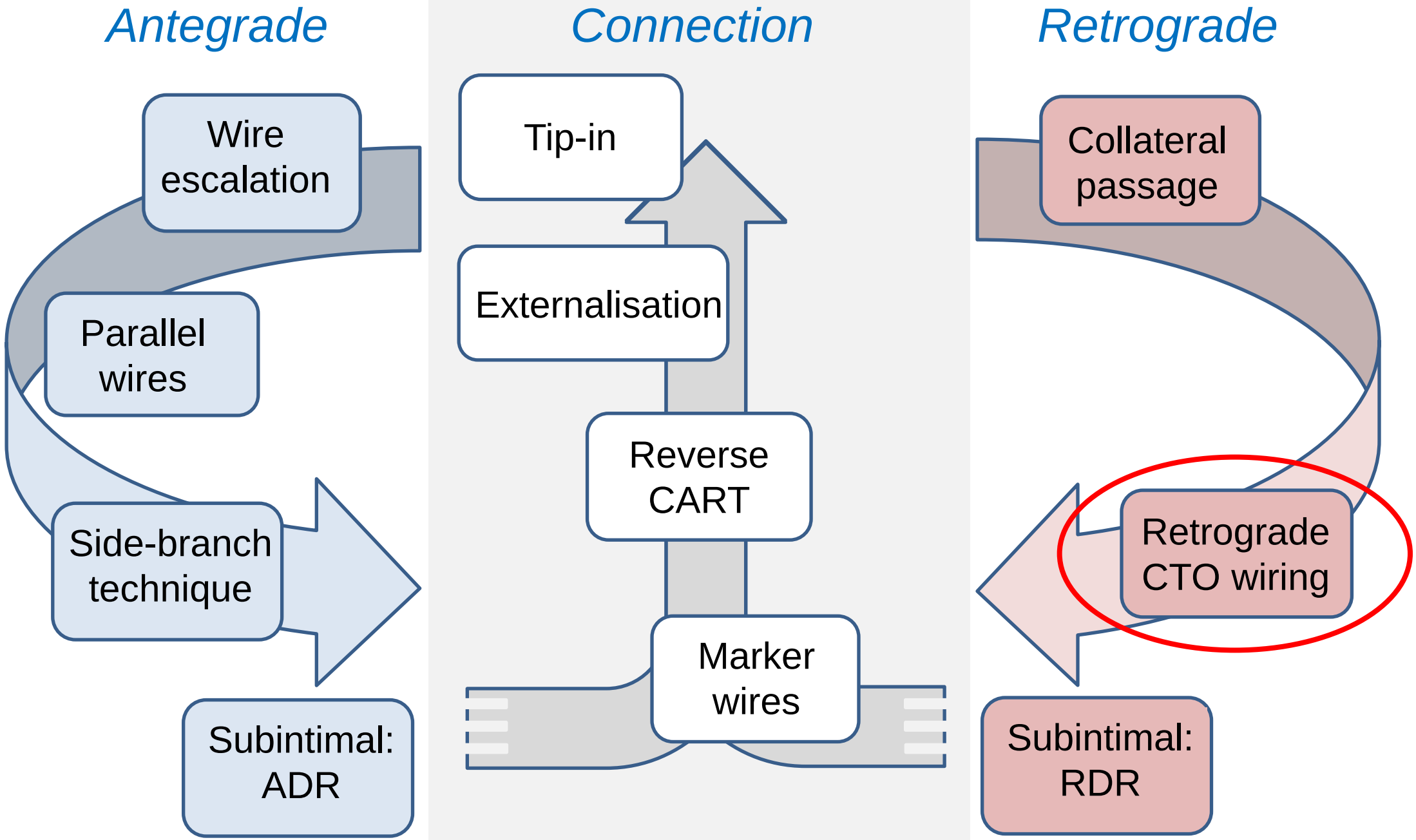


Sion Black

Wire perforation of posterolateral CC1-Collateral



Perforation drains into LV cavum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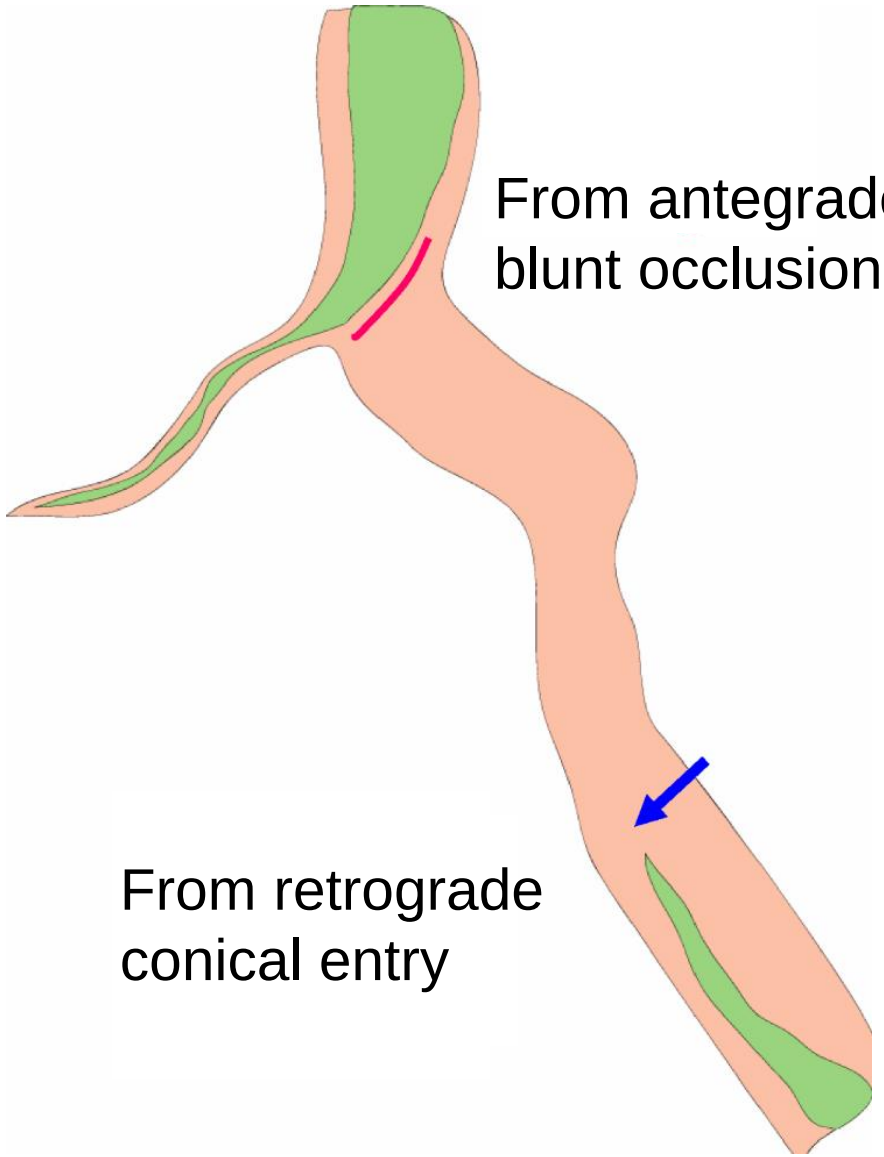
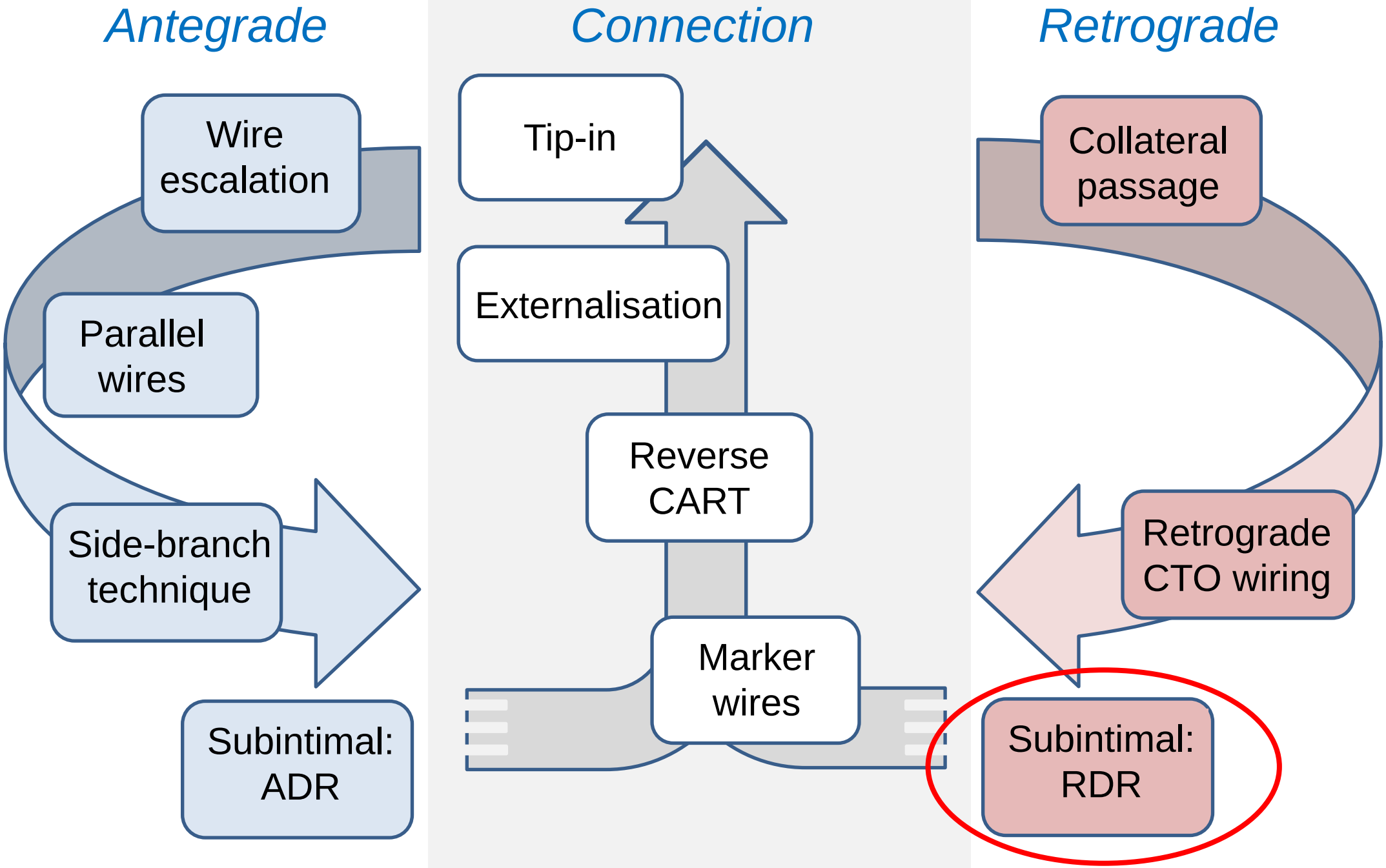
Retrograde CTO passage: Wire escalation



First retrograde wire is the collateral wire:

- Advance MC close to the distal cap
- Start with Sion Black
- Then Gaia Next $1^{st}/2^{nd}/3^{rd}$
- Then Gladius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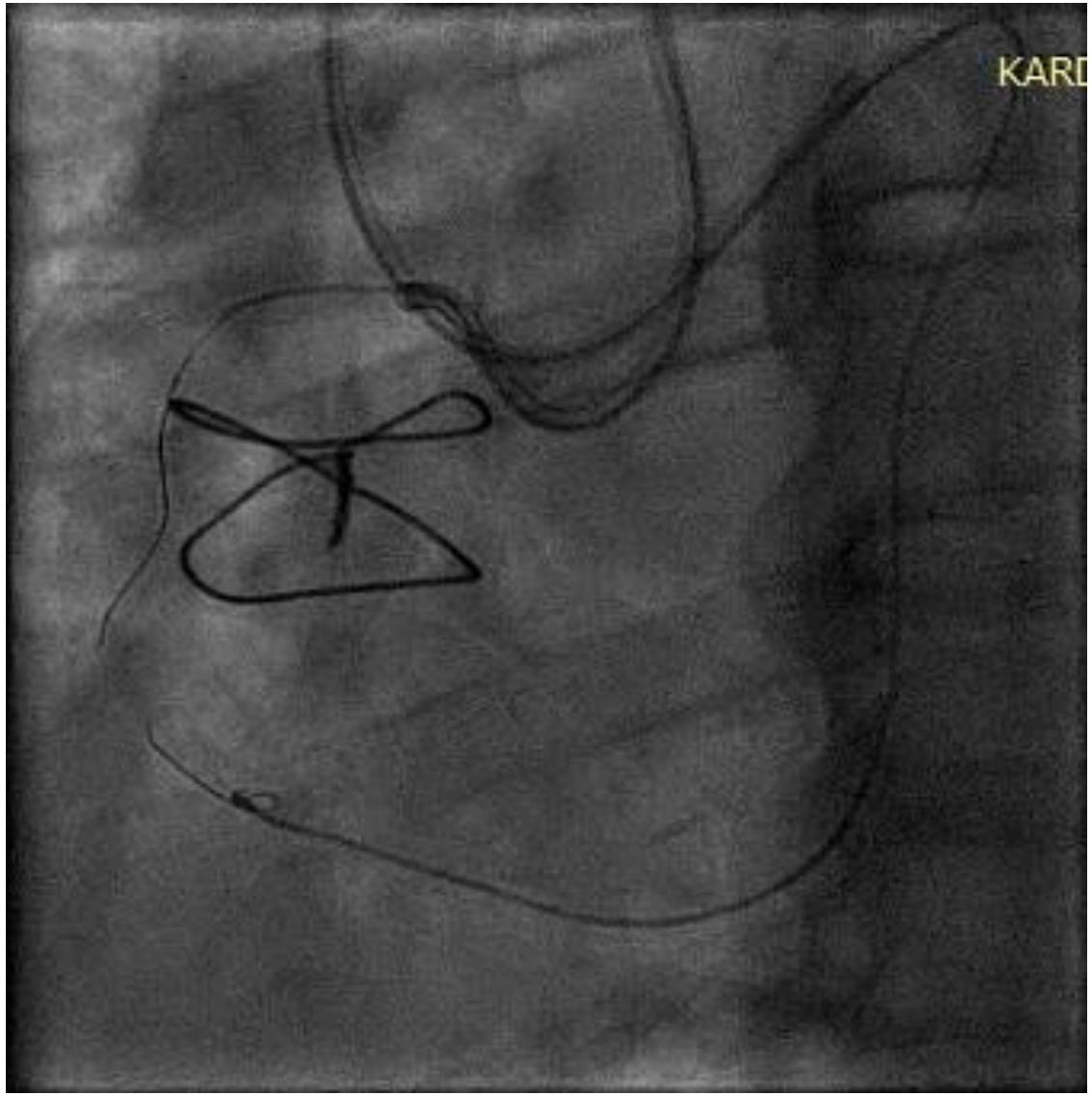
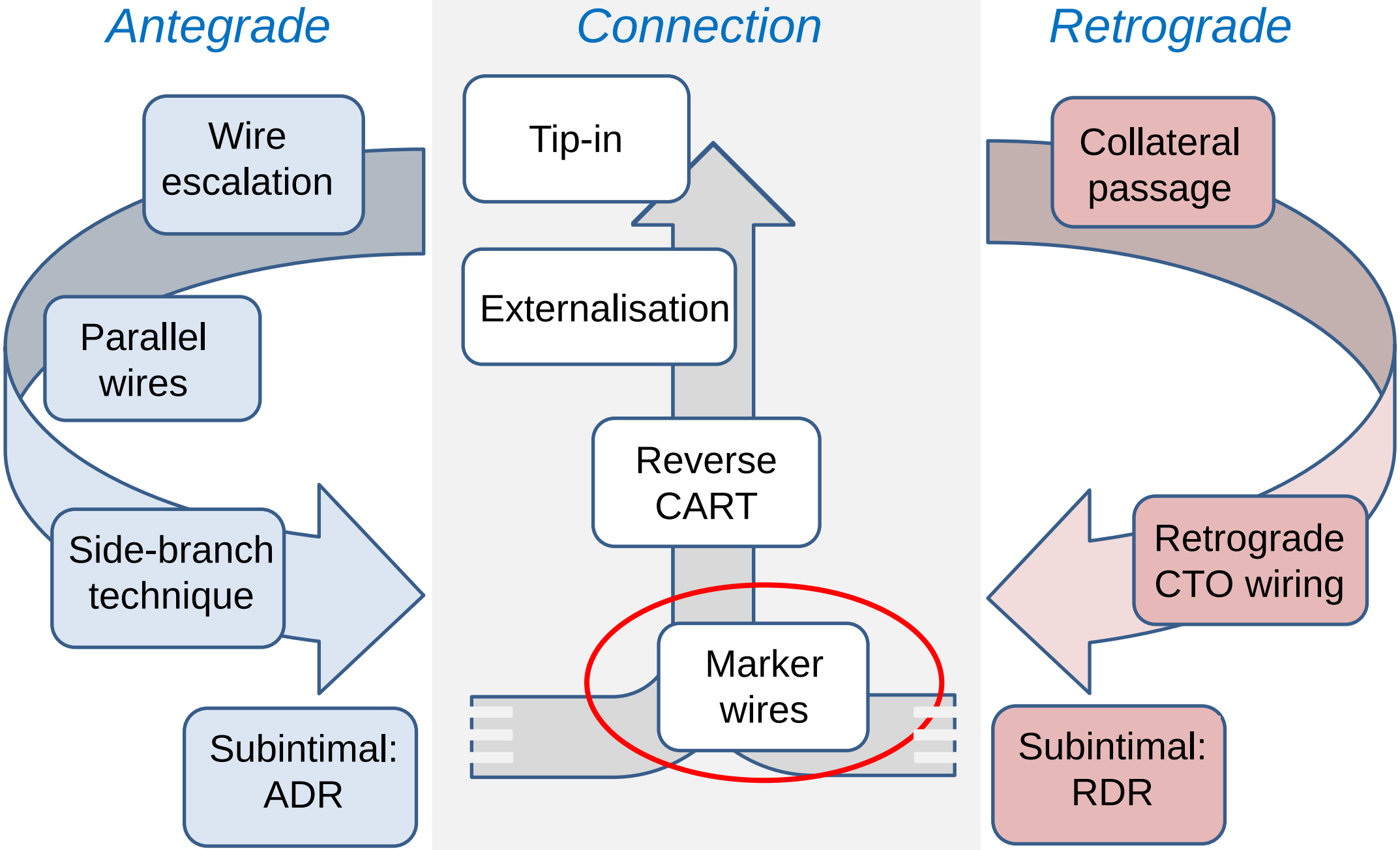
Knuckle technique from retrograde

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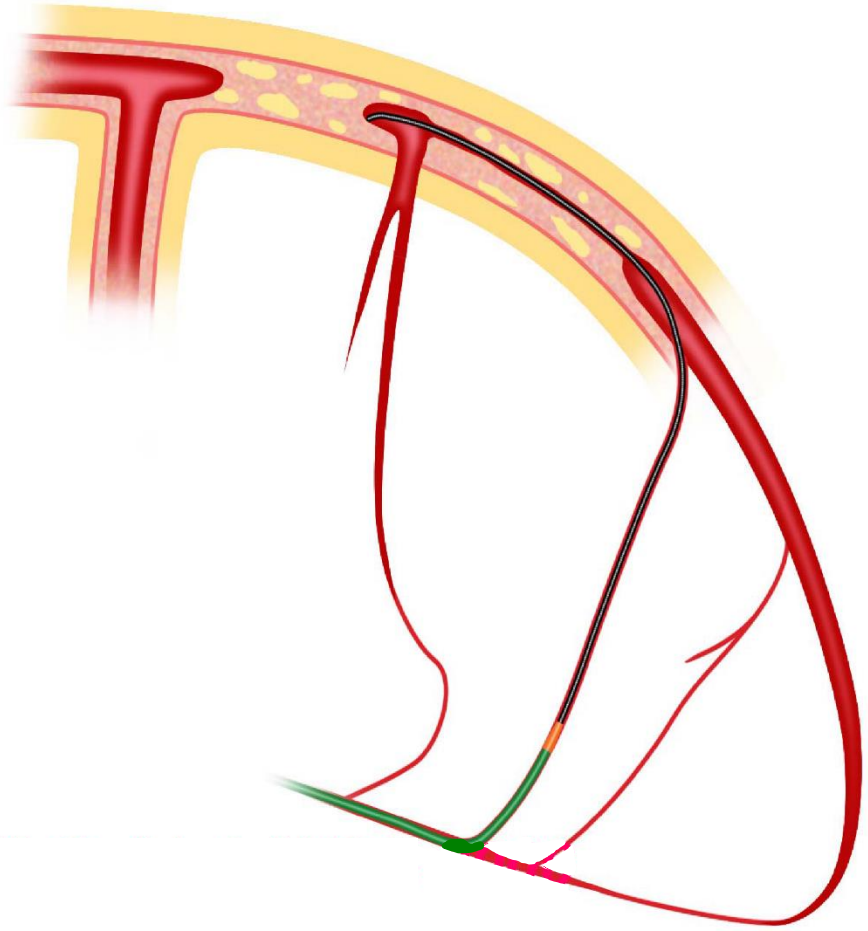
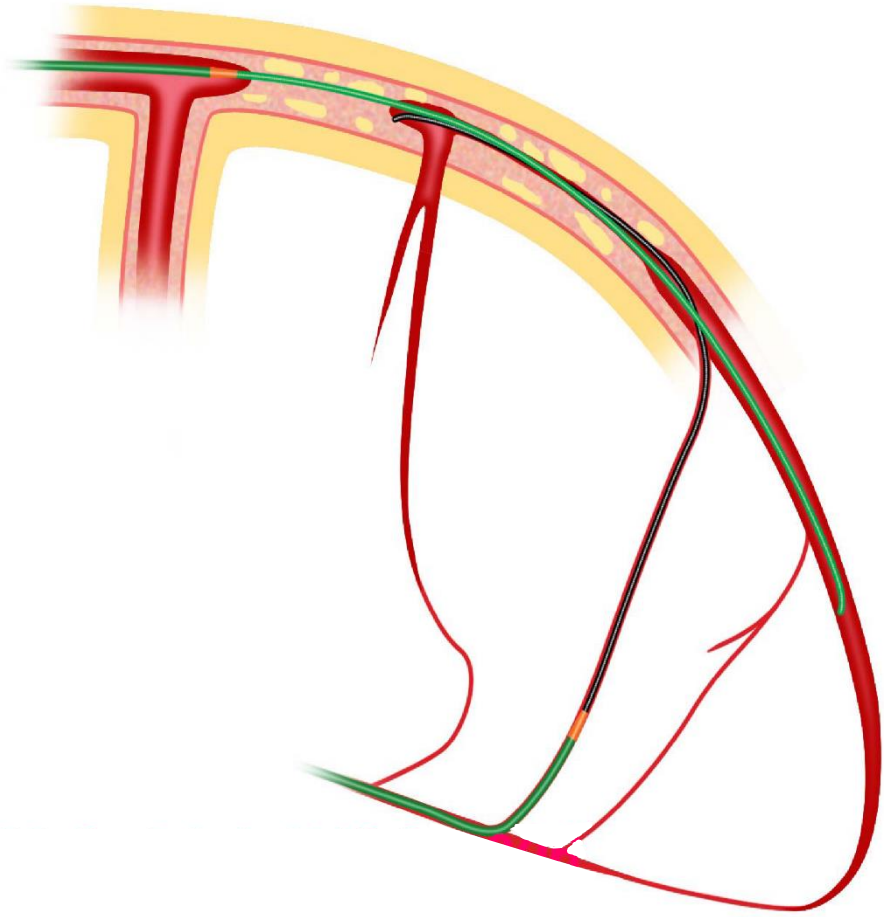
„Kissing-wire“ technique

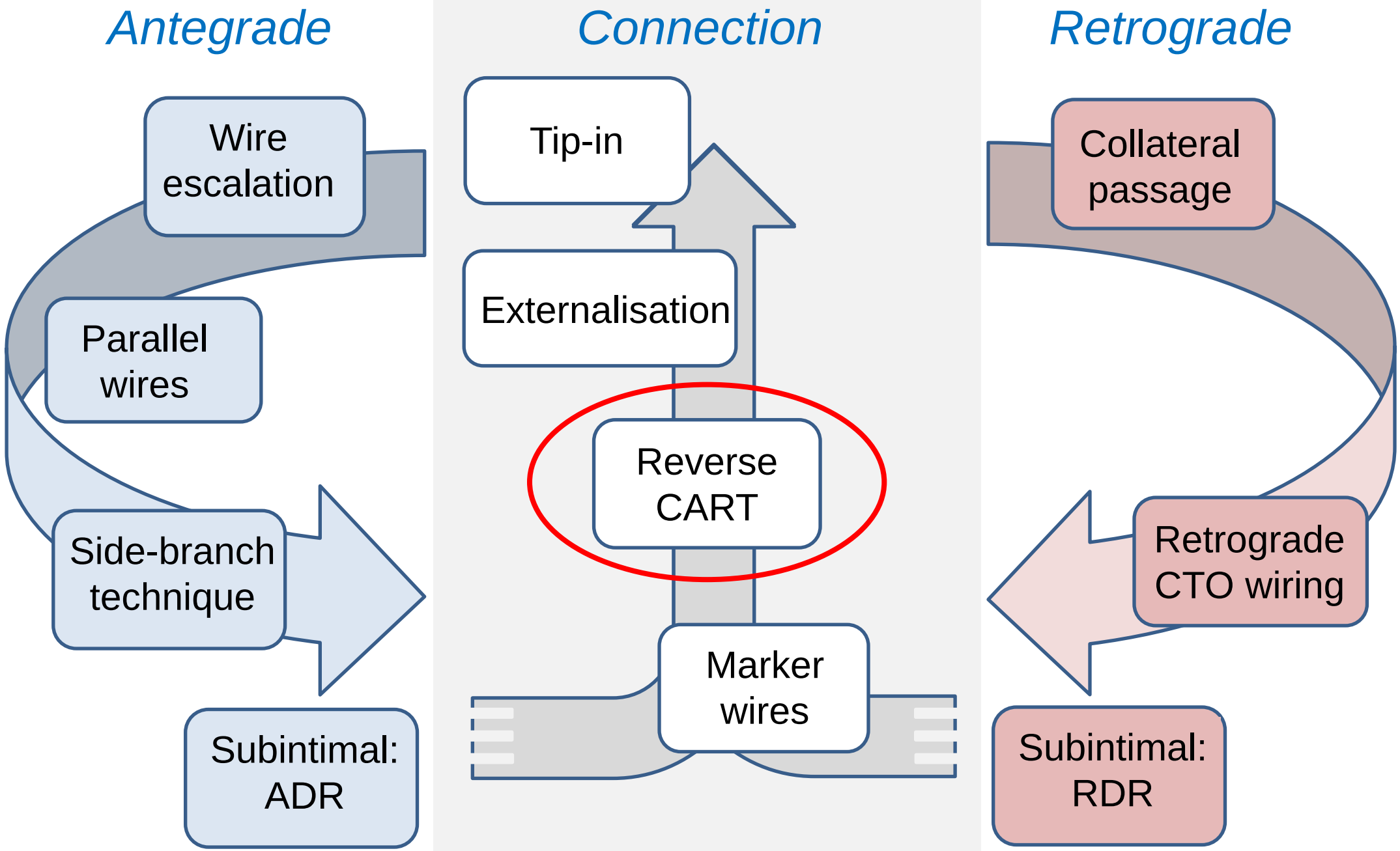


From M. Ochiai

„Kissing-wire“ technique



From M. Ochiai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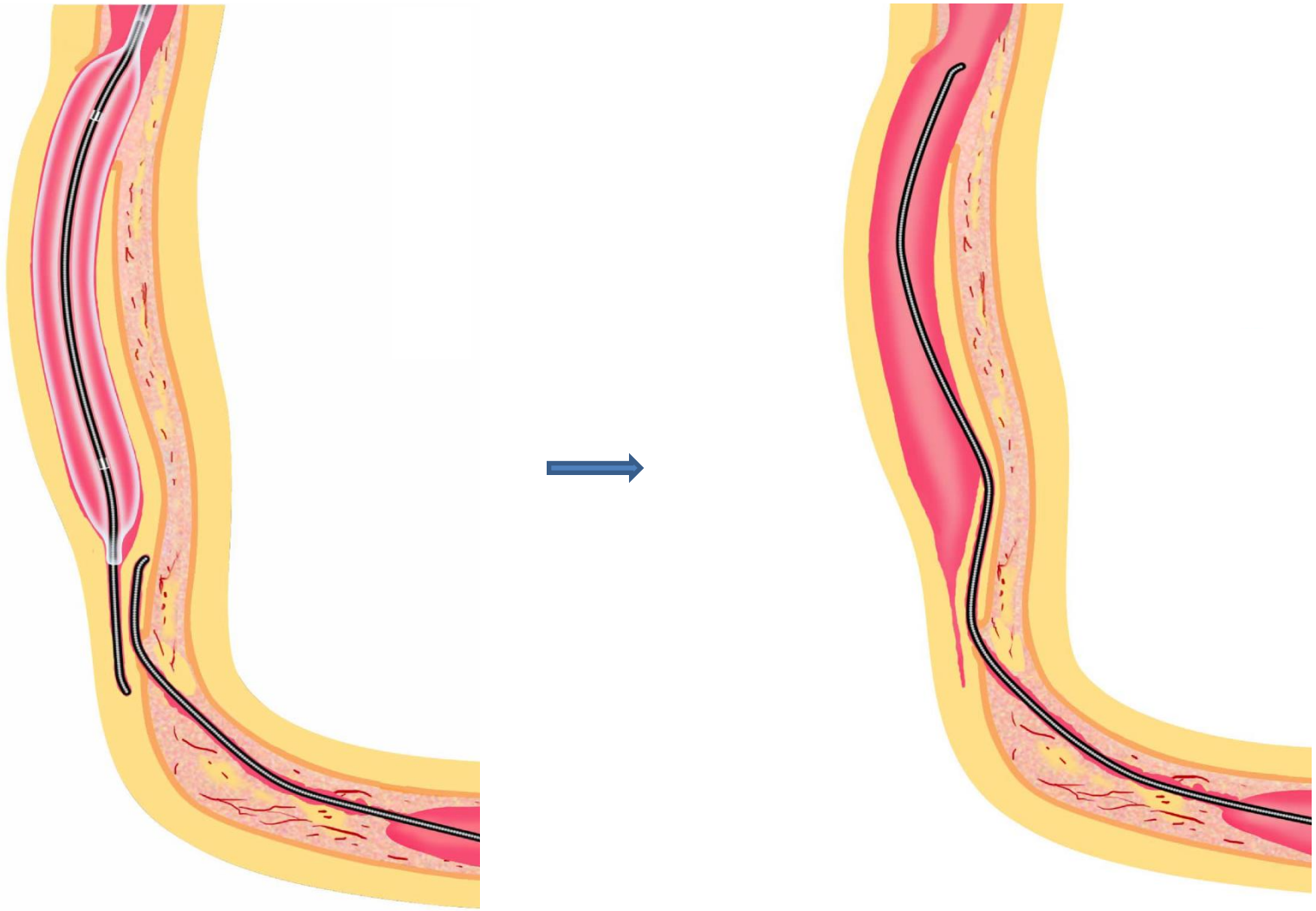
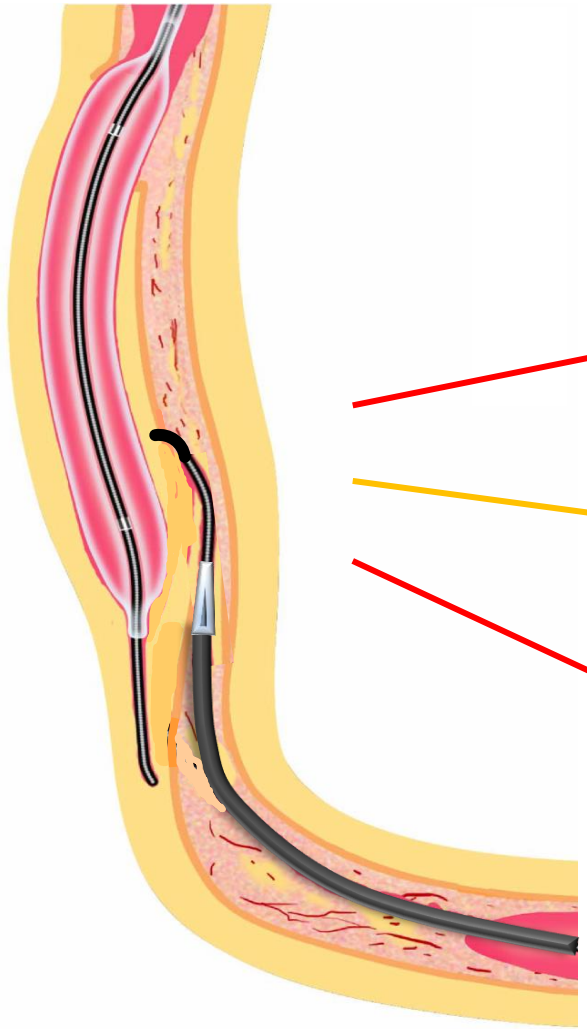
Reverse CART: Balloon dilatation from antegrade



From M. Ochiai

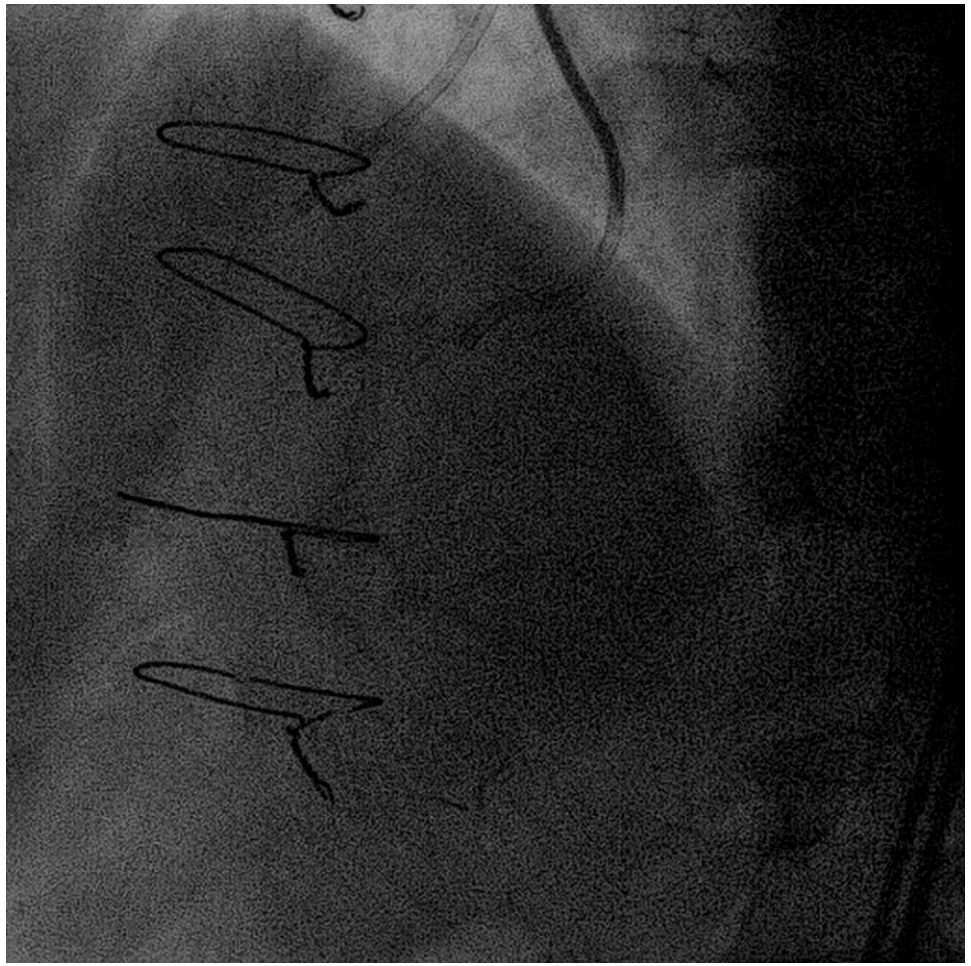
Reverse CART: Balloon dilatation from antegrade



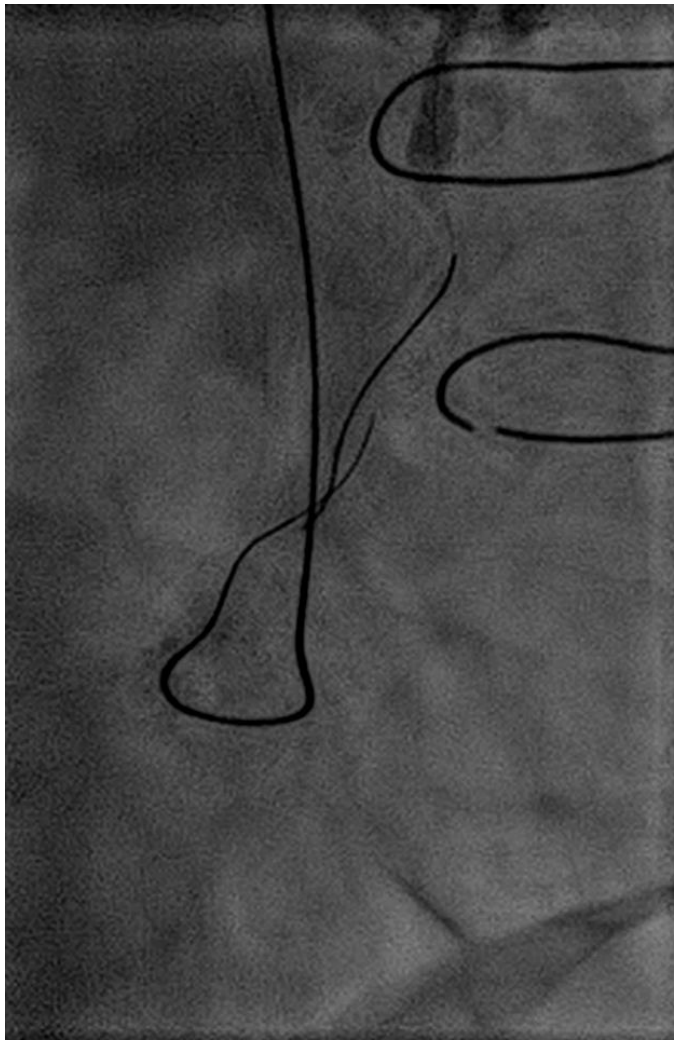
Retrograde wire has to penetrate tissue..

- Gaia Next 2nd/3rd *4.0/6.0g*
- UltimateBros *3.0g*
- Gladius (Polymer) *3.0g*
- ConfianzaPro *12g*

CTO of RCA: Reverse CART -1

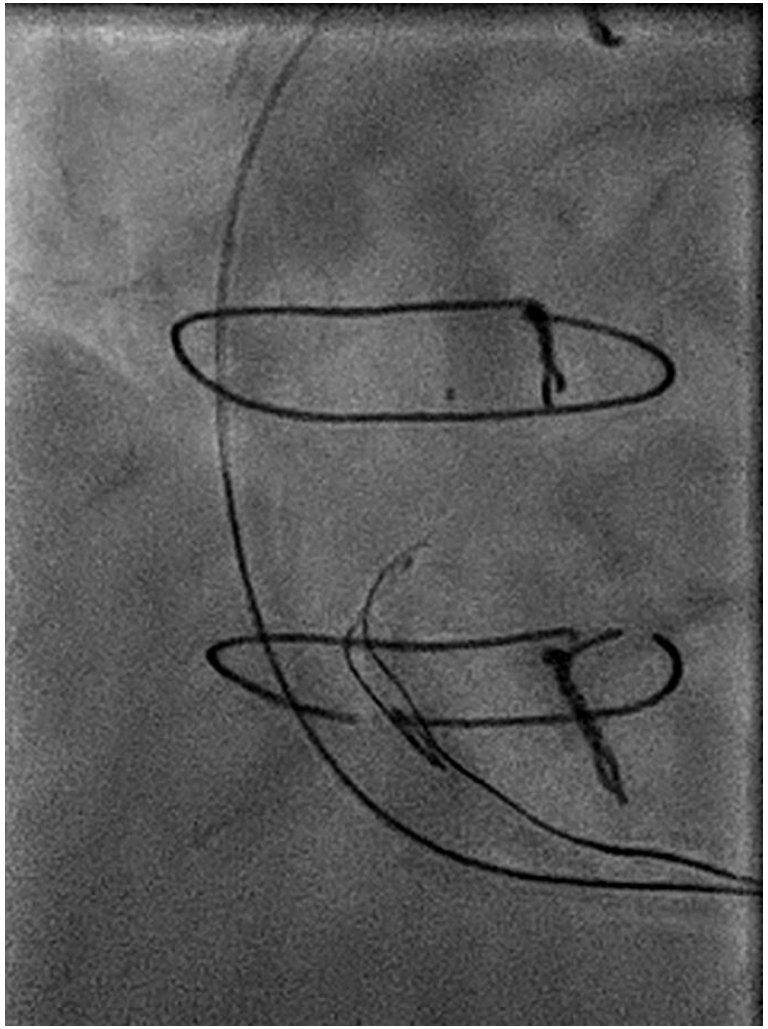


Contra-lateral injection via SVG



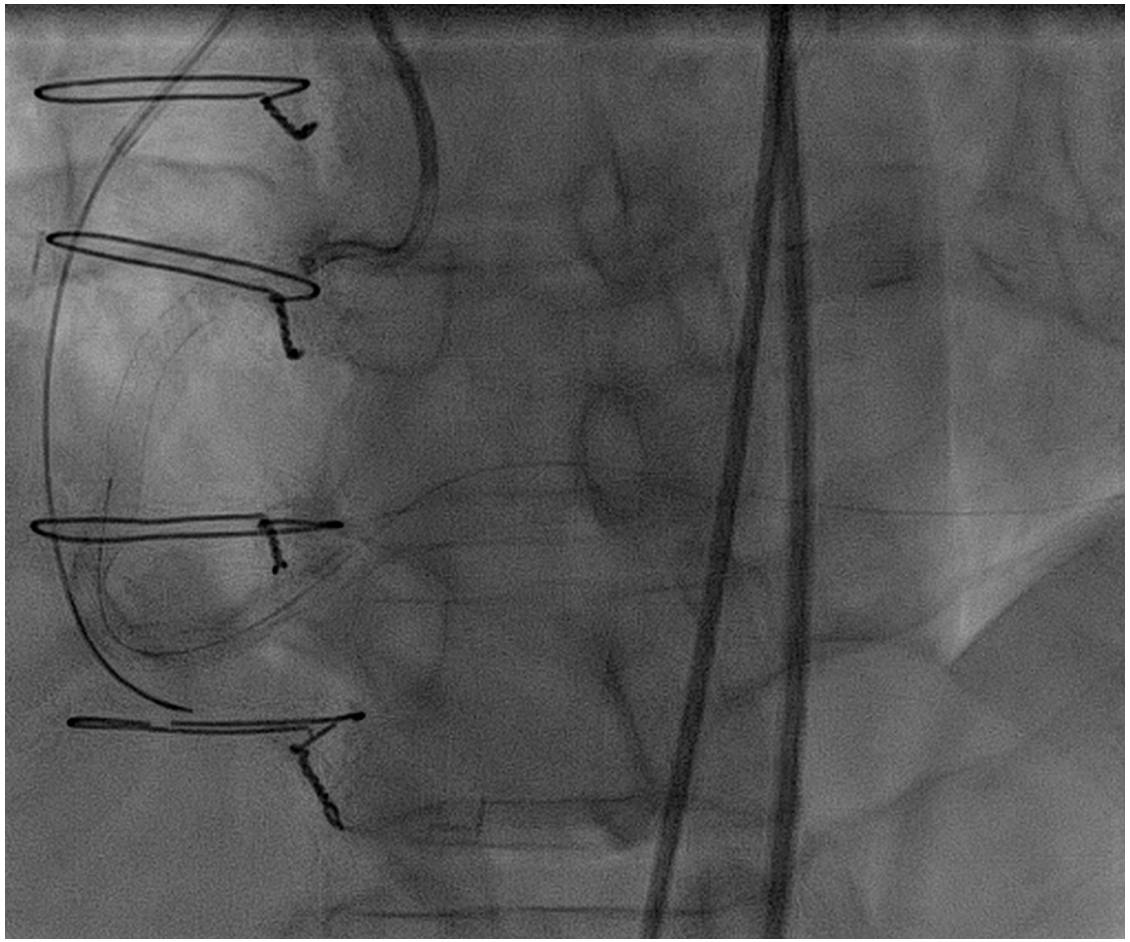
Retrograde wire subintimal

CTO of RCA: Reverse CART -2

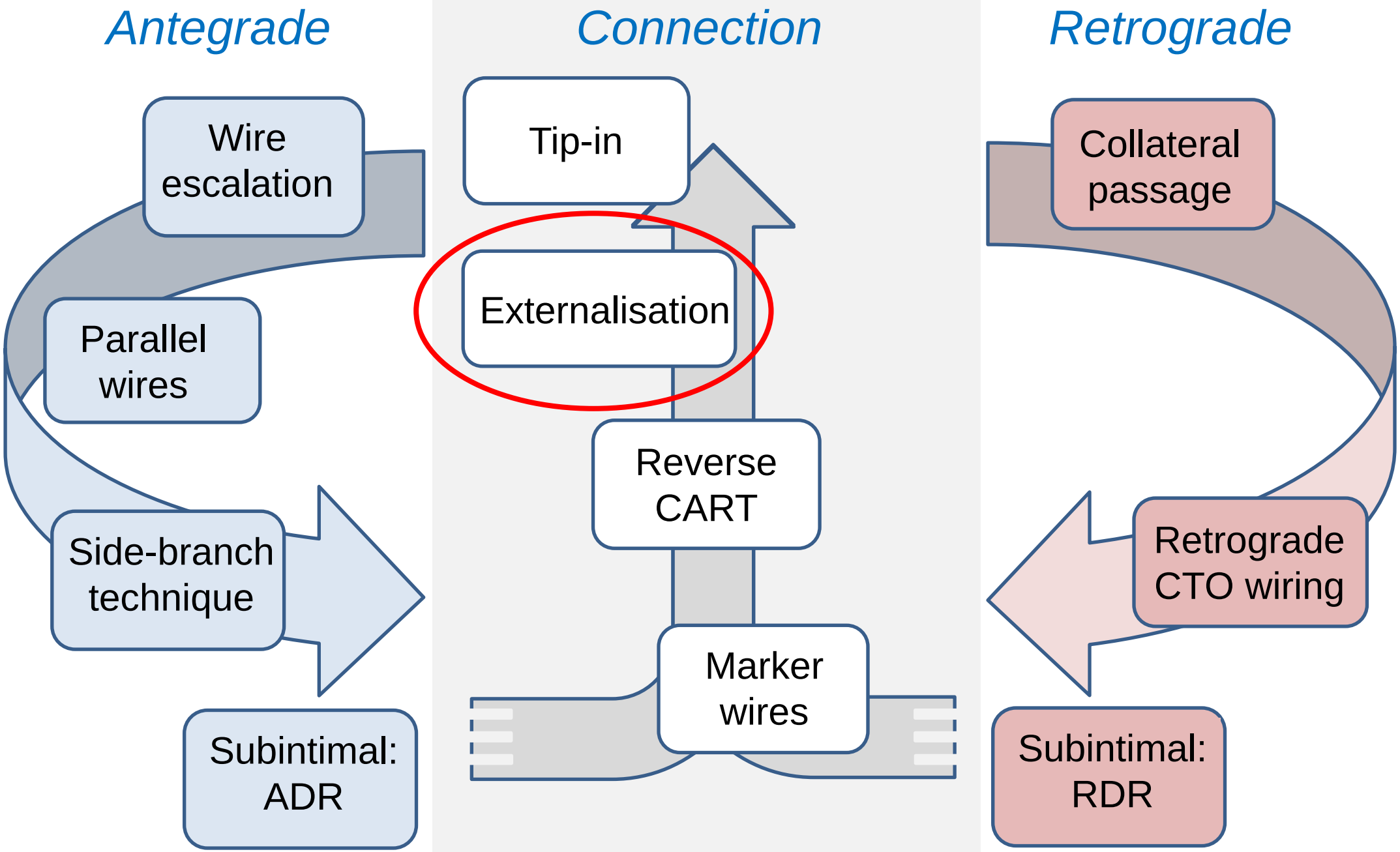


Balloon from antegrade
Retrograde Gaia 3rd enters balloon space after deflation

CTO of RCA: Reverse CART -3



Final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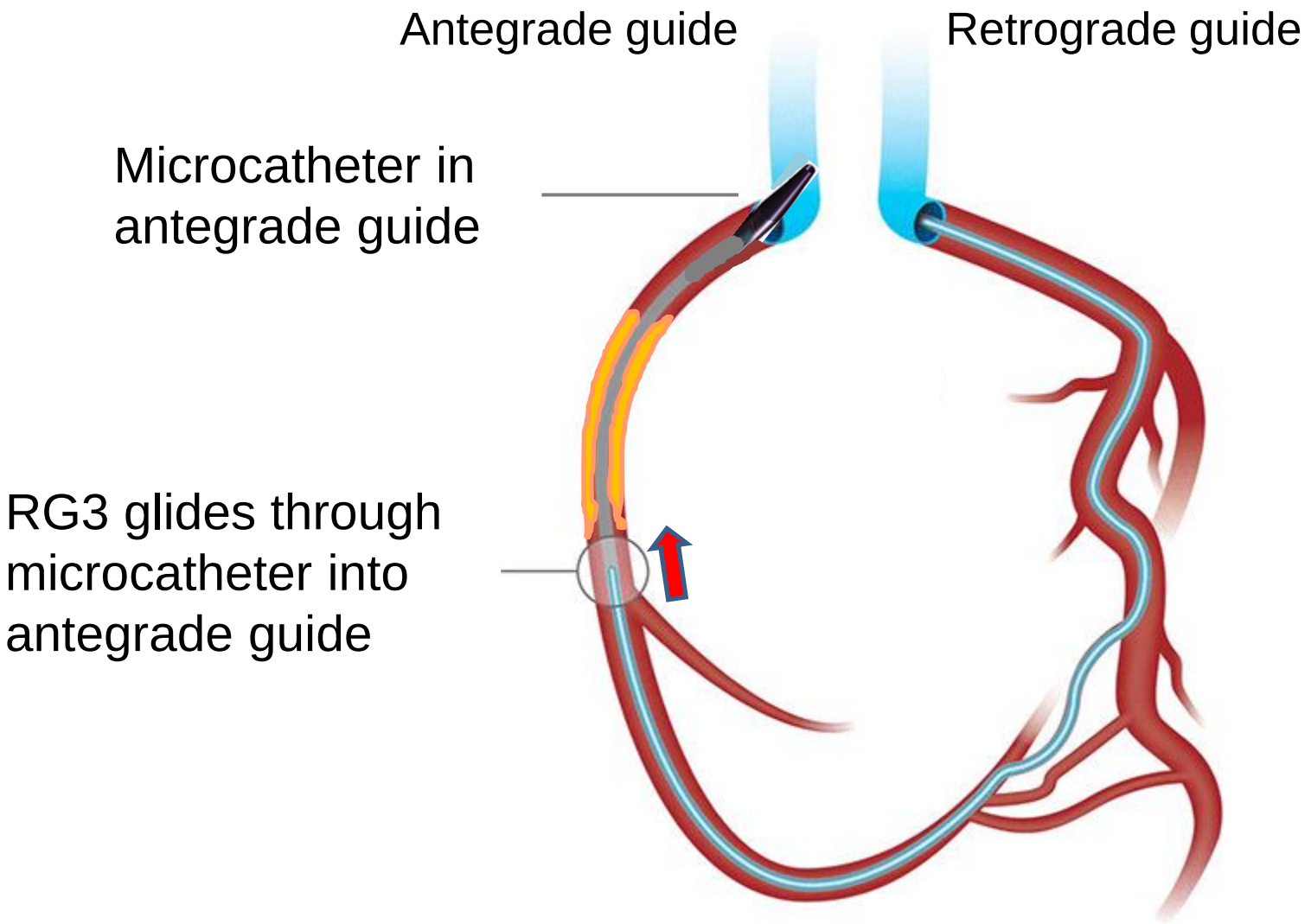
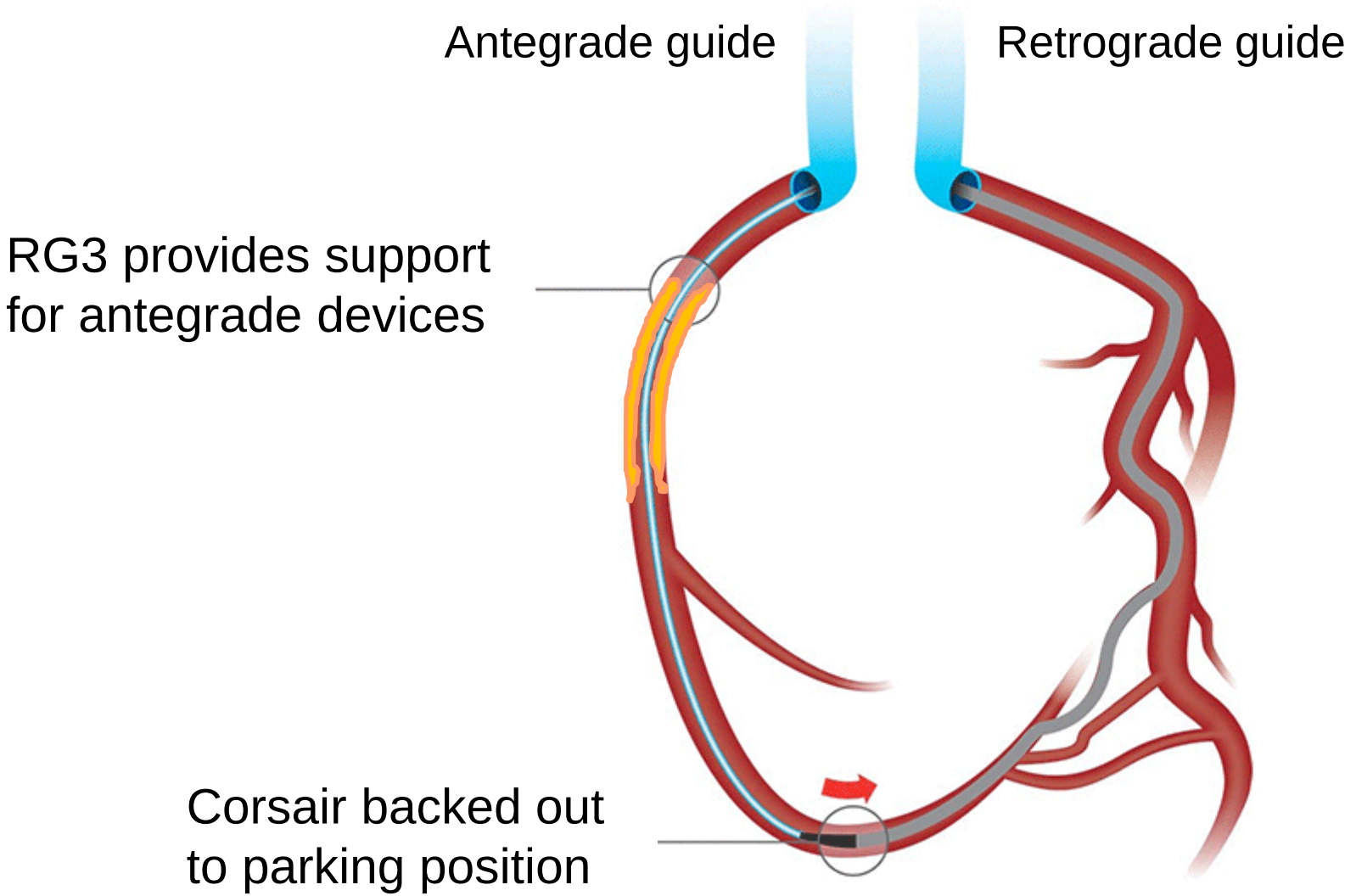
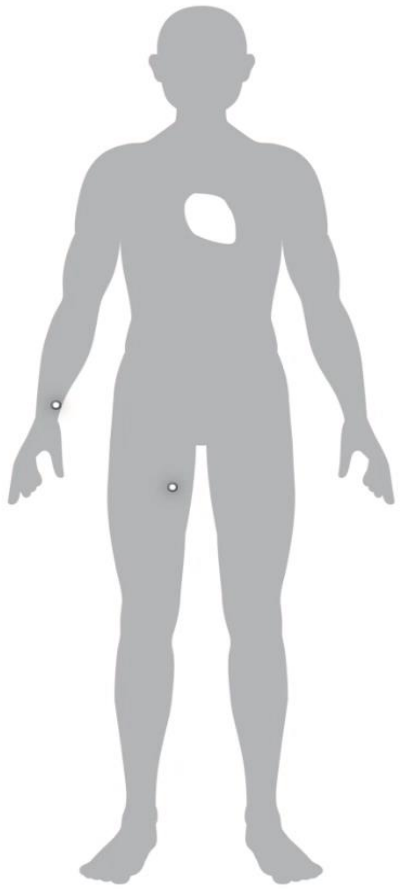
Externalisation with 330cm RG3



Externalisation with 330cm RG3

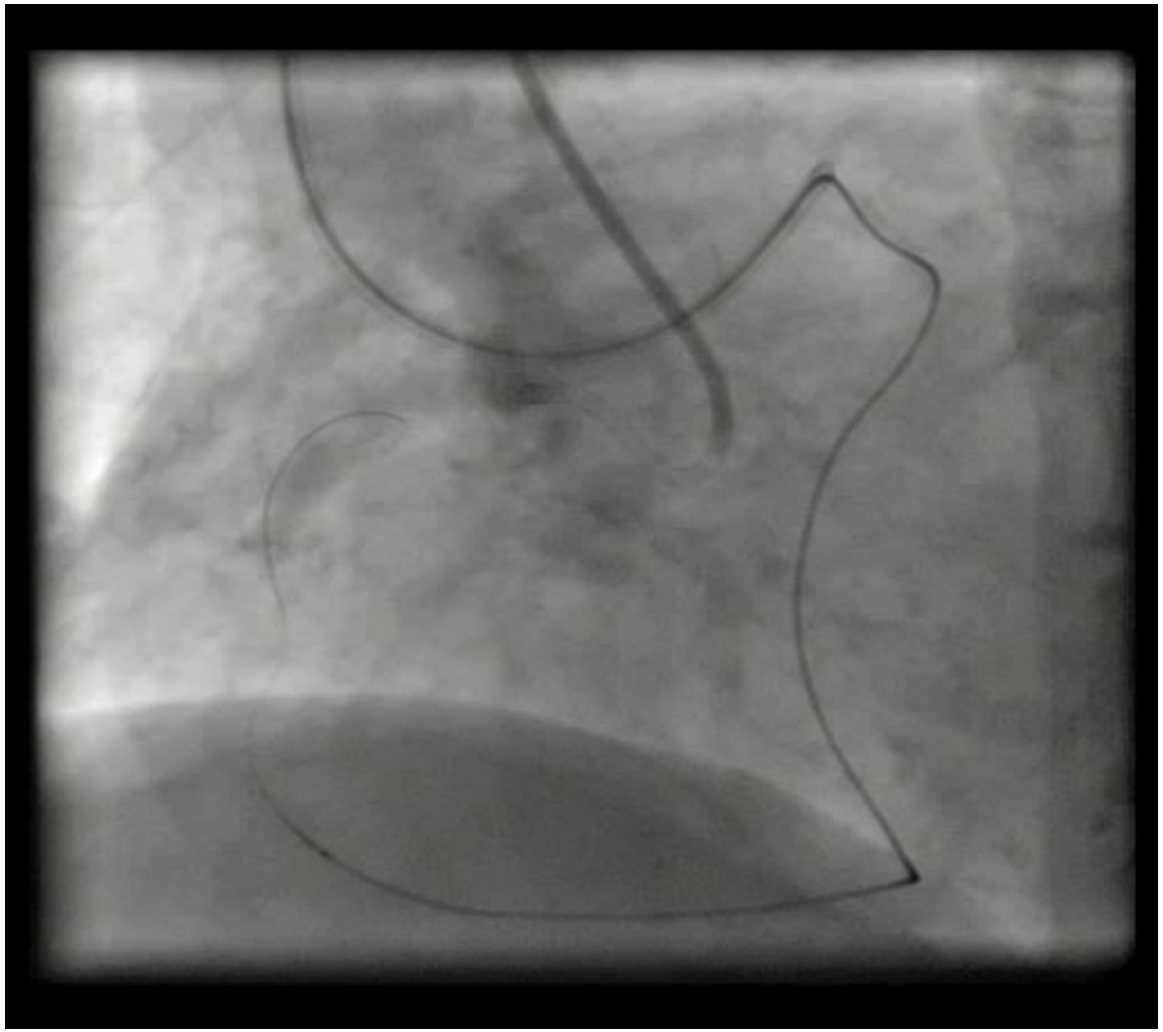


Externalisation with 330cm RG3



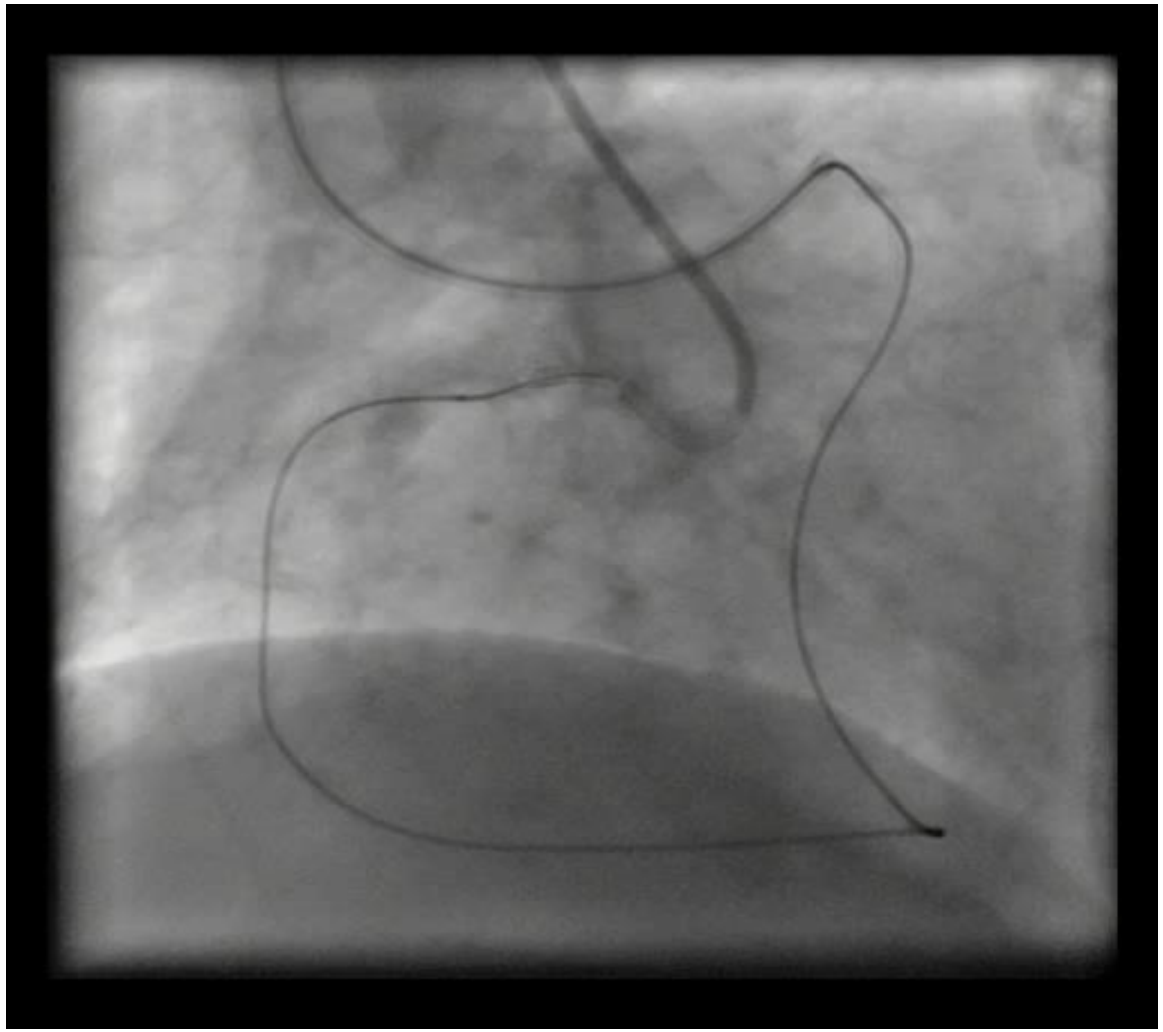
Externalisation Process

Calcified ostial RCA CTO

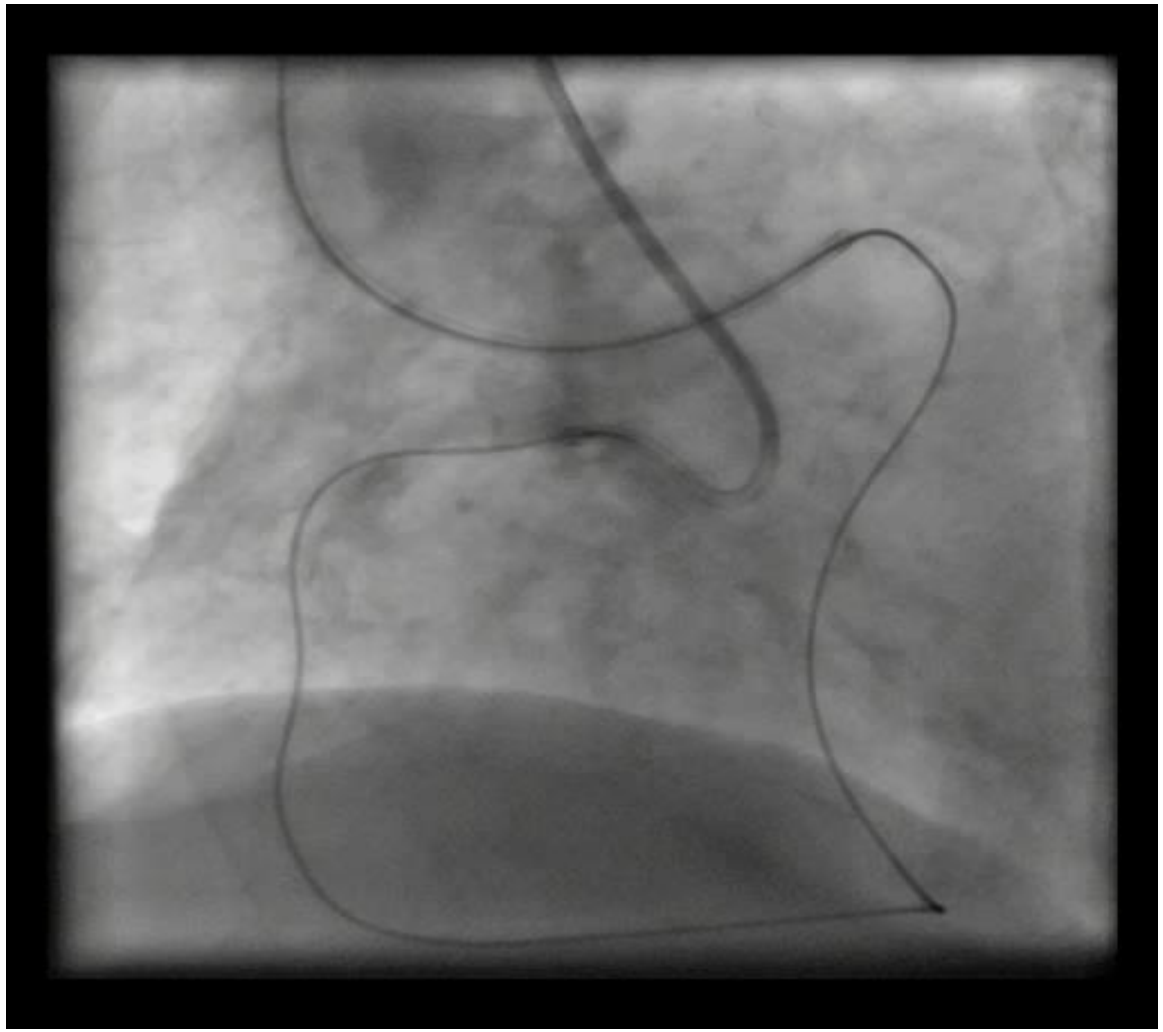


Retrograde wire at distal occlusion end
Corsair microcatheter follows

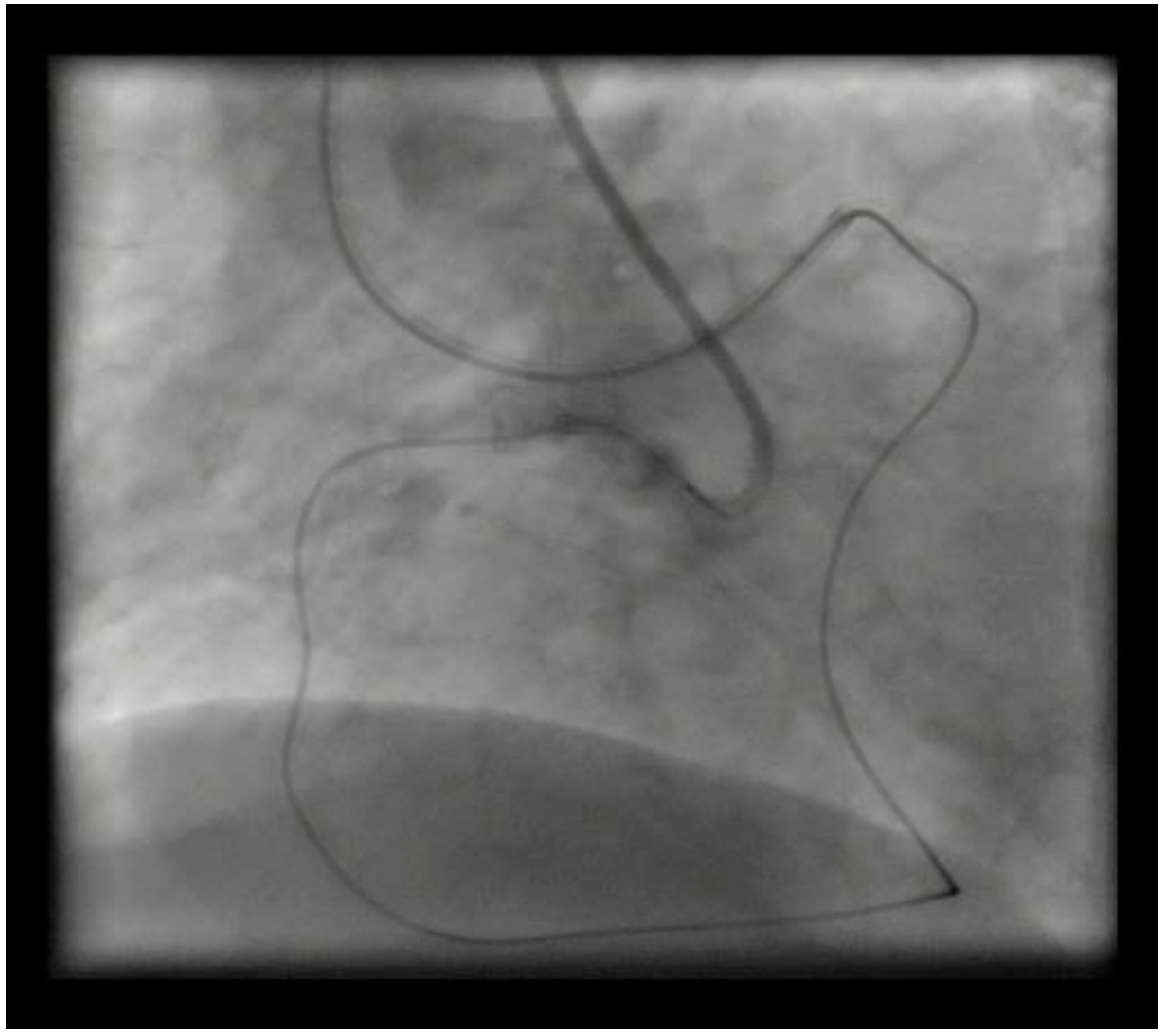
#195876



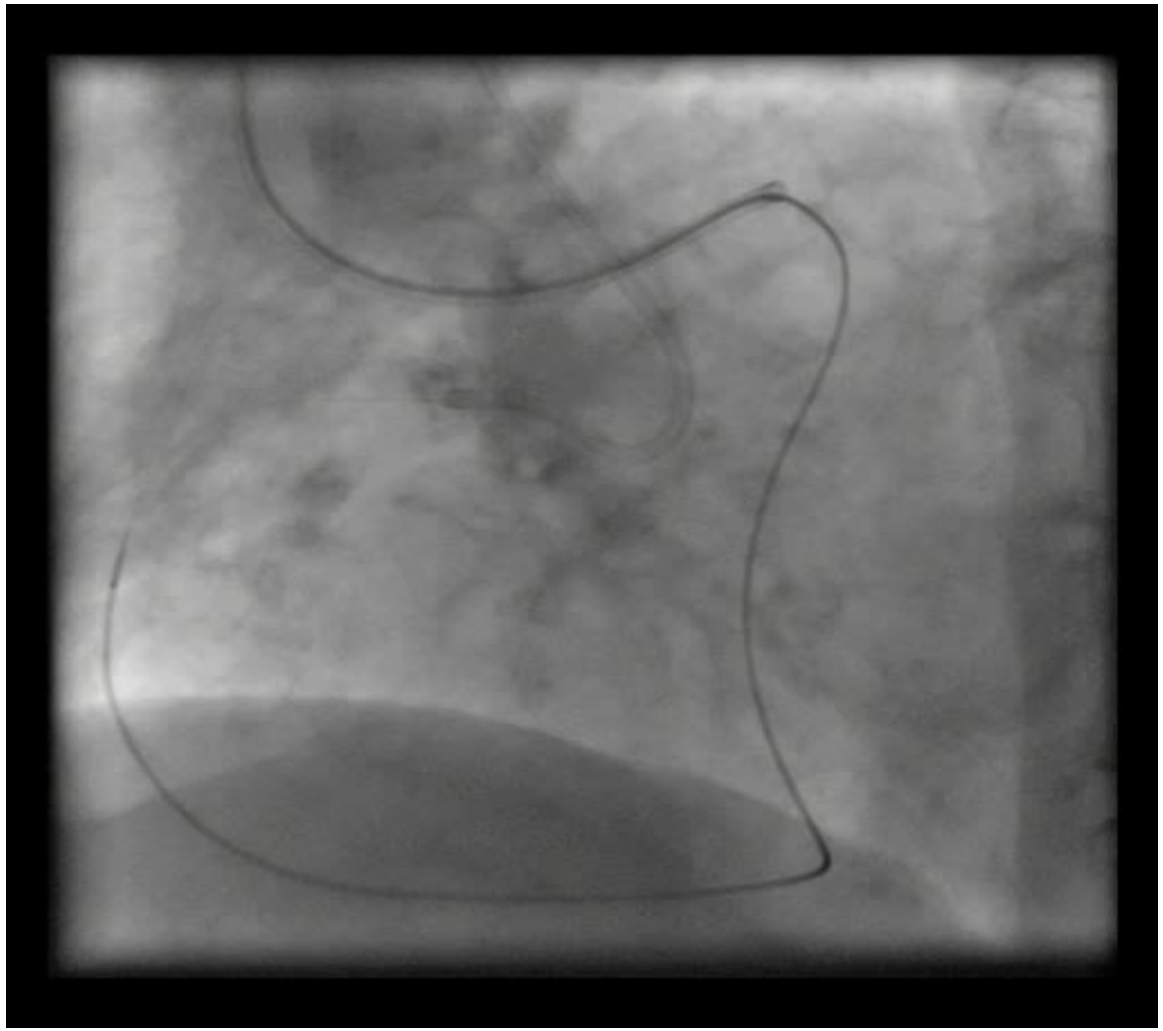
Passage of CTO with ConfianzaPro12
Wire enters into guide



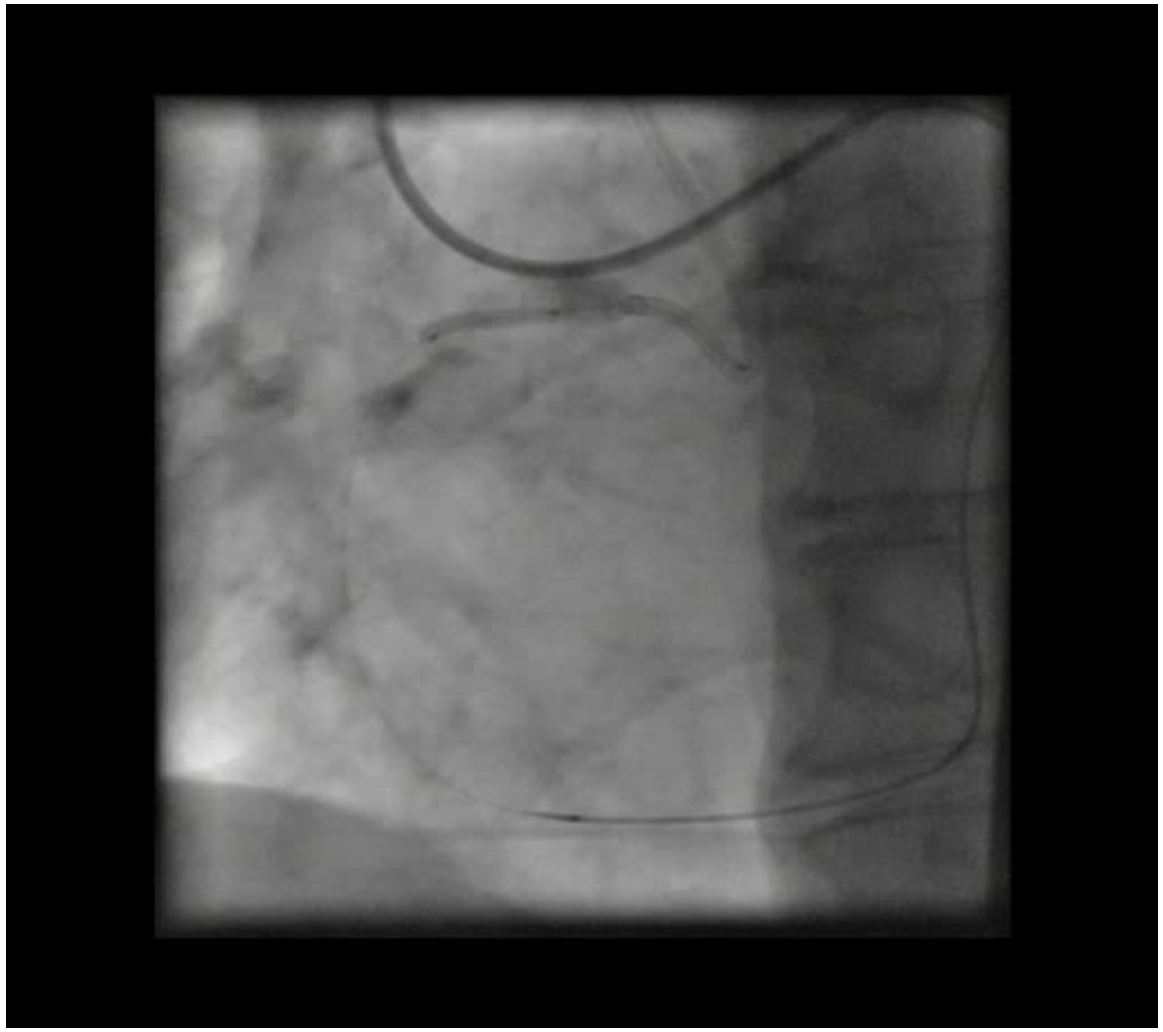
Microcatheter enters into guide



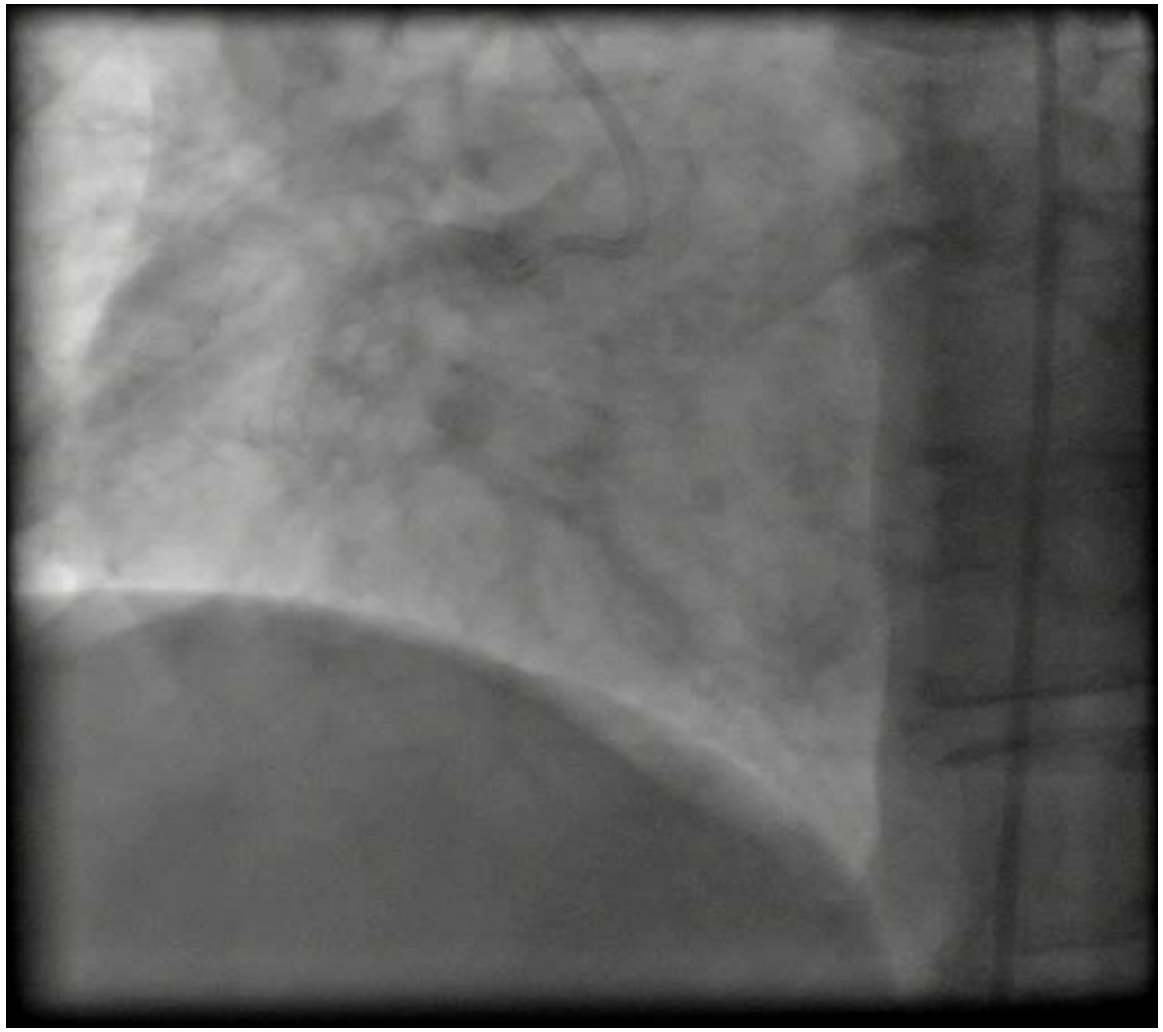
Exchange to RG3 330cm and externalisation



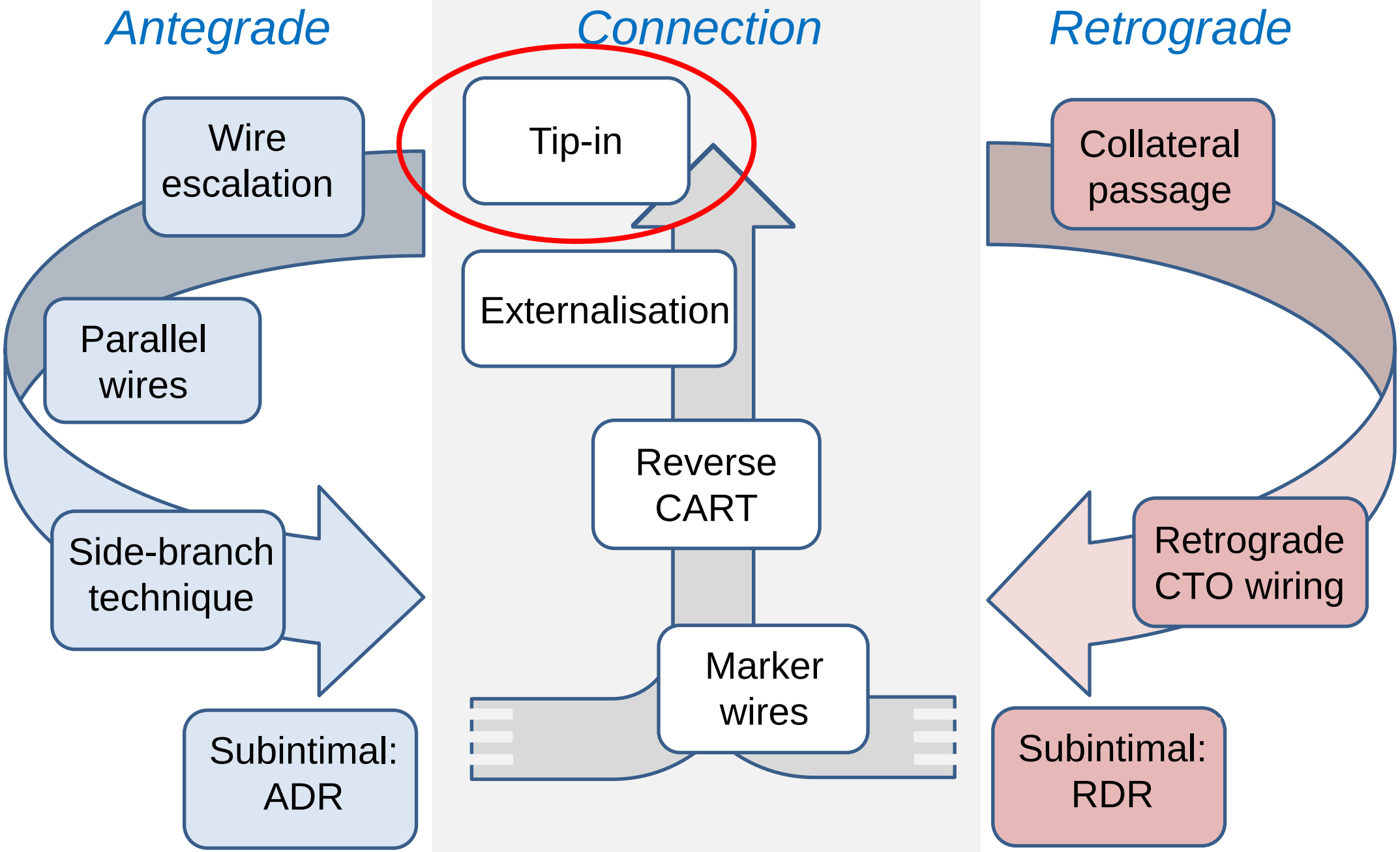
Pull-back of microcatheter to „parking position“



Balloon dilatation from antegrade over externalised wire



After stent implantation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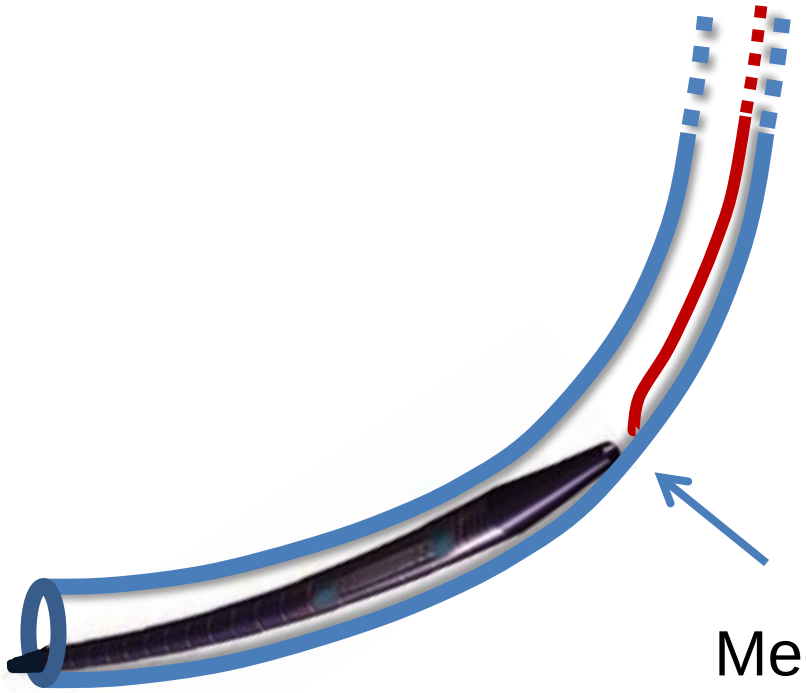
„Tip-in“ manoeuvre in guiding catheter

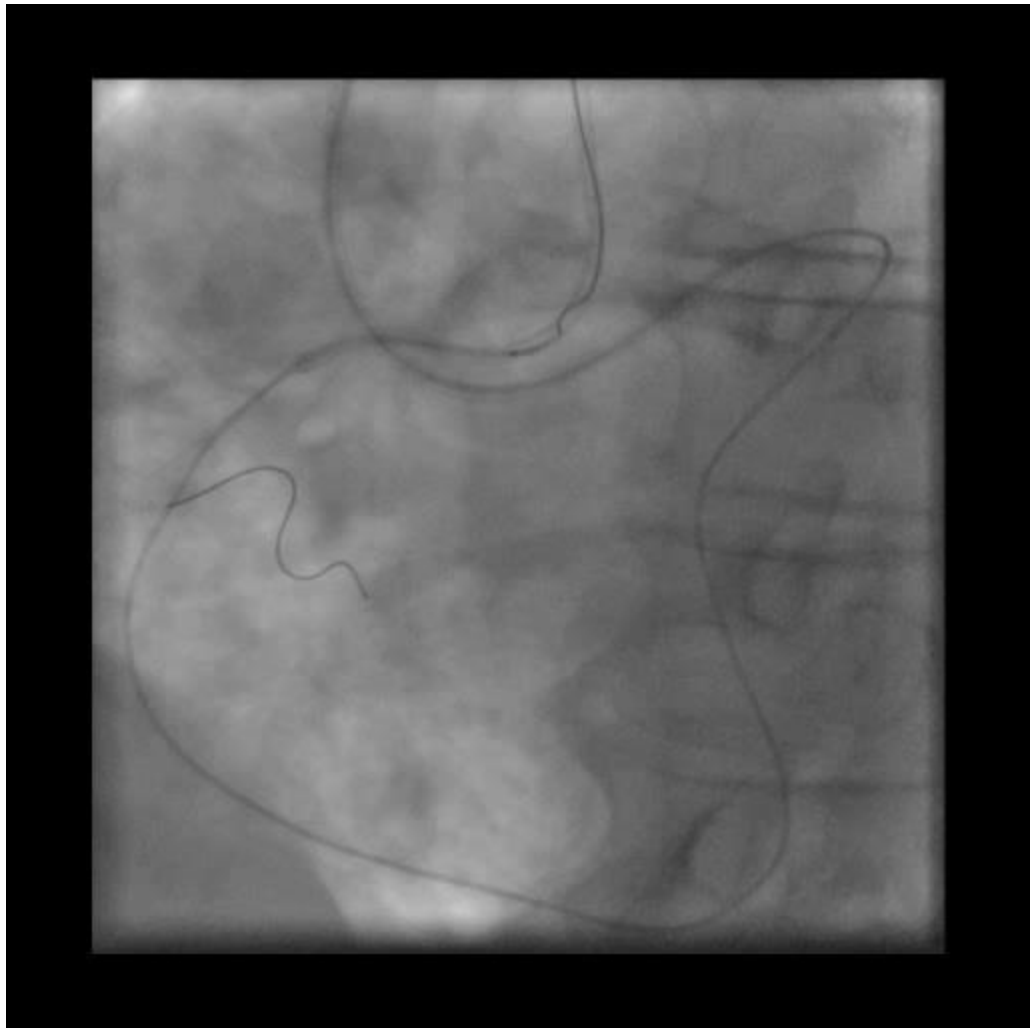


Antegrade wire

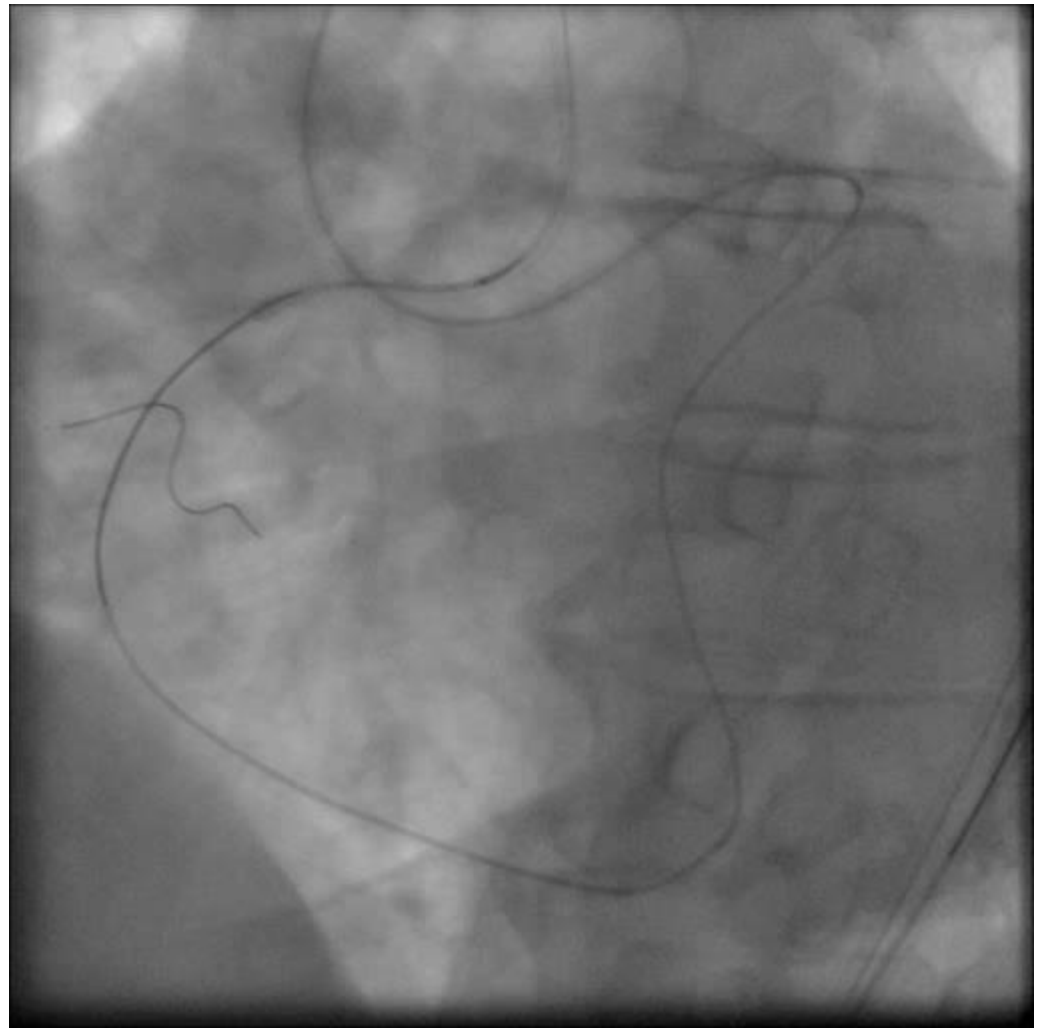
Meeting point in outer curve

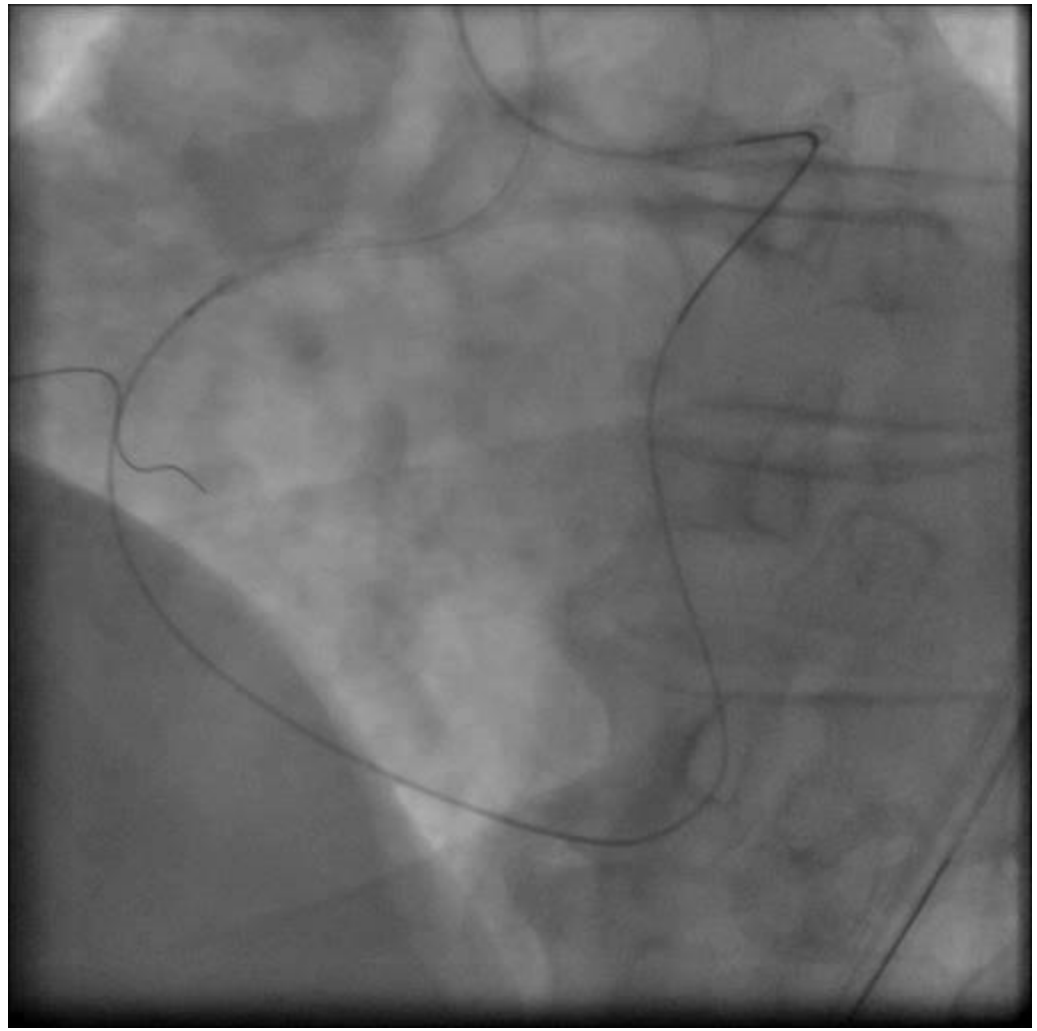
Retrograde microcatheter
in antegrade guide

RCA CTO: „Tip-in“ into microcatheter in antegrade guide



Tip-in with extra-support floppy wire





Advantages of …

Externalisation

- Optimal back-up
- No risk of loosing guiding or wire position

Tip – in

- Fast and predictable (on level of guiding catheter)
- Early retrieval of retrograde micro-catheter from collateral donor artery
- Elegant for distal wire correction

Retrograde technique: Tips

- When you start to work from retrograde look for an experienced colleague or a proctor
- The retrograde technical modules have to be learned and trained step-by-step
- Get experience with septal collaterals before using epicardial collateral pathways
- Try to achieve success with less complex recanalisation techniques and balance risk and clinical need before escalating