



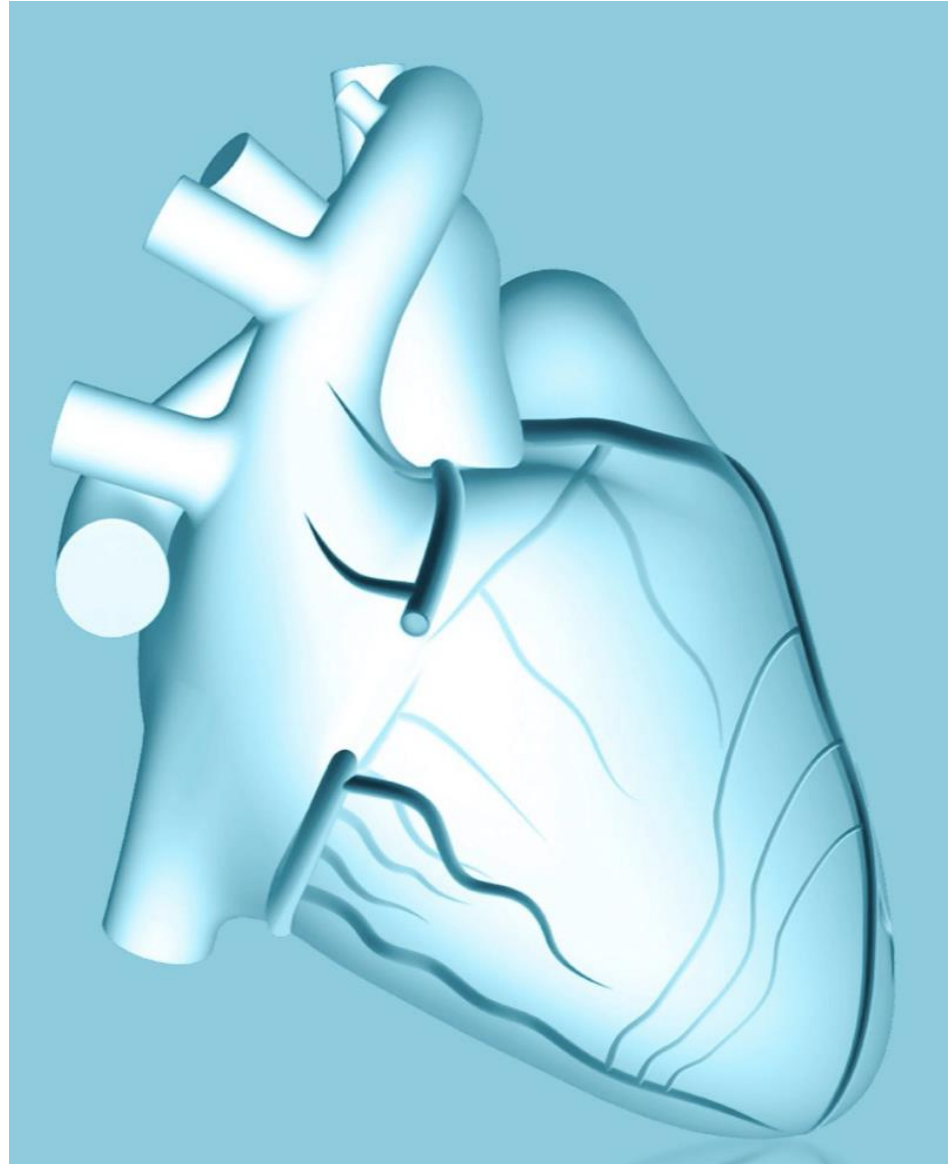
Antegrade en retrograde technieken voor de behandeling van CTOs

J. Halim

Amphia ziekenhuis Breda



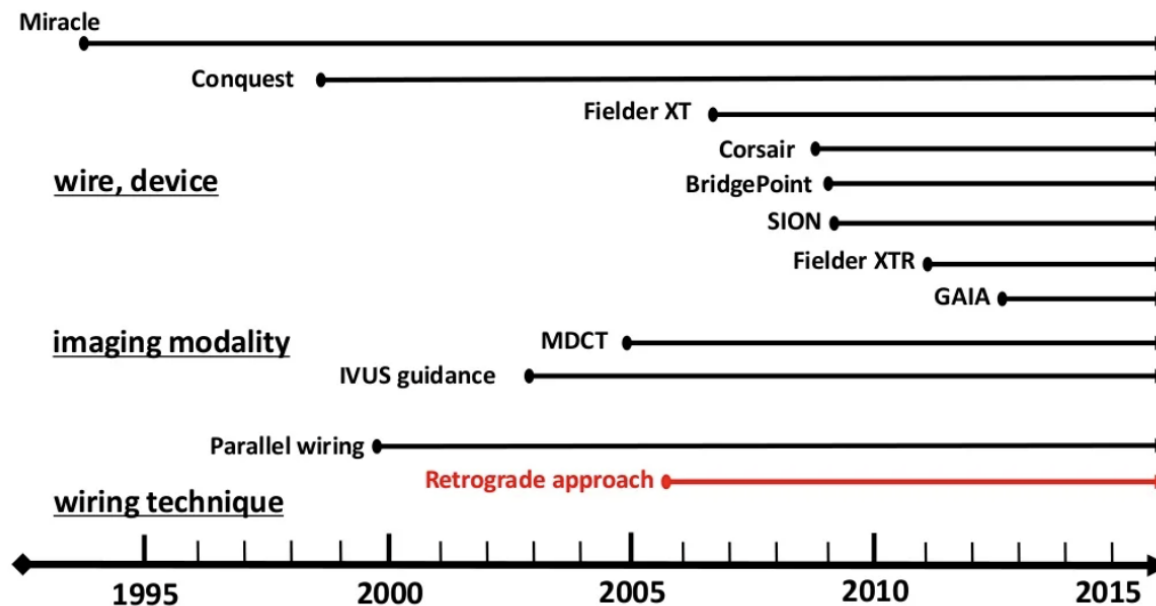
Achtergrond



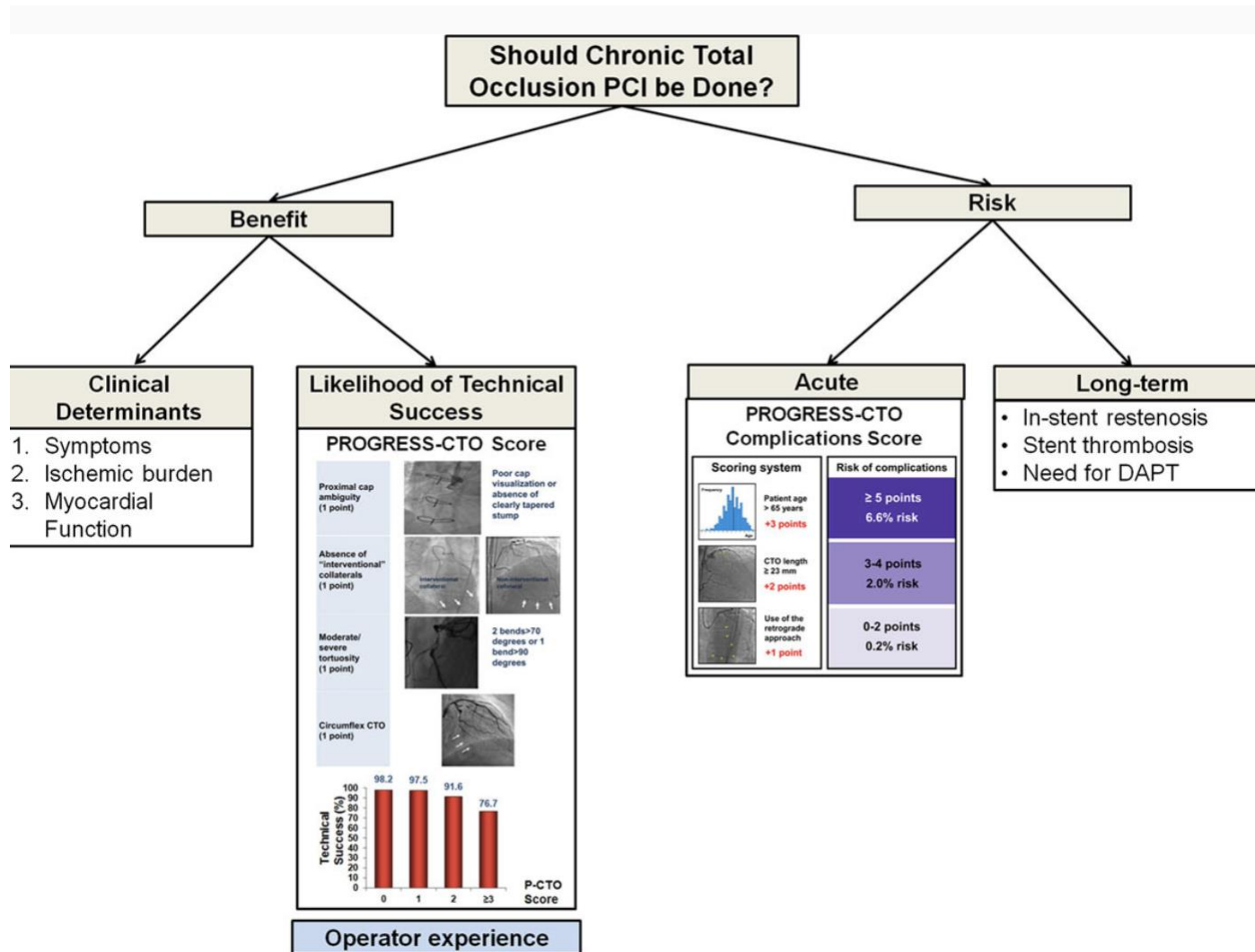
Chronische totale occlusie (CTO):

‘Occlusie van 1 of meer coronairen met een minimumduur van 3 maanden’

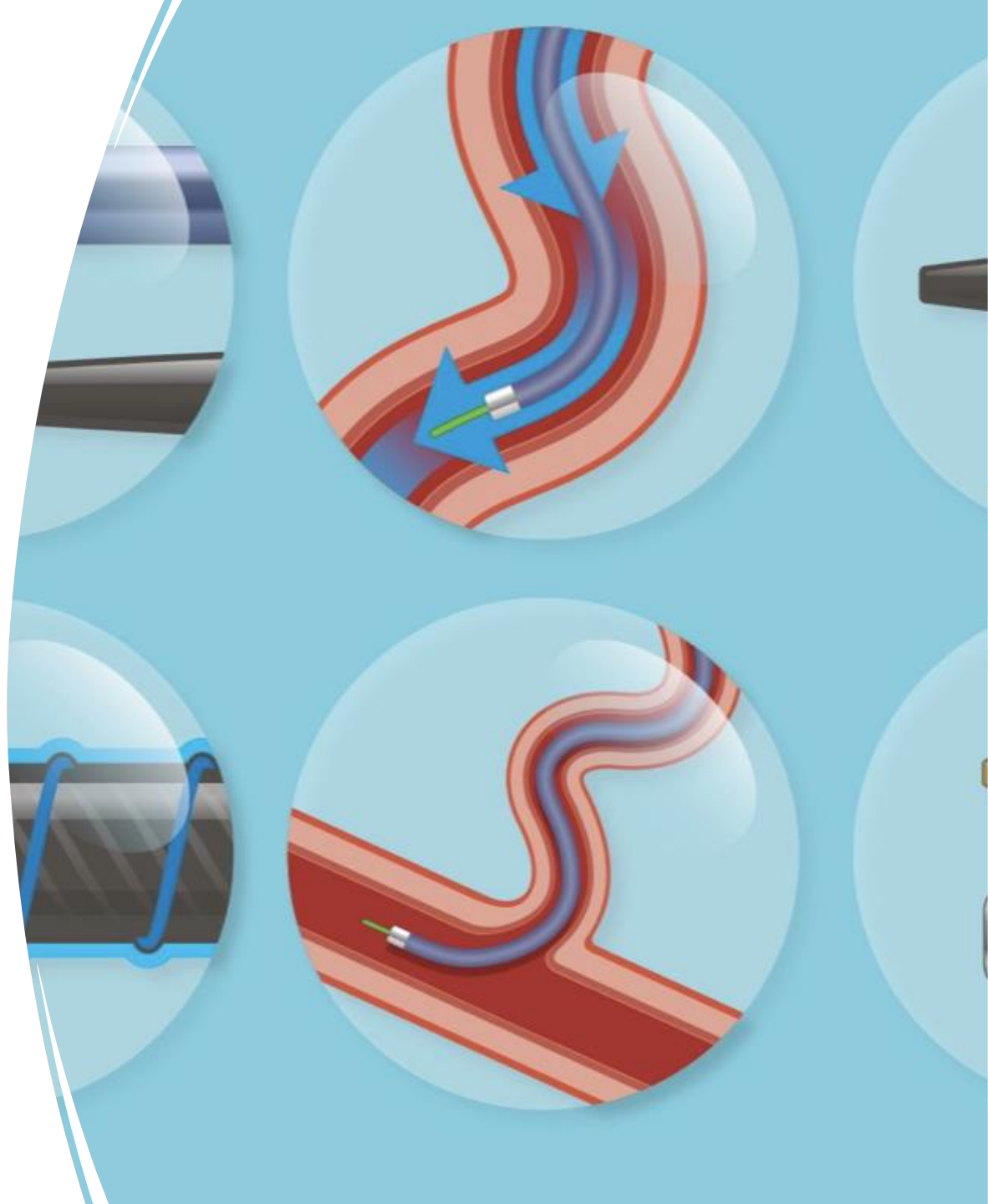
Development of CTO-PCI procedure



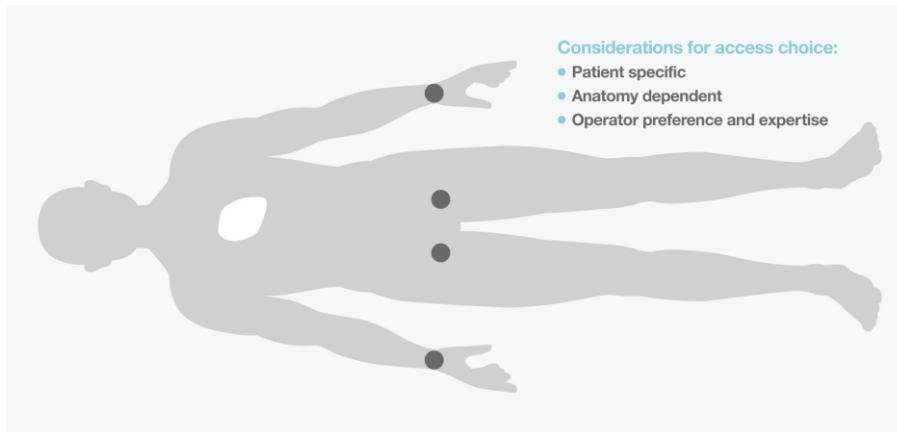
Indicatie



Basisprincipes CTO



Dual access



Potential advantages and disadvantages of guide catheter size

	PRO	CON
6F	Allows: • all transradial approach • reduced access site complications.	• cannot trap out larger microcatheters • all ADR over long wires • less support • microcatheter trap only with dedicated balloon
7F	Allows: • trap out larger microcatheters • CrossBoss and trap • Stingray and trap	• limited IVUS guided cap puncture options • no anchor balloon with ADR
8F	Allows: • microcatheter + anchor balloon + trap • real time IVUS guidance	• usually requires bi-femoral approach • increased risk of access site complications

N.B. Use of a dedicated trapping balloon will permit trapping of equipment in smaller guide catheters than illustrated above

1351 / M
PID: 8834470
BSN: 701700000

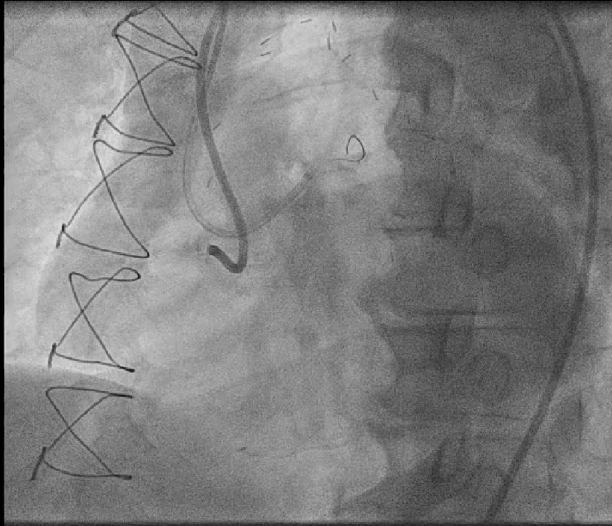
Amphia Ziekenhuis
HCK MG
Study Date: 17-09-2019
Series Time: 09:26:01
Content Time: 09:26:01
Beeld 01

KV: 82
SE: 1 / IMA: 1
Lat: LAO / Ang: 50
Long: Cranial / Ang: 1.8

HCK STANDAARD HARTKATHETERISATIE
Left Coronary 12.5frs



Zr-1951 / M
PID: 8834470
DC: 1951-1952

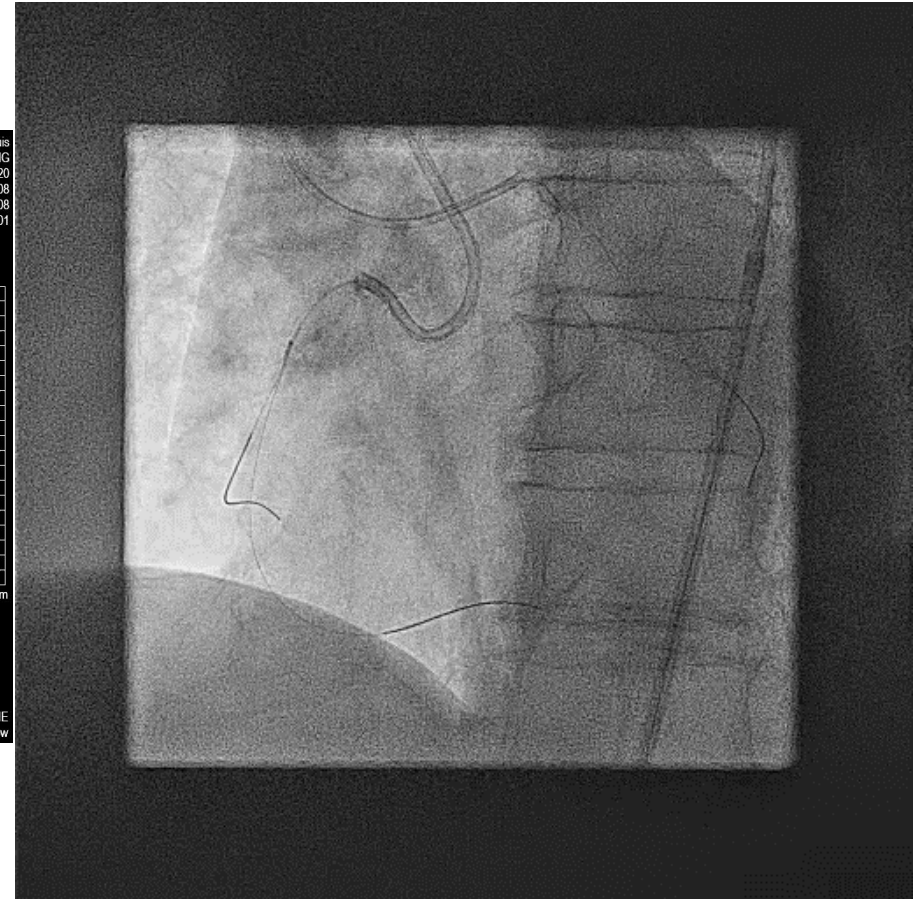


KV: 75.088
SE: 3 / IMA: 3
Lat: LAO / Ang: 39.900001525879
Long: Caudal / Ang: -0.1000000014901

Amphia Ziekenhuis
HCK MG
Study Date: 13-01-2020
Series Time: 14:21:08
Content Time: 14:21:08
Beeld 01



HCK STANDAARD HARTKATHETERISATIE
Coronary-SCH 7.5 fps Low



Differentiated tasks require different wire characteristics

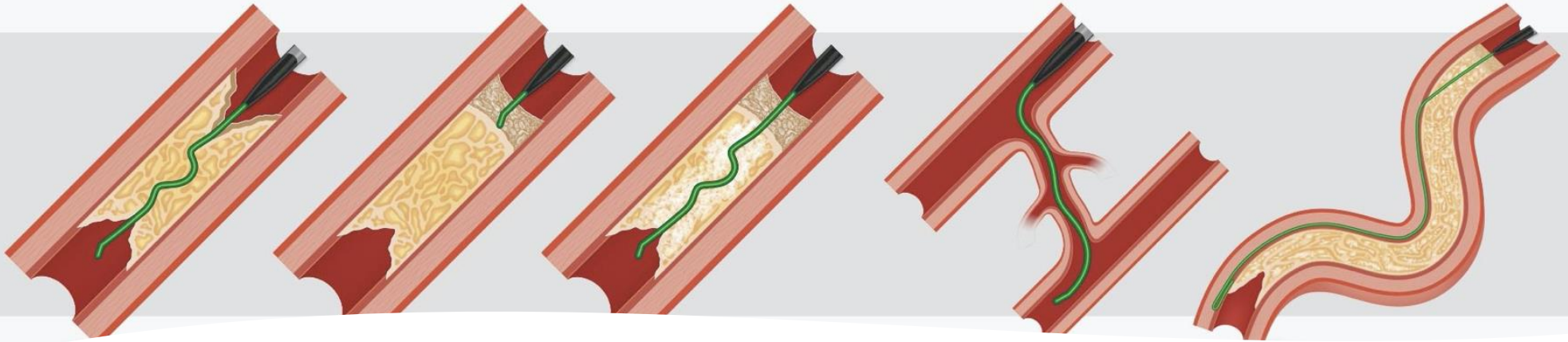
Tapered cap

Blunt proximal cap

Navigating calcium

Wiring collaterals

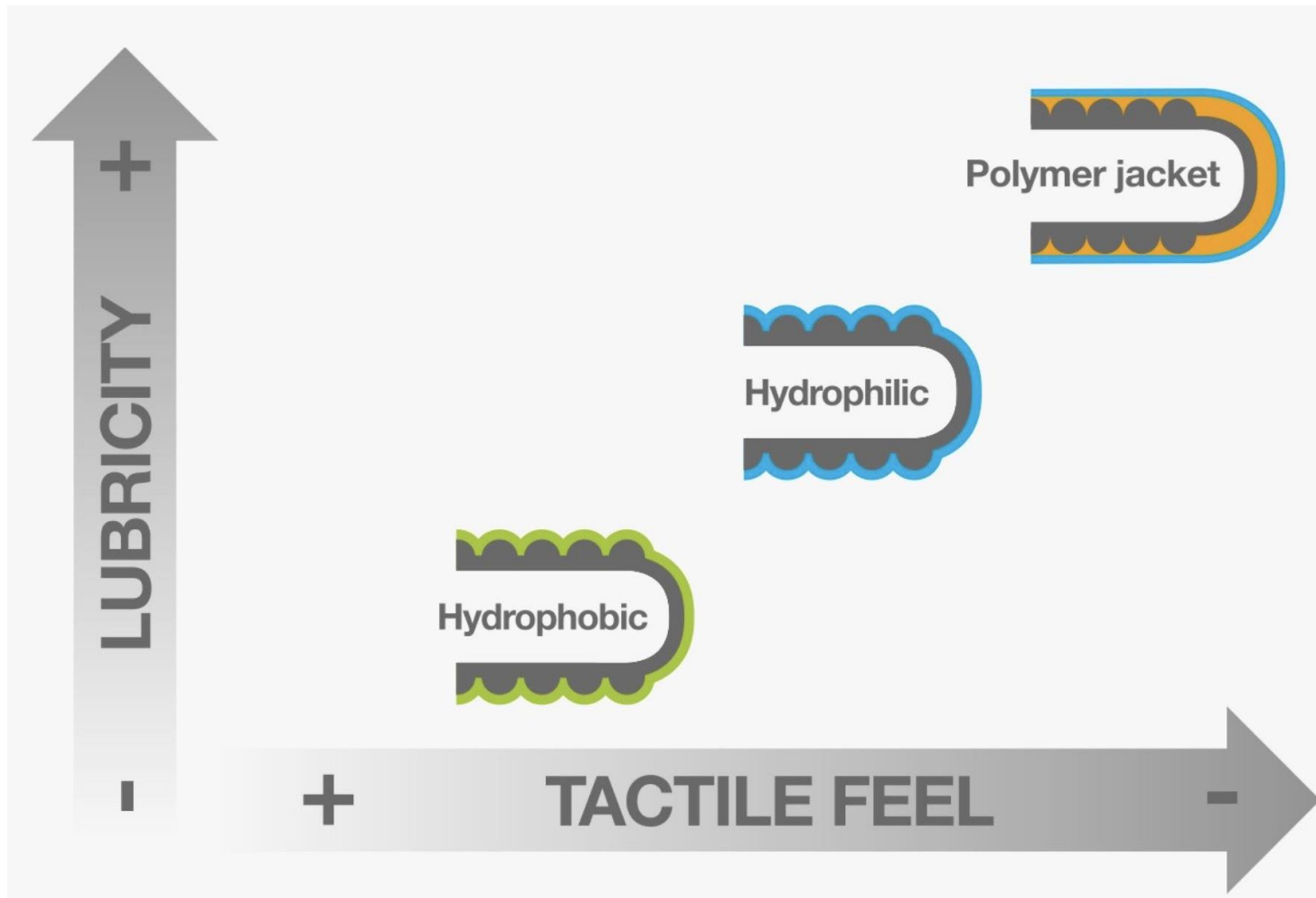
Dealing with tortuosity



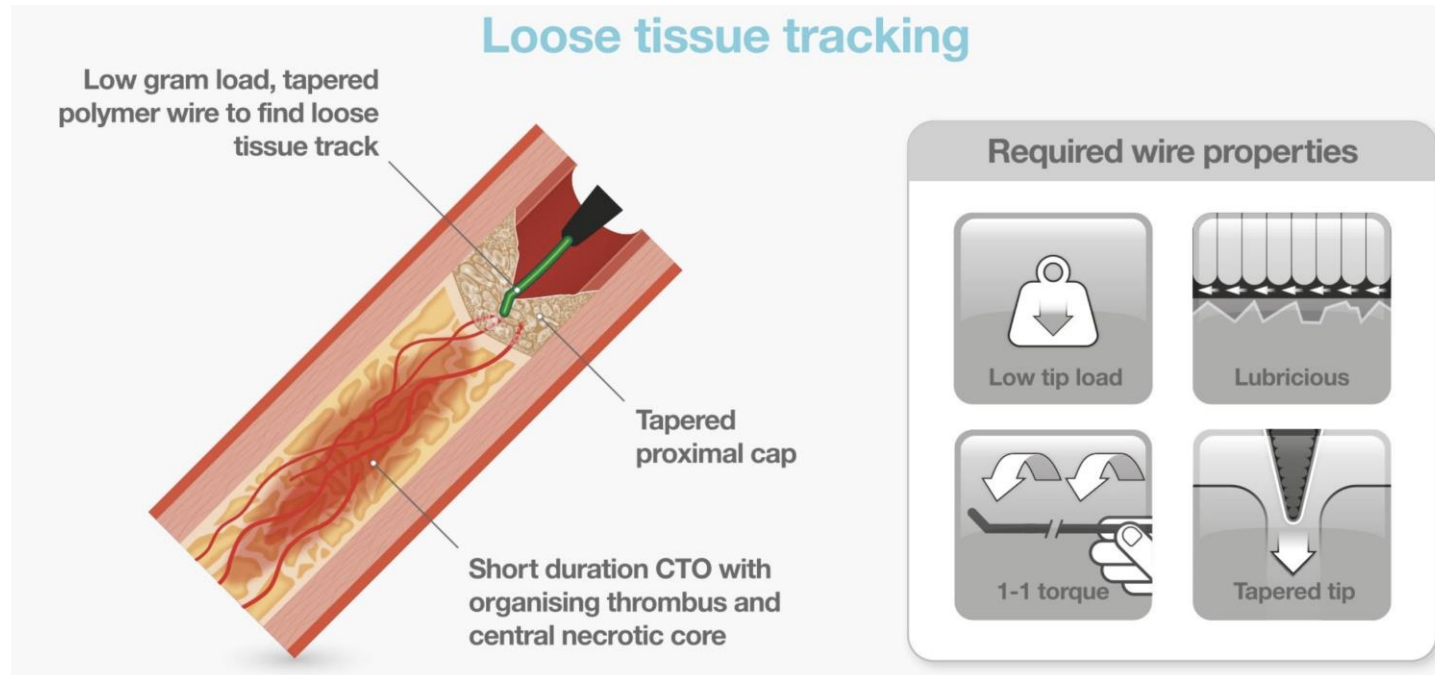
Wires

- Tapered, polymer wires
- Medium penetration, high torque wires
- Medium penetration, polymer wires
- High penetration wires
- Knuckle wires
- Collateral crossing wires
- Externalization wires

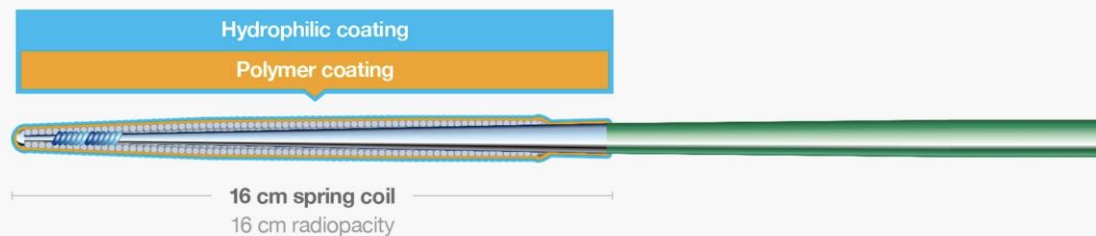




Loose tissue tracking



Fielder XT-A guidewire



Core
SION TECC

Cover
• Polymer coating

Coatings
• Hydrophilic

Wire O.D.
Wire - 0.36 mm (0.014")
Tip - 0.26 mm (0.010")

Tip load
1.0 g

Pilot 50



Core
Core-to-tip

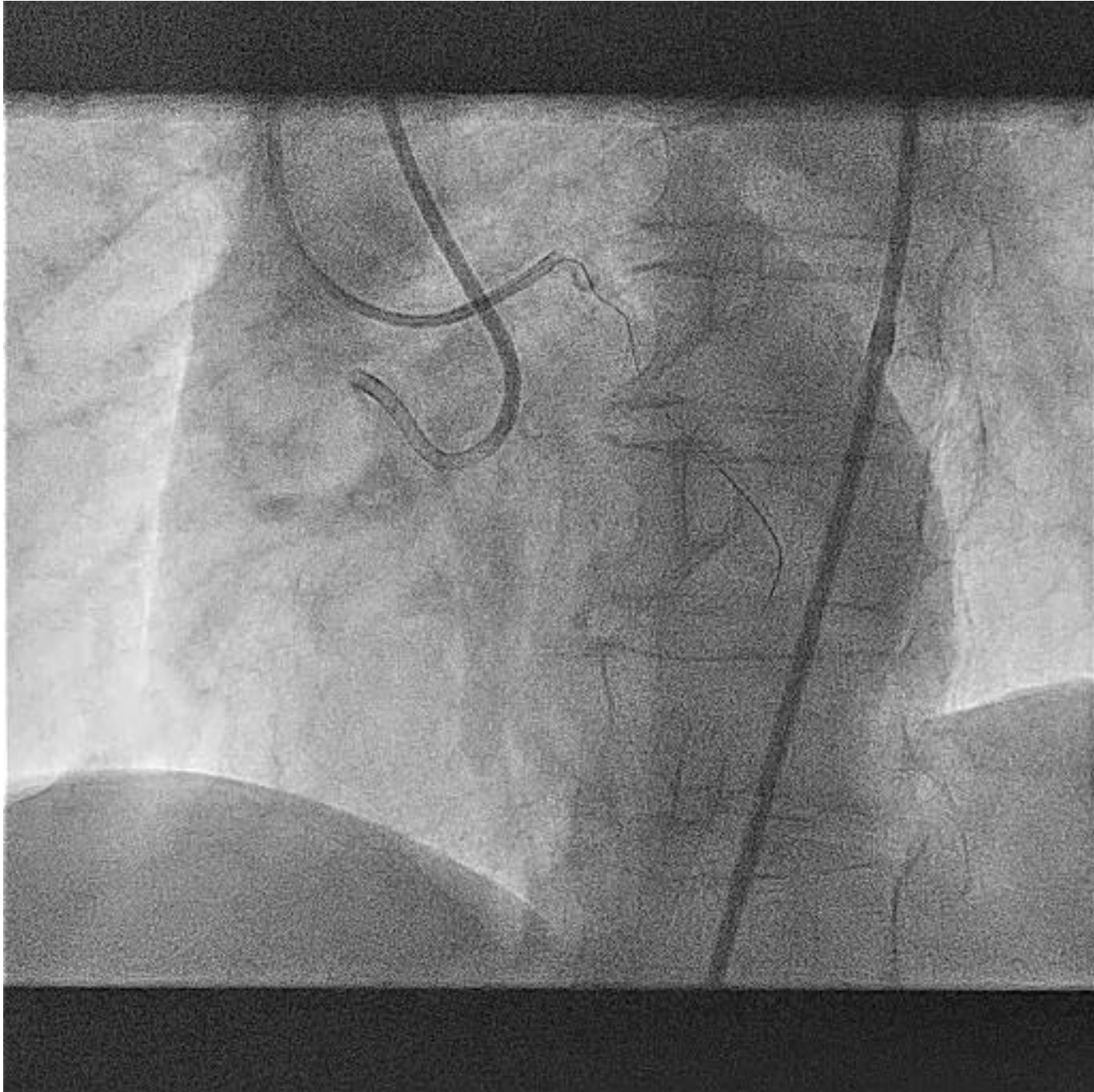
Cover
• Polymer jacket

Coatings
• Hydrophilic

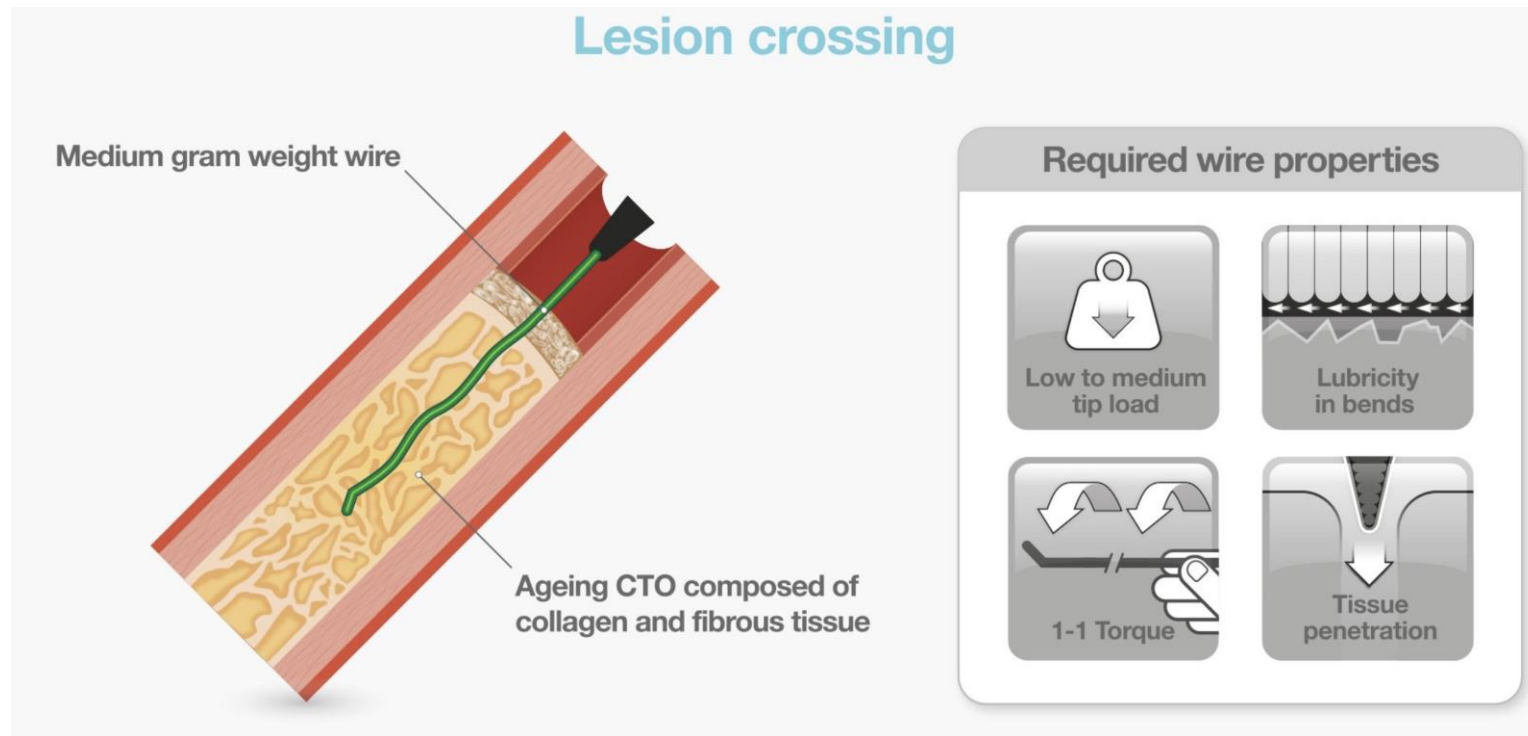
Wire O.D.
0.36 mm (0.014")

Tip load
1.5 g

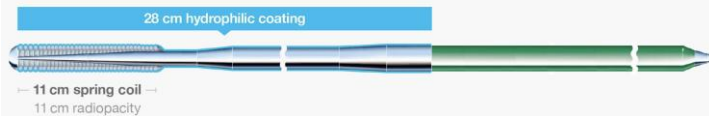




Lesion crossing



ULTIMATEbros 3



Core
Core-to-tip

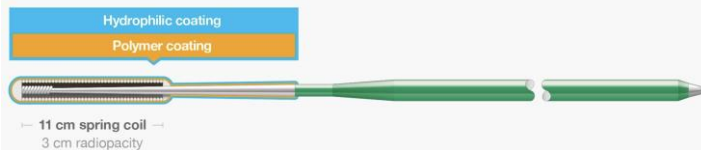
Cover
None

Coatings
• Hydrophilic

Wire O.D.
0.36 mm (0.014")

Tip load
3.0 g

Gladius guidewire



Core
SION TECC

Cover
• Polymer coating

Coatings
• Hydrophilic

Wire O.D.
0.36 mm (0.014")

Tip load
3.0 g

Pilot 200



Core
Core-to-tip

Cover
• Polymer jacket

Coatings
• Hydrophilic

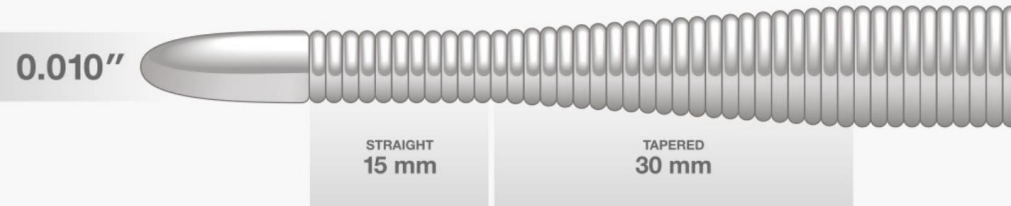
Wire O.D.
0.36 mm (0.014")

Tip load
4.1 g

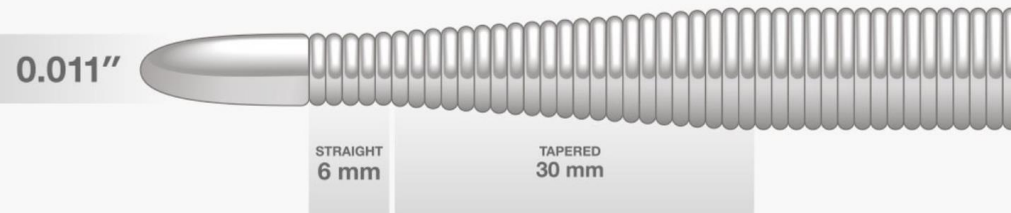


The ASAHI Gaia series of wires

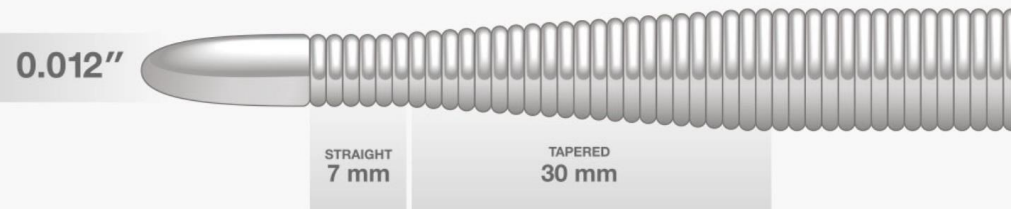
ASAHI Gaia First Tip load 1.7 g



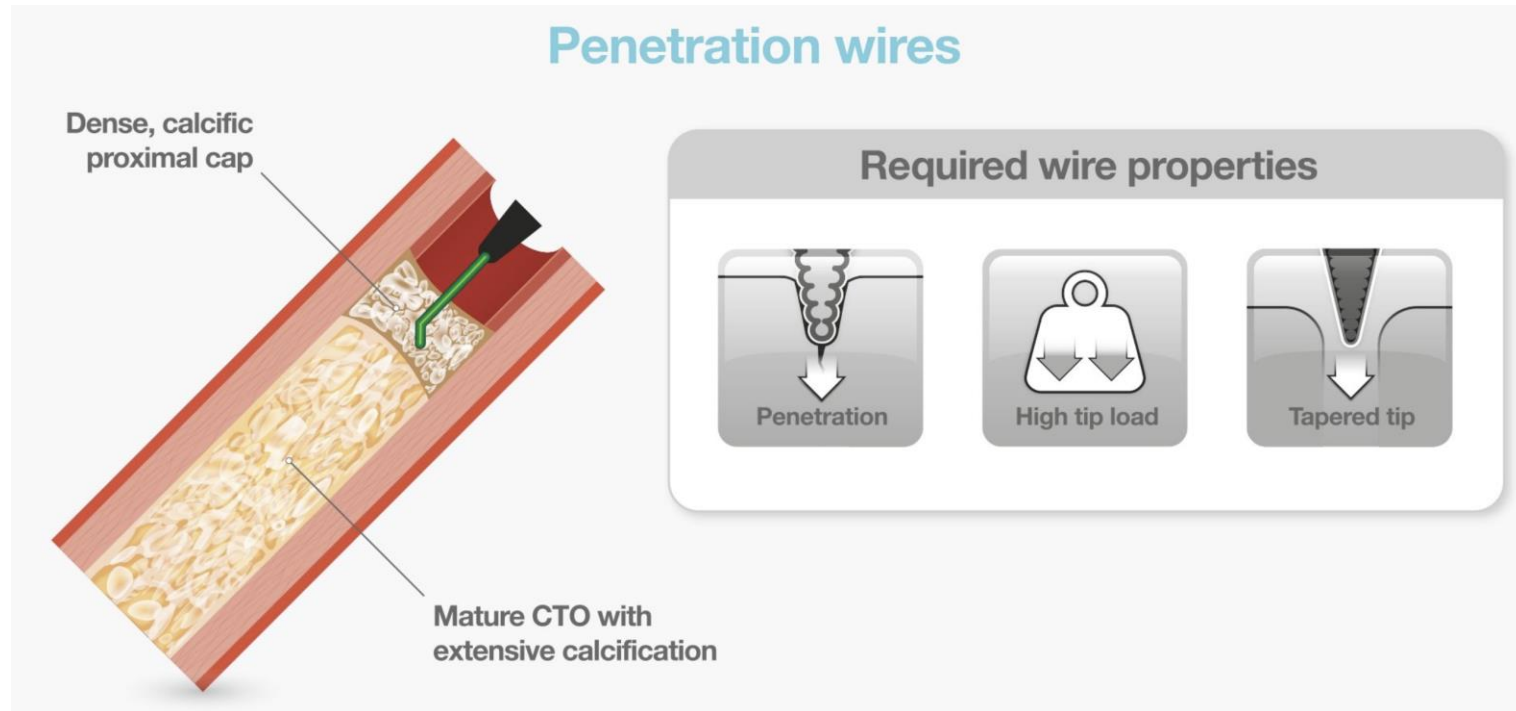
ASAHI Gaia Second Tip load 3.5 g



ASAHI Gaia Third Tip load 4.5 g



High penetration wires



CONFIANZA PRO 9/12



Core	Cover	Coatings	Wire O.D.	Radiopacity	Tip load
Core-to-tip	None	• Hydrophilic	Wire - 0.36 mm (0.014") Tip - 0.26 mm (0.009")	20 cm	9.0 g / 12.0 g

Hornet 14



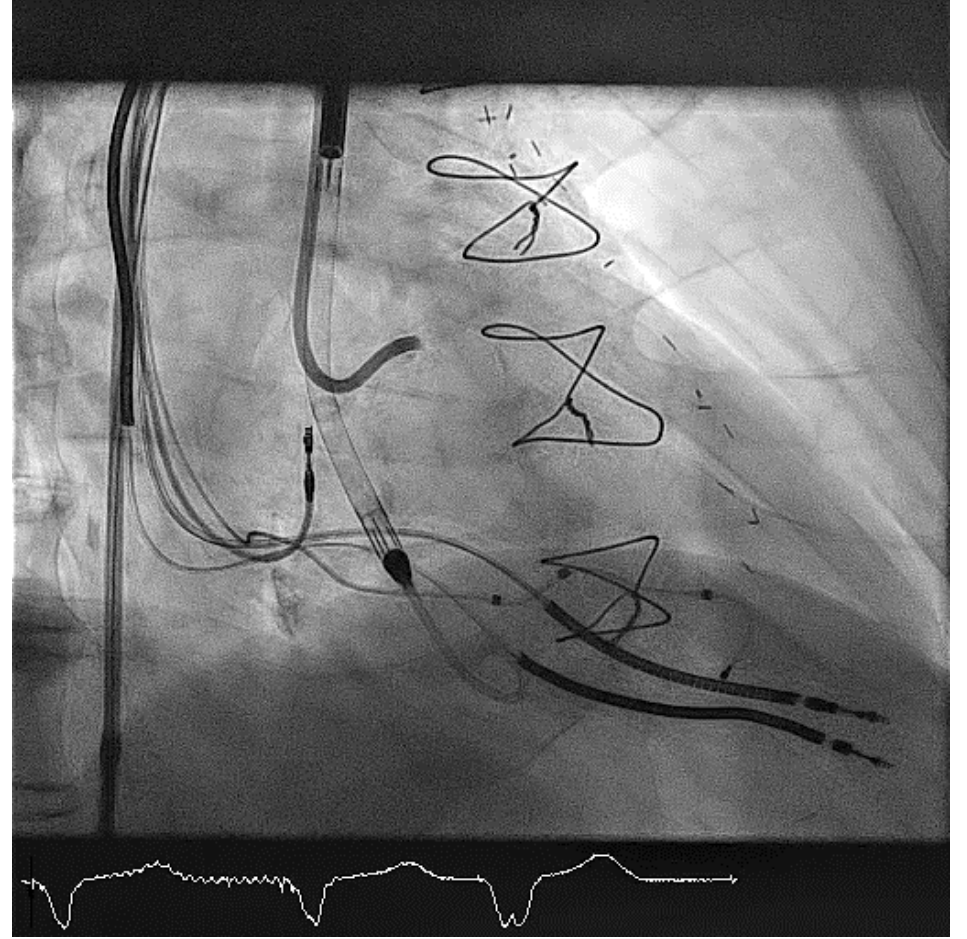
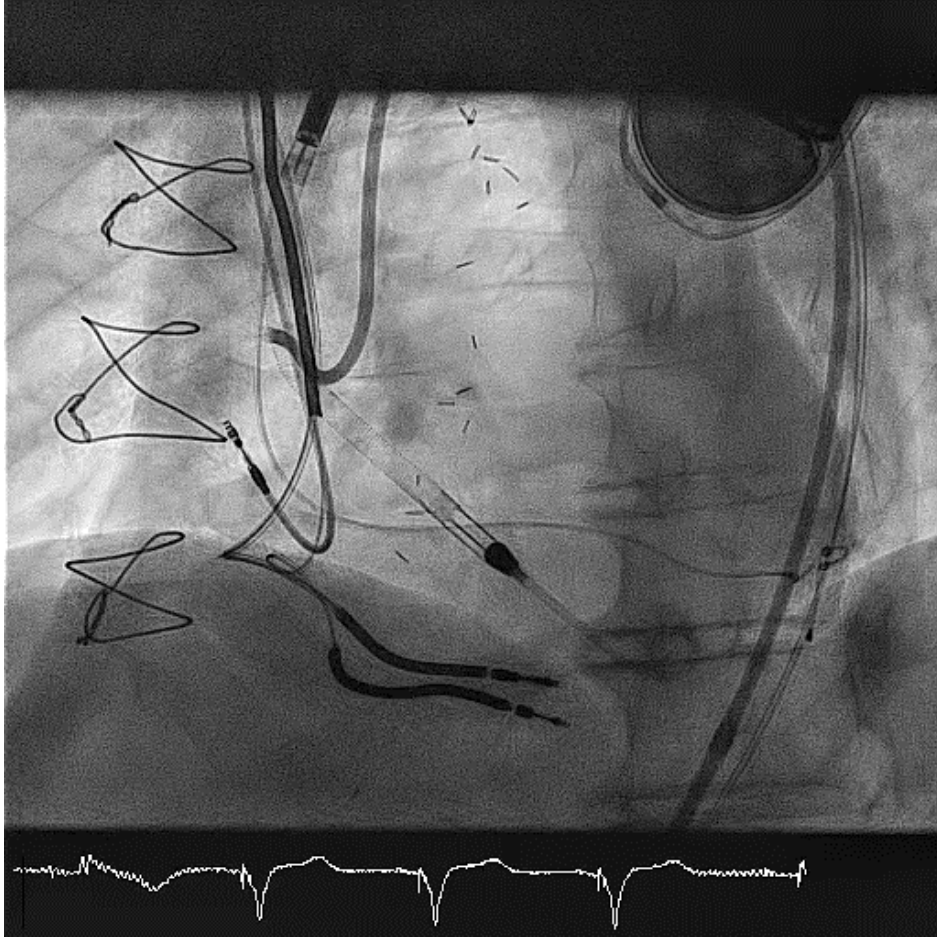
Core	Cover	Coatings	Wire O.D.	Tip load
Core-to-tip	None	• Hydrophilic	Wire - 0.36 mm (0.014") Tip - 0.21 mm (0.008")	14.0 g

Astato XS 8-20 / 8-40



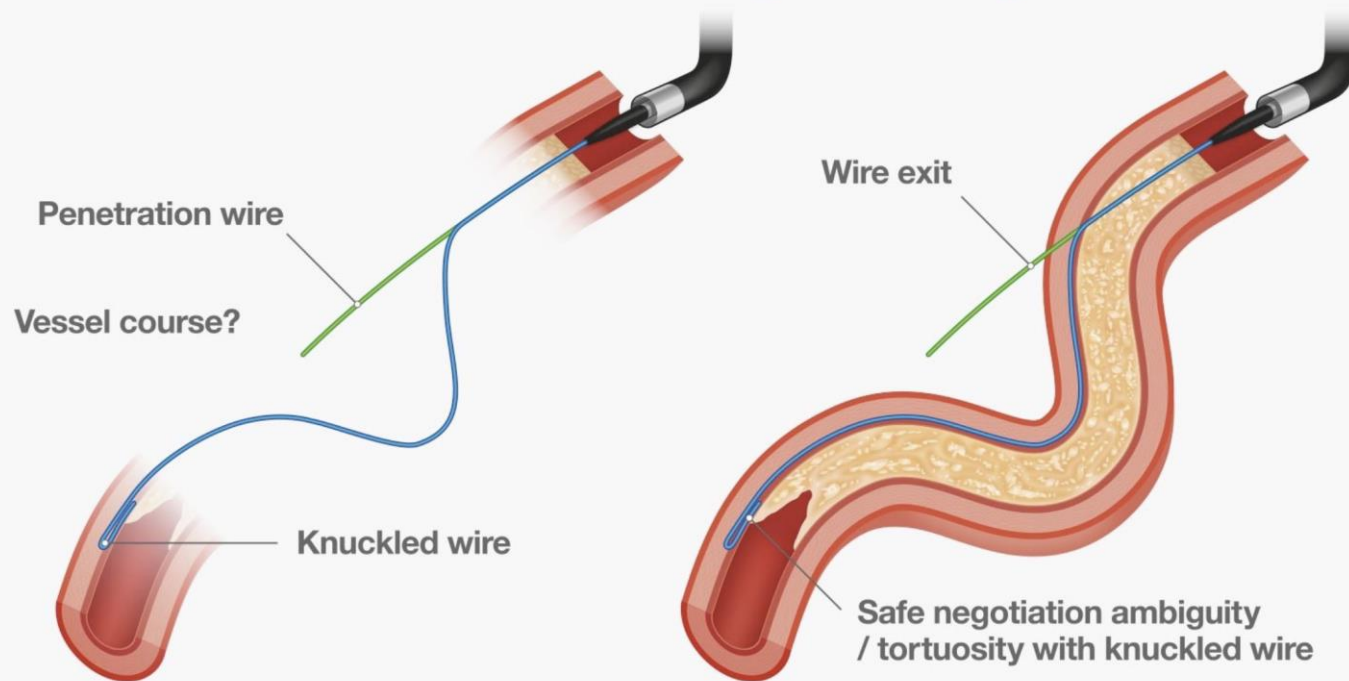
Core	Cover	Coatings	Wire O.D.	Tip load
Core-to-tip	None	• Hydrophilic ■ Uncoated ball tip	Wire - 0.36 mm (0.014") Tip - 0.21 mm (0.008")	20.0 g / 40.0 g



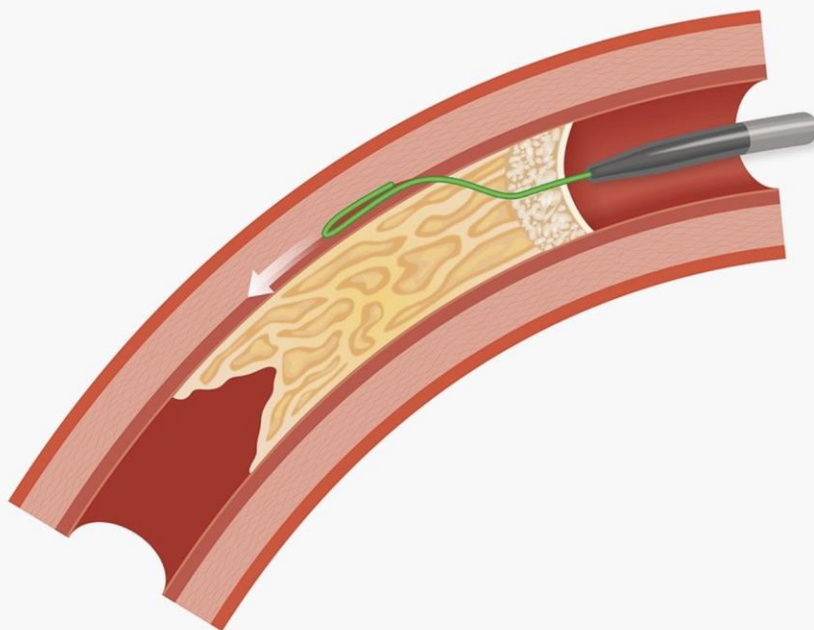


Knuckle wires

Knuckled wire (blunt dissection) versus penetration wire in tortuous or ambiguous segments

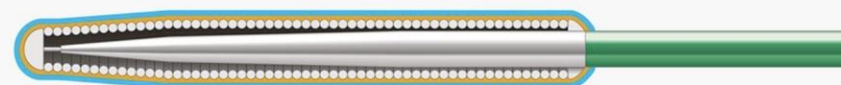


Knuckle toolkit



First line

Wire: ASAHI Fielder XT



Tapered (0.009") polymer wire with low tip load (0.8 g)

Second line

Wire: Pilot 200



Non-tapered (0.014") polymer wire with medium tip load (4.1 g)



Collateral crossing

Collateral wiring

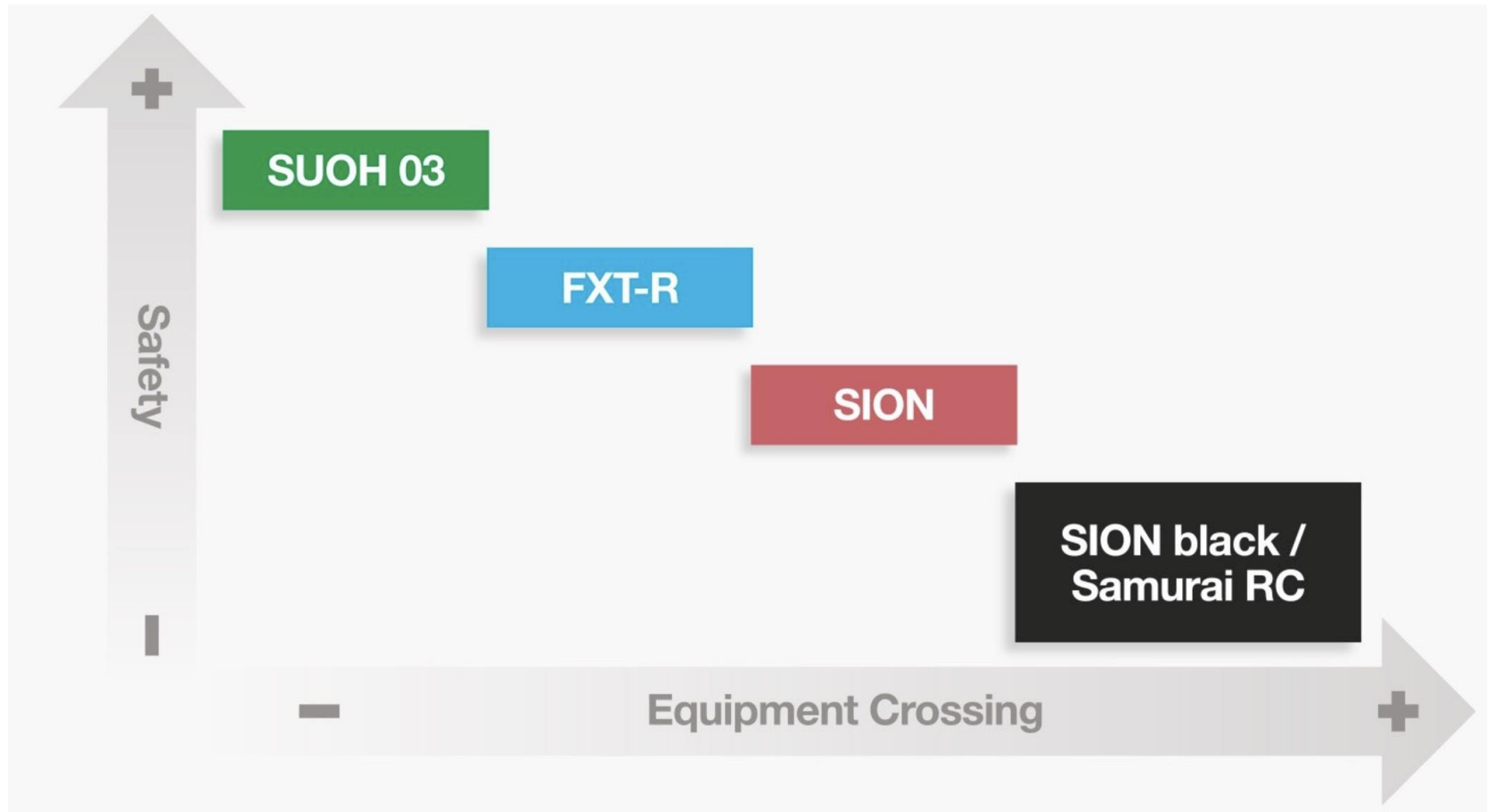


Required wire properties

- Low tip load
- Spring coil hydrophilic wire
- 1-1 torque response
- Flexibility in shaft

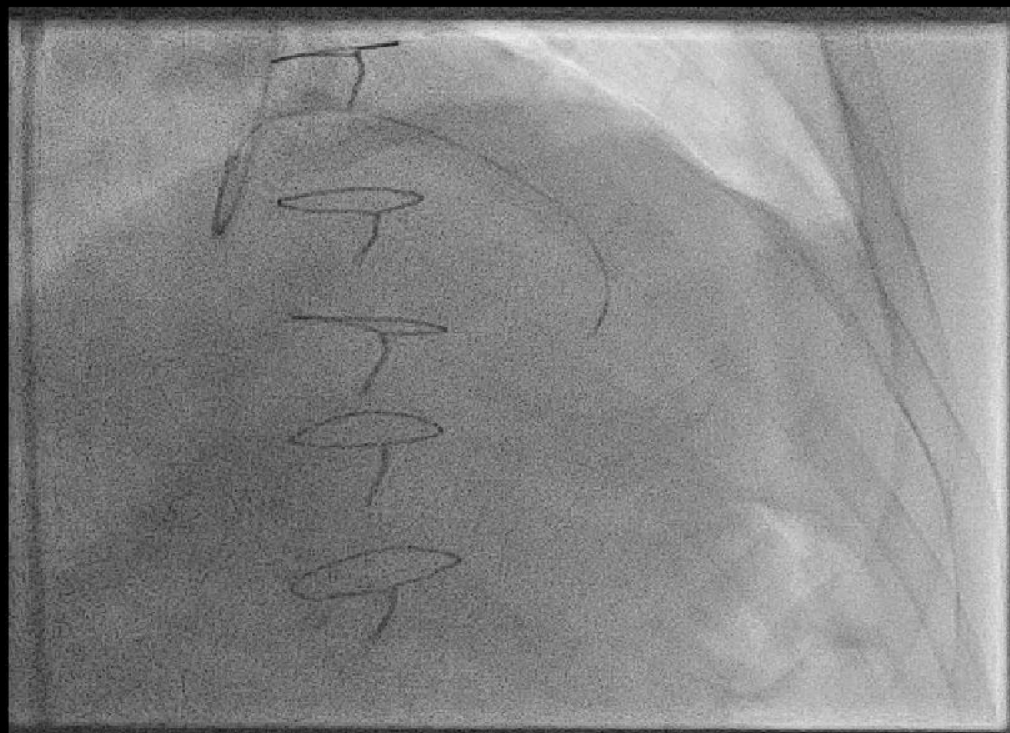
SION / Fielder XT-R / SION black / Samurai RC / SUOH 03





1944 / M
PID: 7756188
15

Amphia Ziekenhuis
HCK MG
Study Date: 08-07-2020
Series Time: 10:25:28
Content Time: 10:25:28
Beeld 001



KV: 90.367
SE: 12 / IMA: 12
Lat: RAO / Ang: -30.299999237061
Long: Cranial / Ang: 26.200000762939

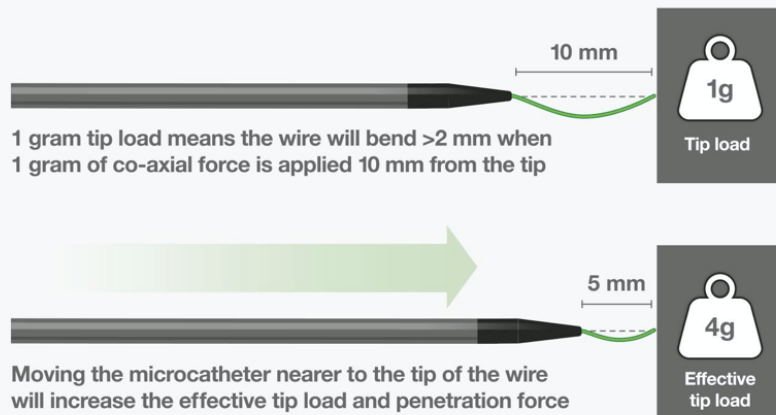
HCK STANDAARD HARTKATHETERISATIE
Fluoroscopy - stored



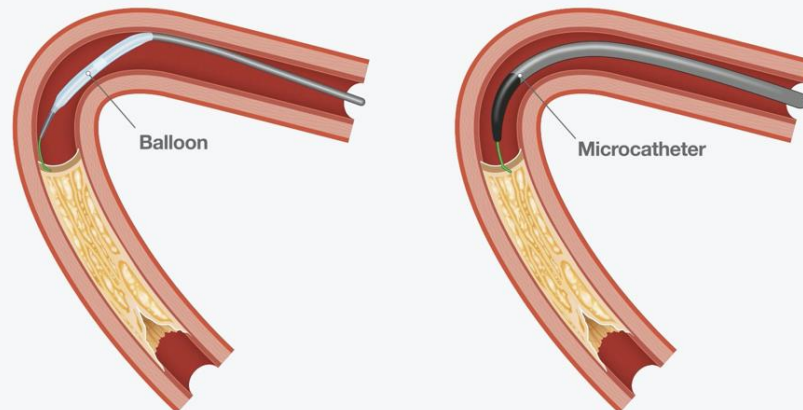
Microkatheters

- a) Wire exchange
- b) Wire torque transmissie
- c) Variatie in tipload
- d) Co-axial support
- e) Lesion crossing

Tip load and penetration force



Microcatheters facilitate delivery of co-axial force in tortuous coronary anatomy



Non-coil based microkatheter

CARAVEL

Entry Profile

0.48 mm (1.4 F)

Distal Profile

0.62 mm (1.9 F)

Proximal Profile

0.85 mm (2.6 F)

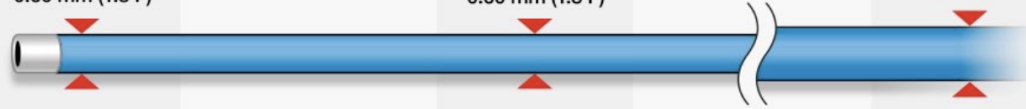


FINECROSS MG

0.60 mm (1.8 F)

0.60 mm (1.8 F)

0.87 mm (2.6 F)

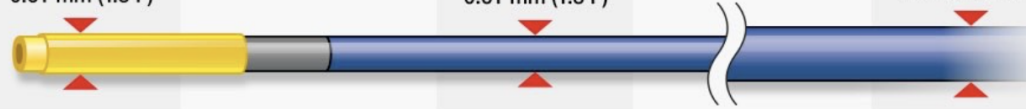


SUPERCROSS

0.61 mm (1.8 F)

0.61 mm (1.8 F)

0.84 mm (2.5 F)



NHANCER PRO X

0.5 mm (1.5 F)

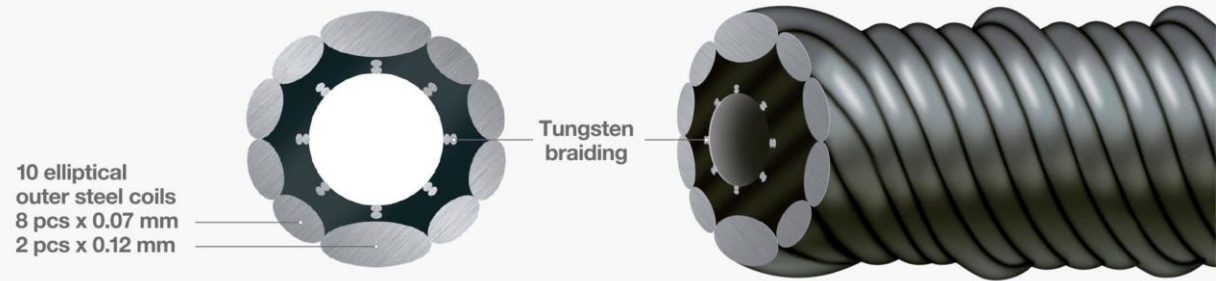
0.76 mm (2.3 F)

0.86 mm (2.6 F)

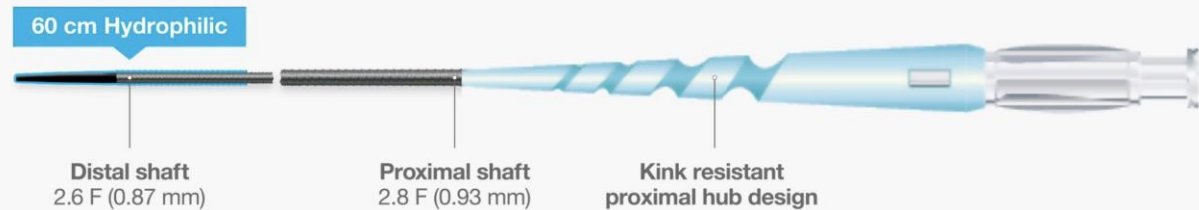


Coli based microkatheter

Corsair and Corsair Pro shaft construction



Corsair Pro



Coatings

- Hydrophilic
- 135 cm catheter = distal 60 cm
- 155 cm catheter = distal 60 cm

Shaft O.D.

- Tip - 0.016" (1.2 F)
- Distal - 0.034" (2.6 F)
- Proximal - 0.037" (2.8 F)

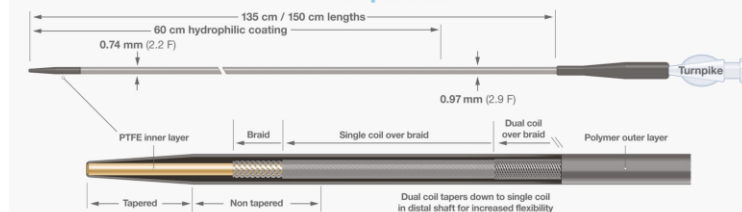
Shaft I.D.

- Tip - 0.015" (1.1 F)
- Distal - 0.018" (1.35 F)
- Proximal - 0.018" (1.35 F)

Shaft lengths

- 135 cm
- 150 cm

Turnpike LP



Coatings

Hydrophilic
-135 cm catheter = distal 60 cm
-155 cm catheter = distal 60 cm

Shaft O.D.

Tip - 0.021" (1.6 F)
Distal - 0.029" (2.2 F)
Proximal - 0.038" (2.9 F)

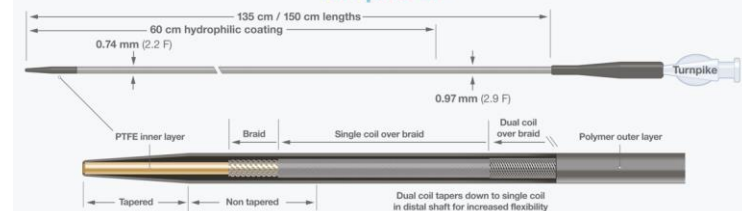
Shaft I.D.

Tip - 0.015" (1.1 F)
Shaft - 0.018" (1.3 F)

Shaft lengths

135 cm
150 cm

Turnpike LP



Coatings

Hydrophilic
-135 cm catheter = distal 60 cm
-155 cm catheter = distal 60 cm

Shaft O.D.

Tip - 0.021" (1.6 F)
Distal - 0.029" (2.2 F)
Proximal - 0.038" (2.9 F)

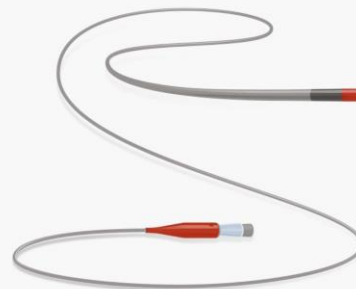
Shaft I.D.

Tip - 0.015" (1.1 F)
Shaft - 0.018" (1.3 F)

Shaft lengths

135 cm
150 cm

Mamba



Coatings

Hydrophilic
-135 cm catheter = distal 60 cm
-150 cm catheter = distal 60 cm

Shaft O.D.

Tip - 0.018" (1.4 F)
Distal (Mamba) - 0.032" (2.4 F)
Distal (Mamba Flex) - 0.028" (2.1 F)

Shaft I.D.

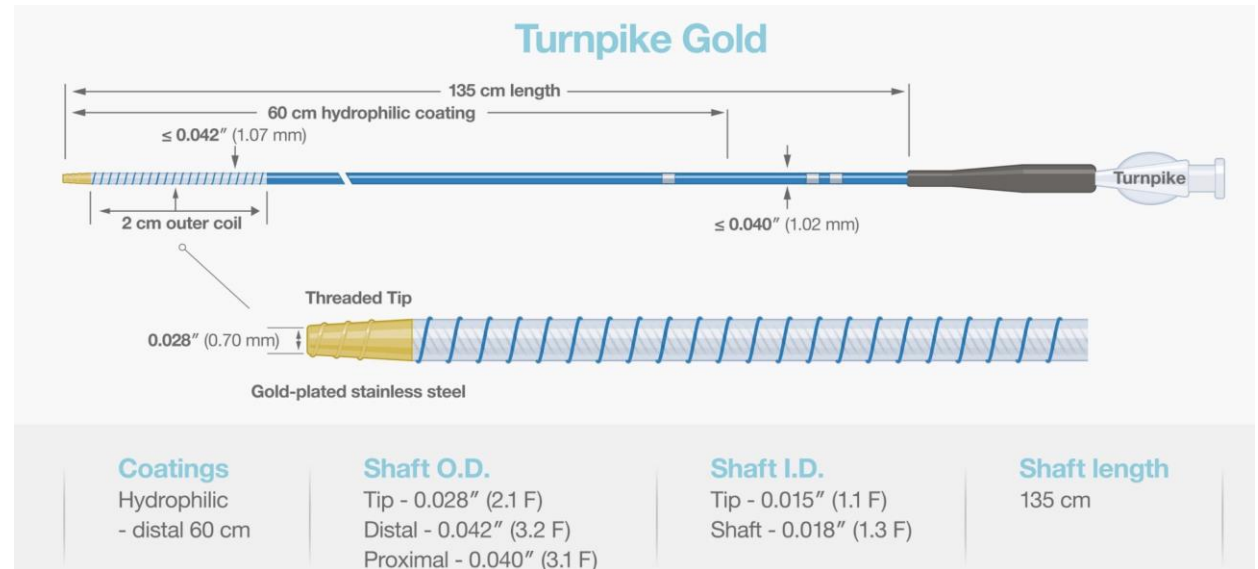
Not available

Shaft lengths

Mamba - 150 cm
Mamba Flex
- 135 and 150 cm



Penetration microkatheters



Tornus 2.1 F
0.12 mm x 8 wires



Tornus 88 Flex (2.6 F)
0.18 mm x 8 wires

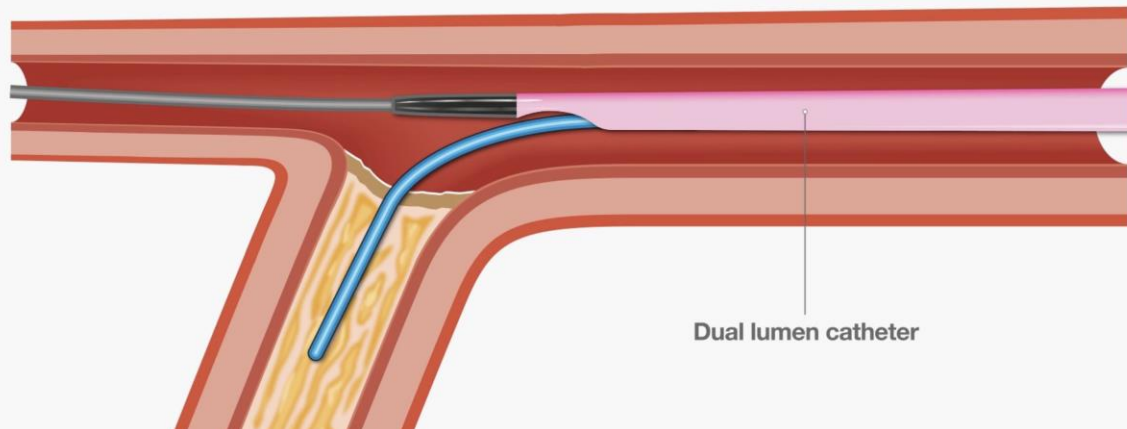


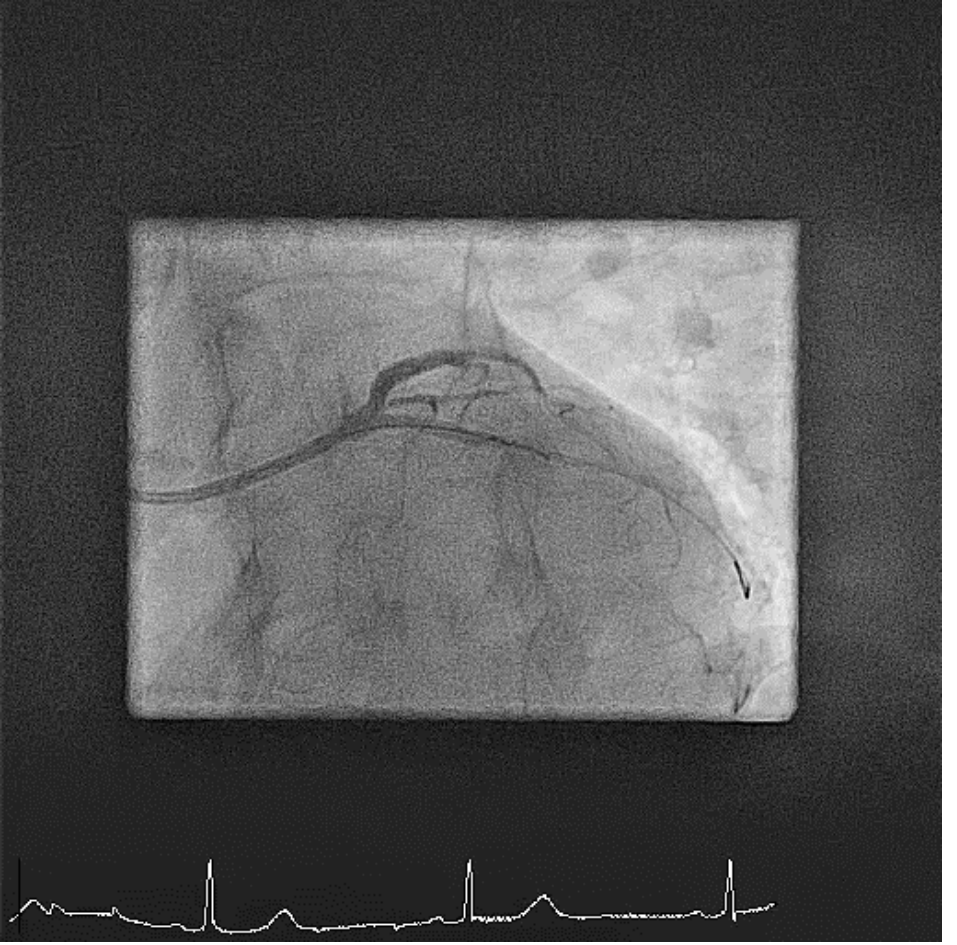
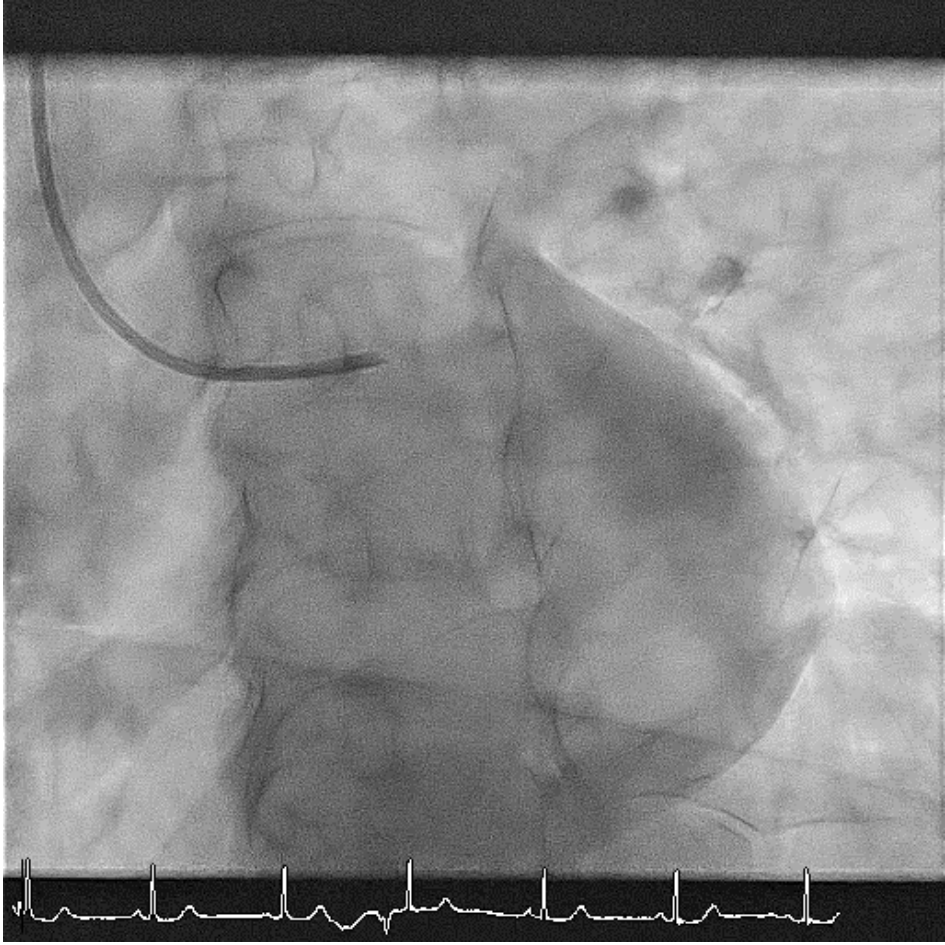
Dual lumen microkatheter

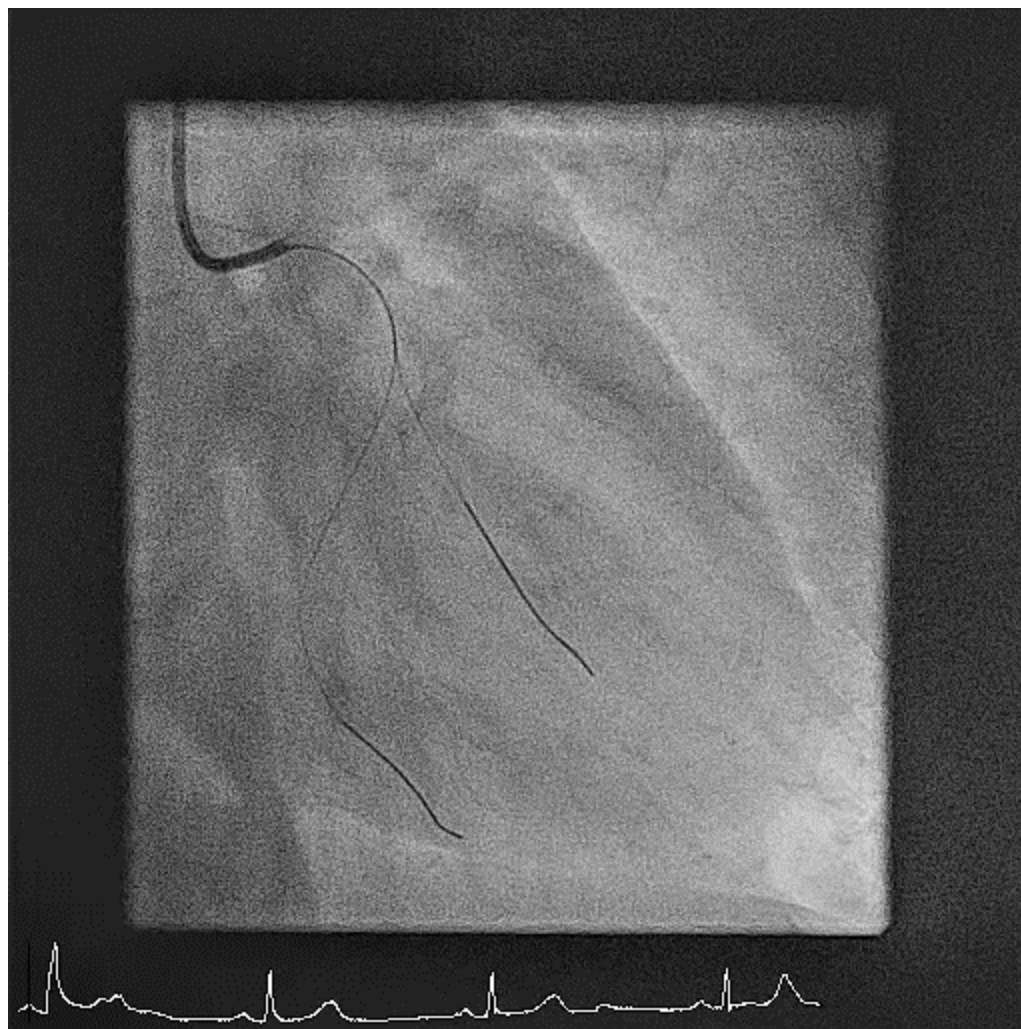
Dual lumen catheters



Dual lumen catheters facilitate co-axial transmission of force to angulated caps and side branches







Trapping device

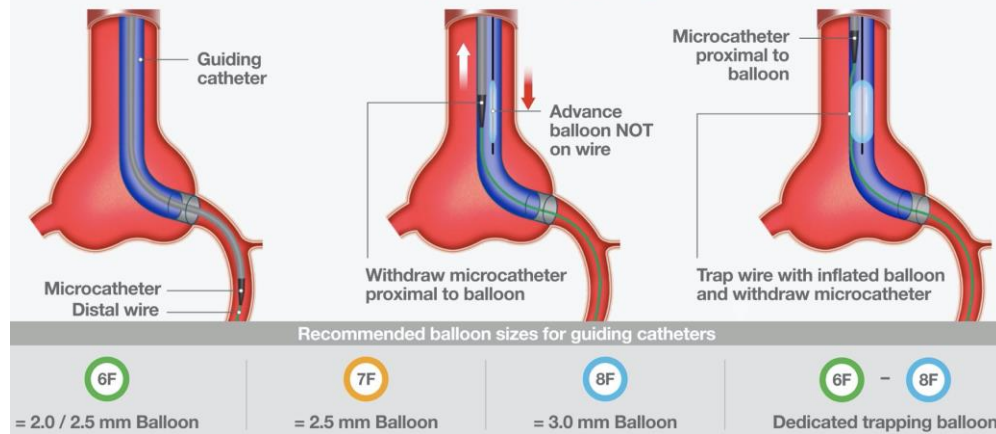
Gebruik van ballon ofwel dedicated trapping device (TrapIT/Trapper/Trapliner)

Lange wires (> 300cm) of extensiewire

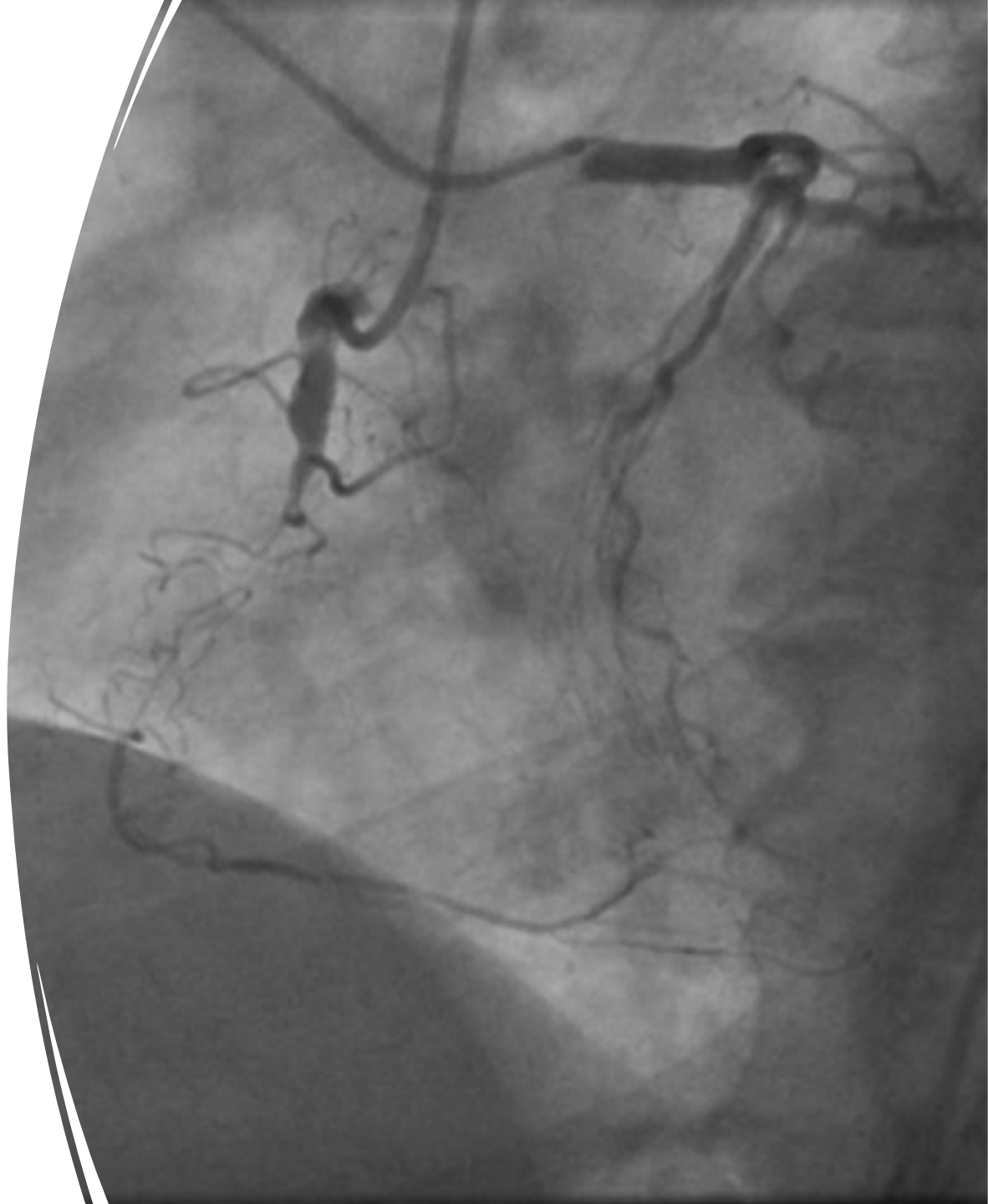
TrapLiner

Integrated balloon facilitates guidewire trapping to maintain wire position during microcatheter exchanges

Recommended technique for trapping (and balloon sizes)

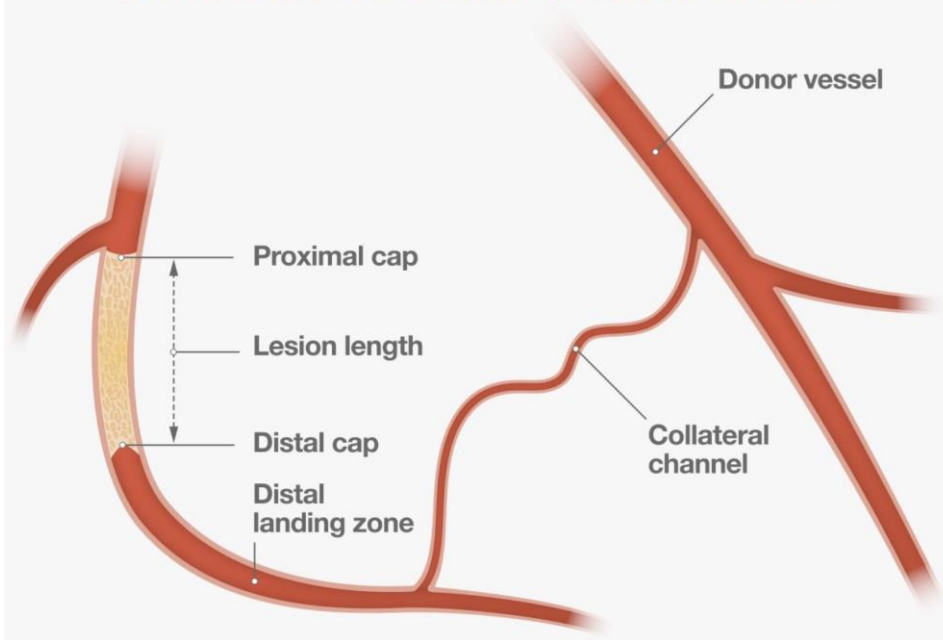


Hoe benaderen we een CTO?

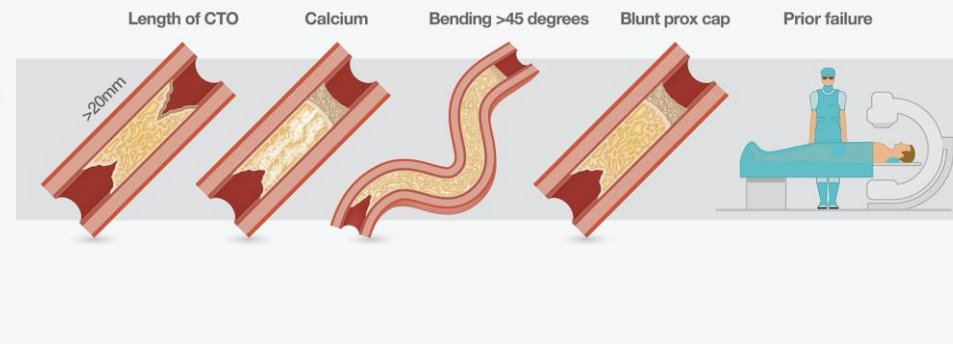


J-CTO score

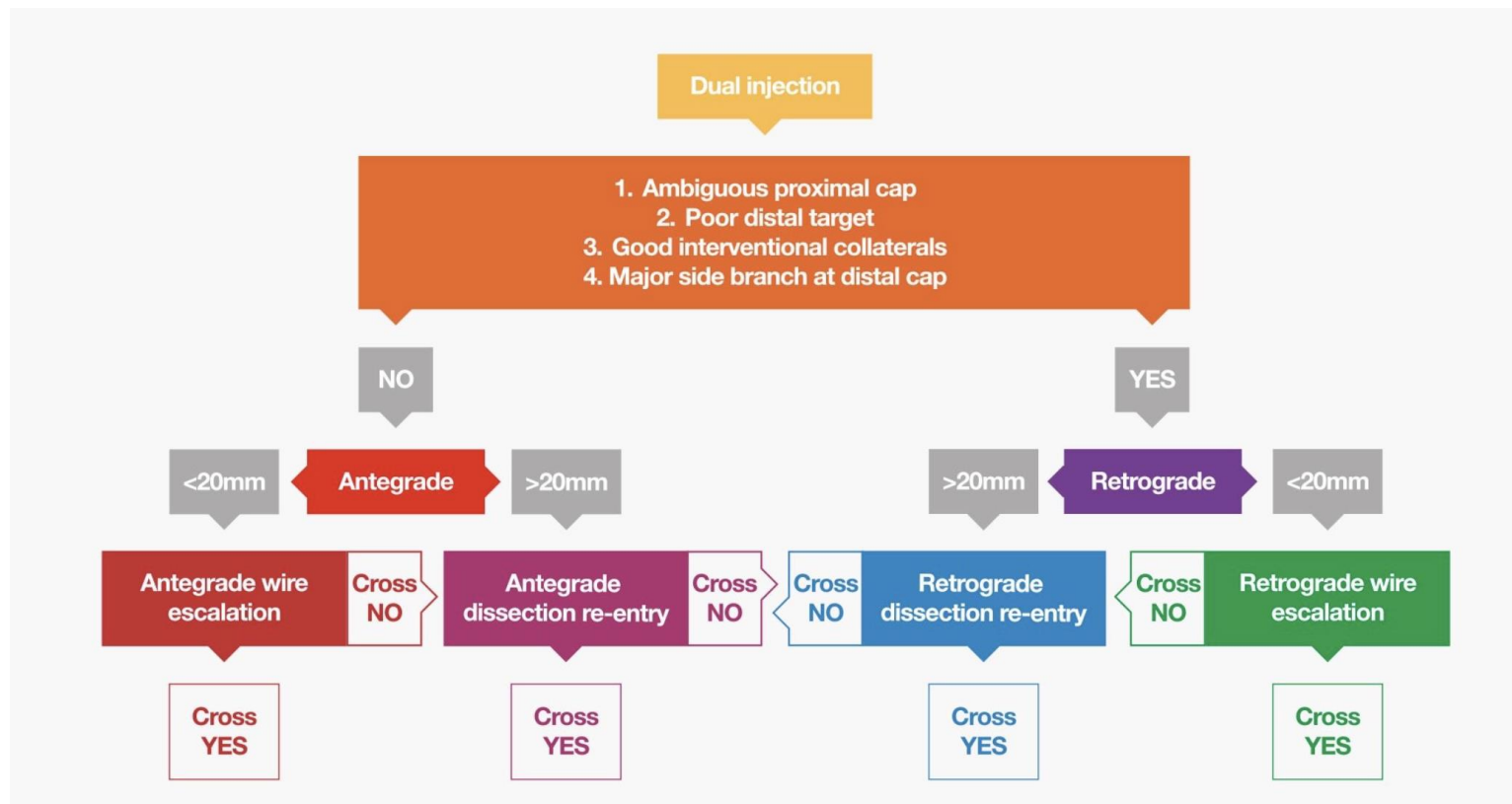
Common CTO anatomical terms



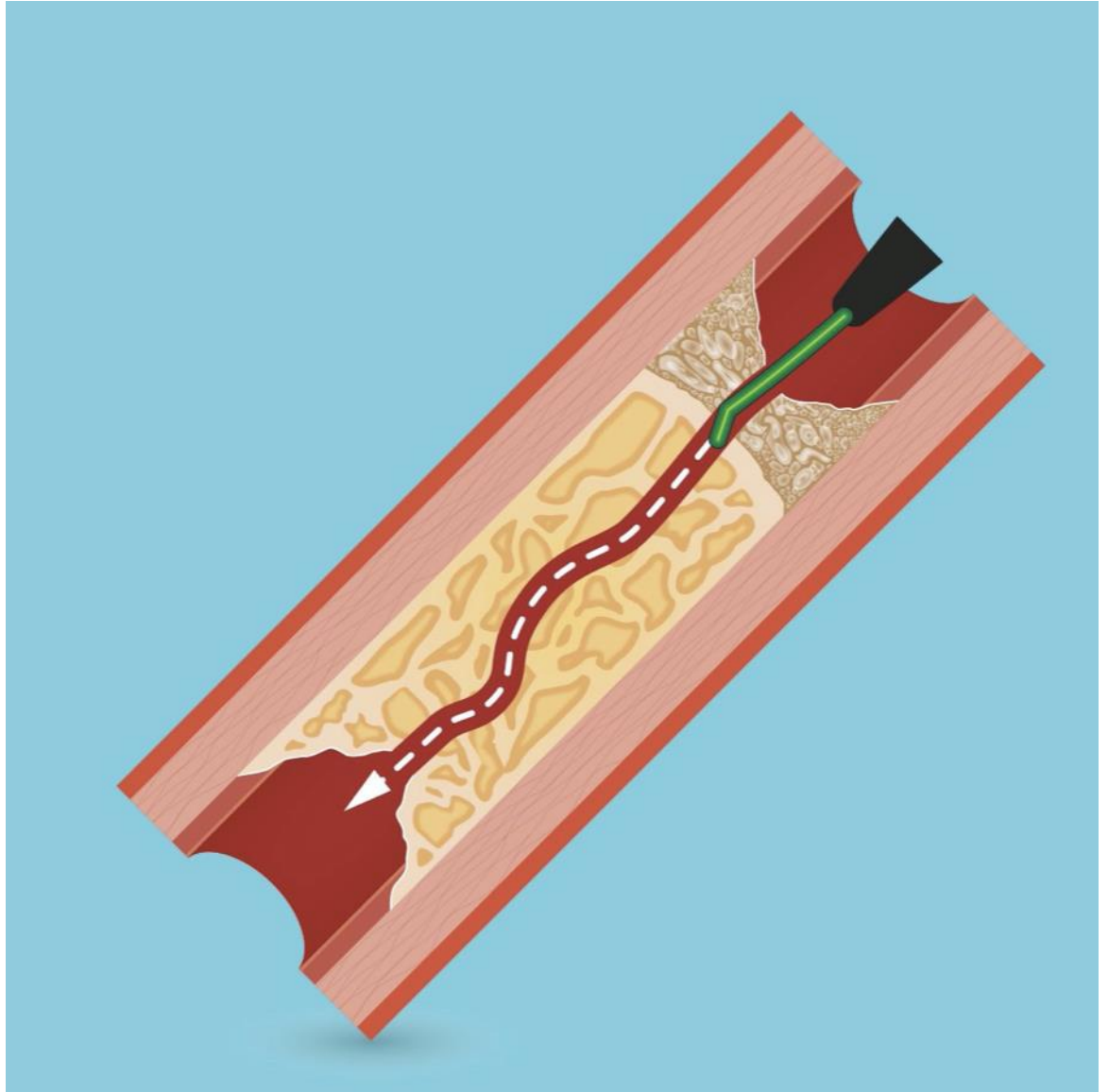
J-CTO score (+1 for each characteristic)

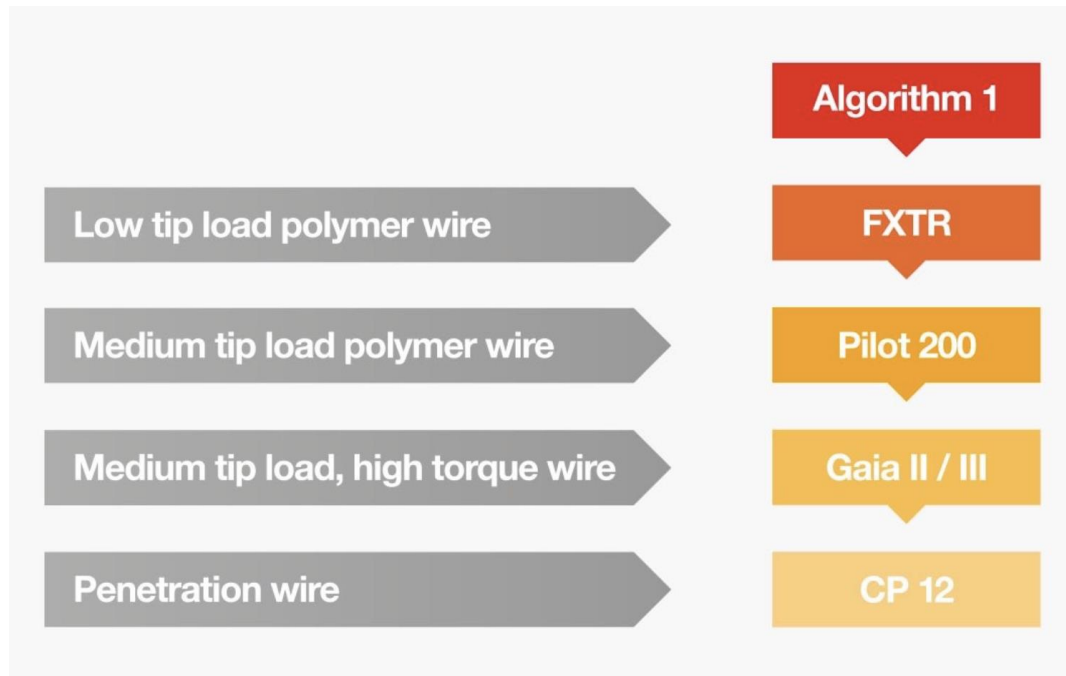


Hybride strategie

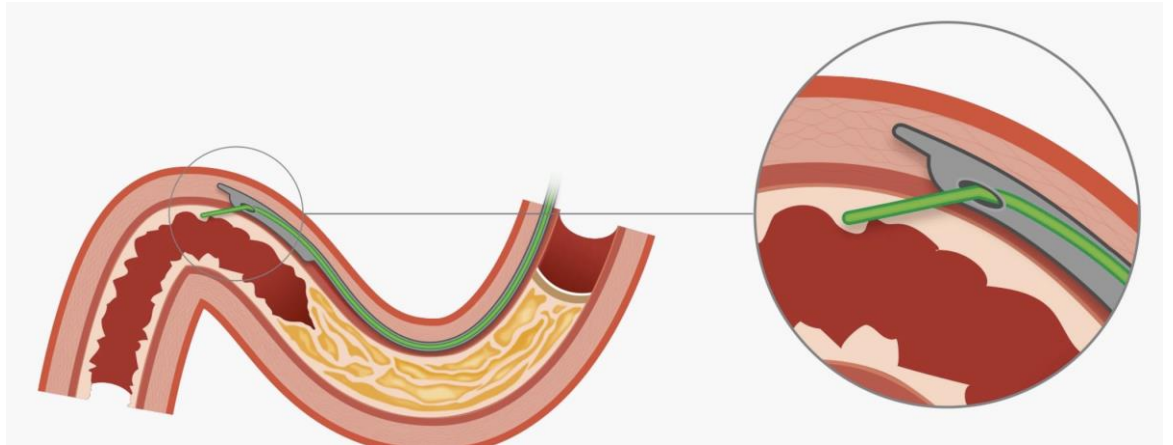


Antegrade wire escalation (AWE)





Antegrade dissection re-entry



K, 1951

Voorgeschiedenis

1998: CABG (LIMA-D-LAD; Ao-AL-MO-PLRCA)

2019: AP CCS-II. CAG: occlusie RCA en anastomose on RCA

2019: Mislukte poging PCI CTO RCA

AP CCS-II onder maximale anti-angineuze therapie.

Echocardiografie:

LVEF 45%. Hypokinesie inferior

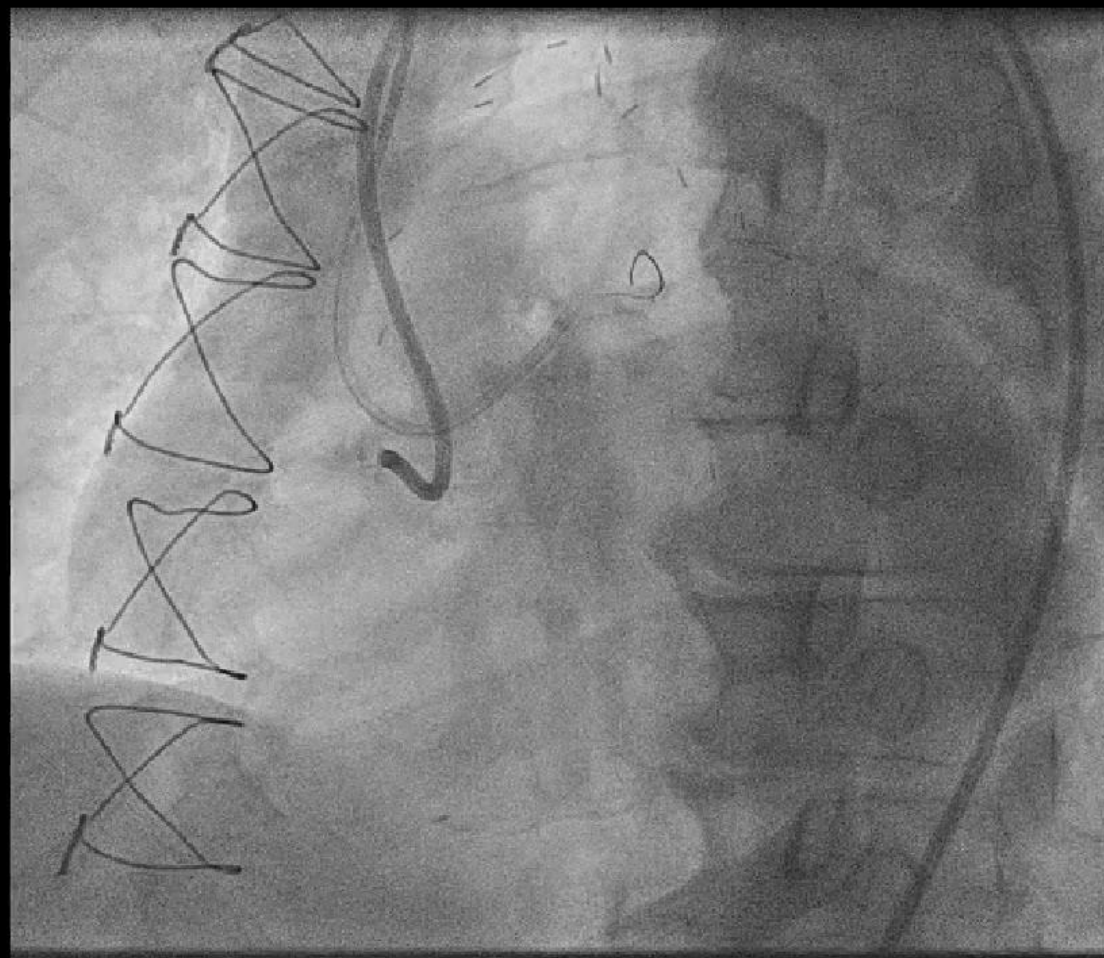
SPECT:

Ischemie inferior. LVEF 43%.



2-00-1351 / M
PID: 8834470
DON: 75000000

Amphia Ziekenhuis
HCK MG
Study Date: 13-01-2020
Series Time: 14:21:08
Content Time: 14:21:08
Beeld 01



KV: 75.088
SE: 3 / IMA: 3
Lat: LAO / Ang: 39.900001525879
Long: Caudal / Ang: -0.1000000014901

HCK STANDAARD HARTKATHETERISATIE
Coronary-SCH 7.5 fps Low

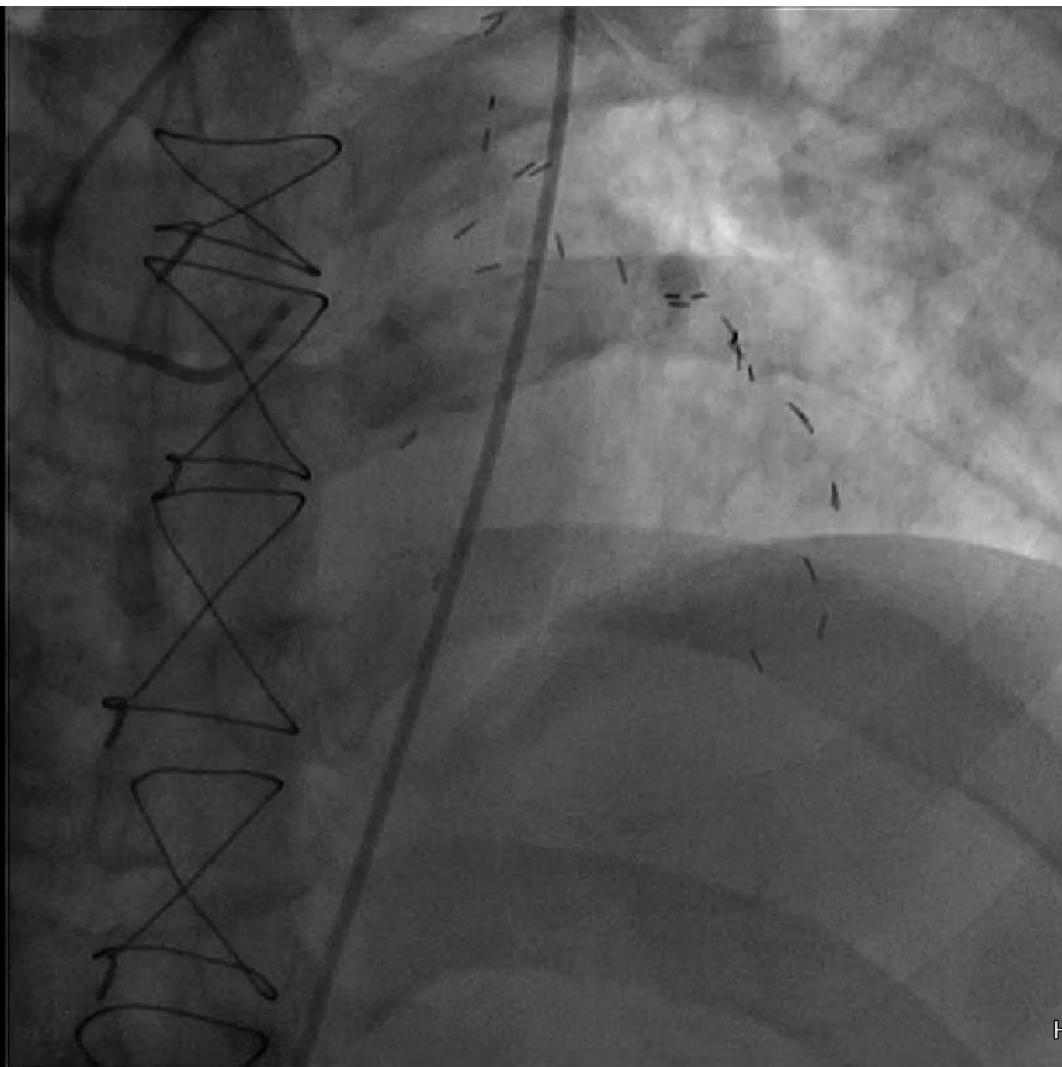


1951 / M
PID: 8834470
D: 1951-01-01

Amphia Ziekenhuis
HCK MG
Study Date: 17-09-2019
Series Time: 09:30:51
Content Time: 09:30:51
Beeld 01

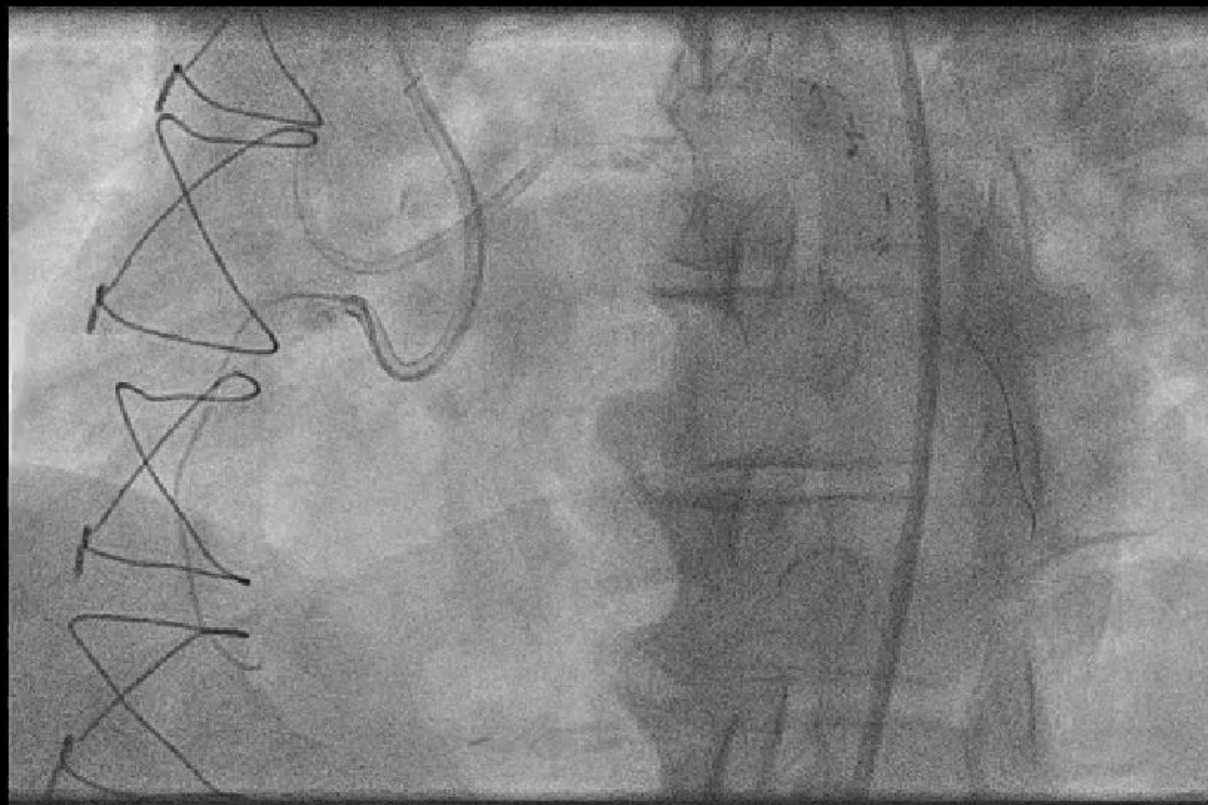
KV: 75
SE: 10 / IMA: 10
Lat: LAO / Ang: 3.6
Long: Cranial / Ang: 28

HCK STANDAARD HARTKATHETERISATIE
Left Coronary 12.5frs



1951 / M
PID: 8834470

Amphia Ziekenhuis
HCK MG
Study Date: 13-01-2020
Series Time: 14:58:31
Content Time: 14:58:31
Beeld 01

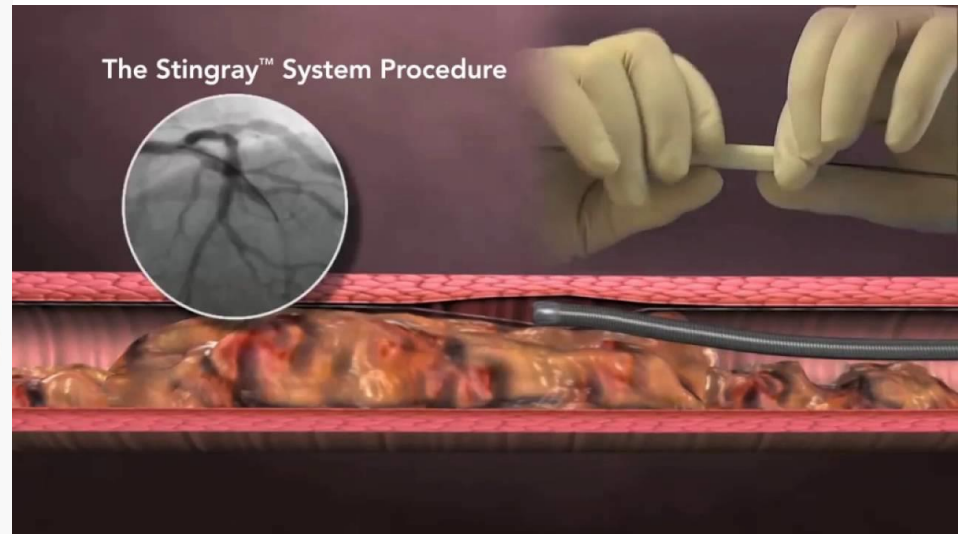
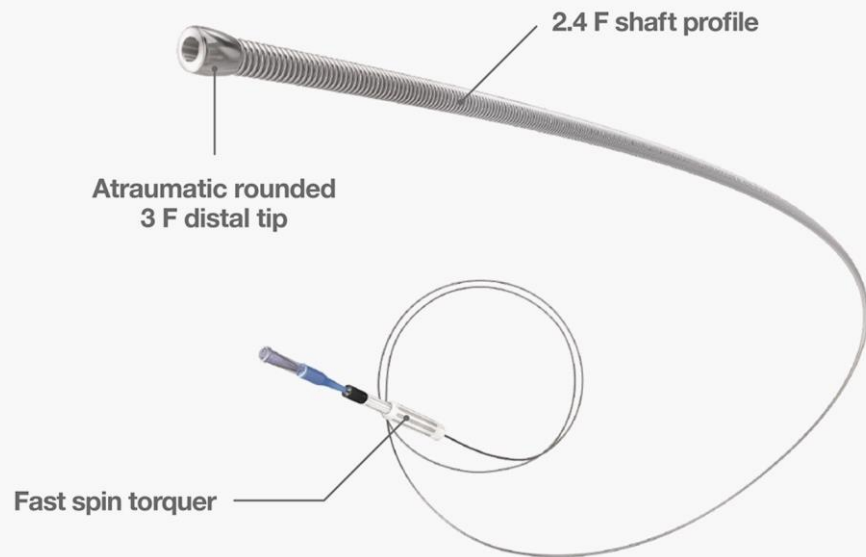


10 cm

KV: 76.234
SE: 7 / IMA: 7
Lat: LAO / Ang: 34.599998474121
Long: Caudal / Ang: -1.3999999761581

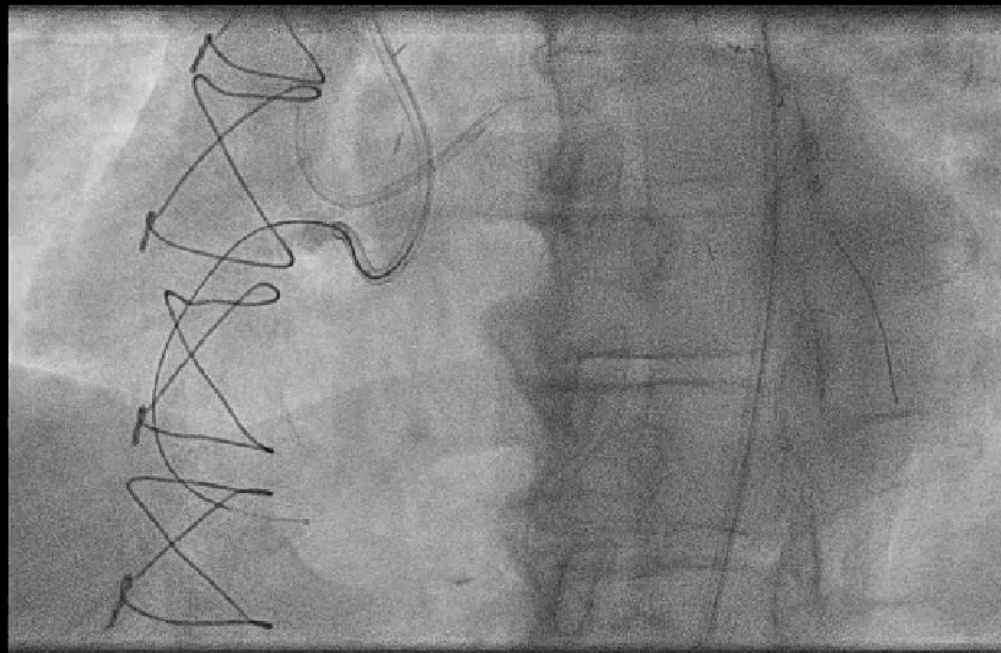
HCK STANDAARD HARTKATHETERISATIE
Coronary-SCH 7.5 fps Low

CrossBoss



2. 1951 / M
PID: 8834470
ECN: 761100

Amphia Ziekenhuis
HCK MG
Study Date: 13-01-2020
Series Time: 15:02:28
Content Time: 15:02:28
Beeld 01



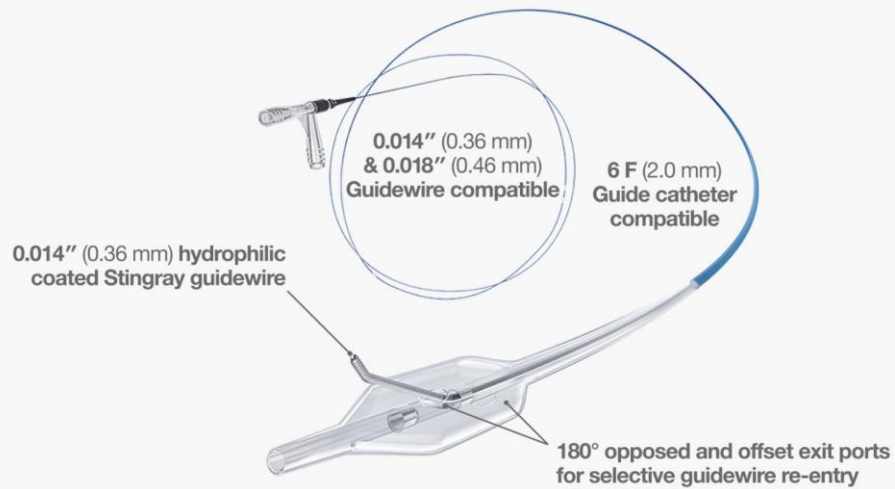
KV: 75.461
SE: 8 / IMA: 8
Lat: LAO / Ang: 29.200000762939
Long: Caudal / Ang: -1.3999999761581

HCK STANDAARD HARTKATHETERISATIE
Coronary-SCH 7.5 fps Low

10 cm

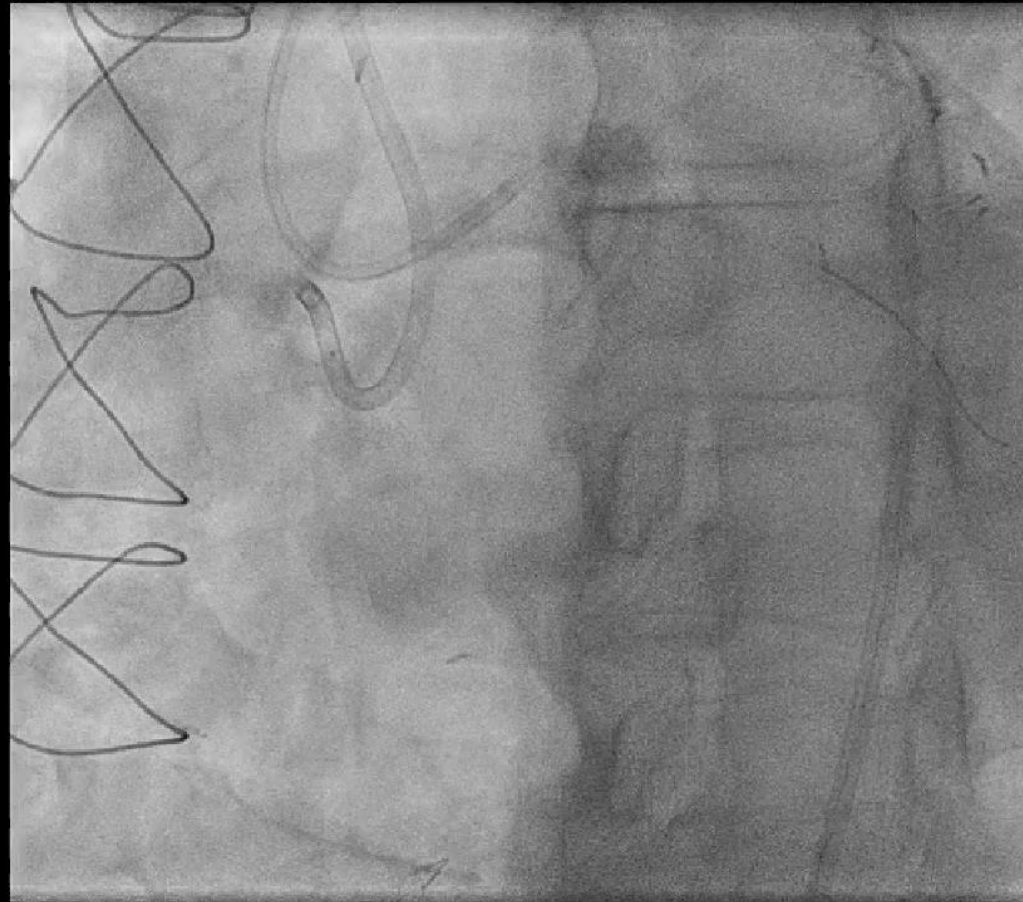


Stingray balloon and wire



Z. -1951 / M
PID: 8834470
C

Amphia Ziekenhuis
HCK MG
Study Date: 13-01-2020
Series Time: 15:07:30
Content Time: 15:07:30
Beeld 01



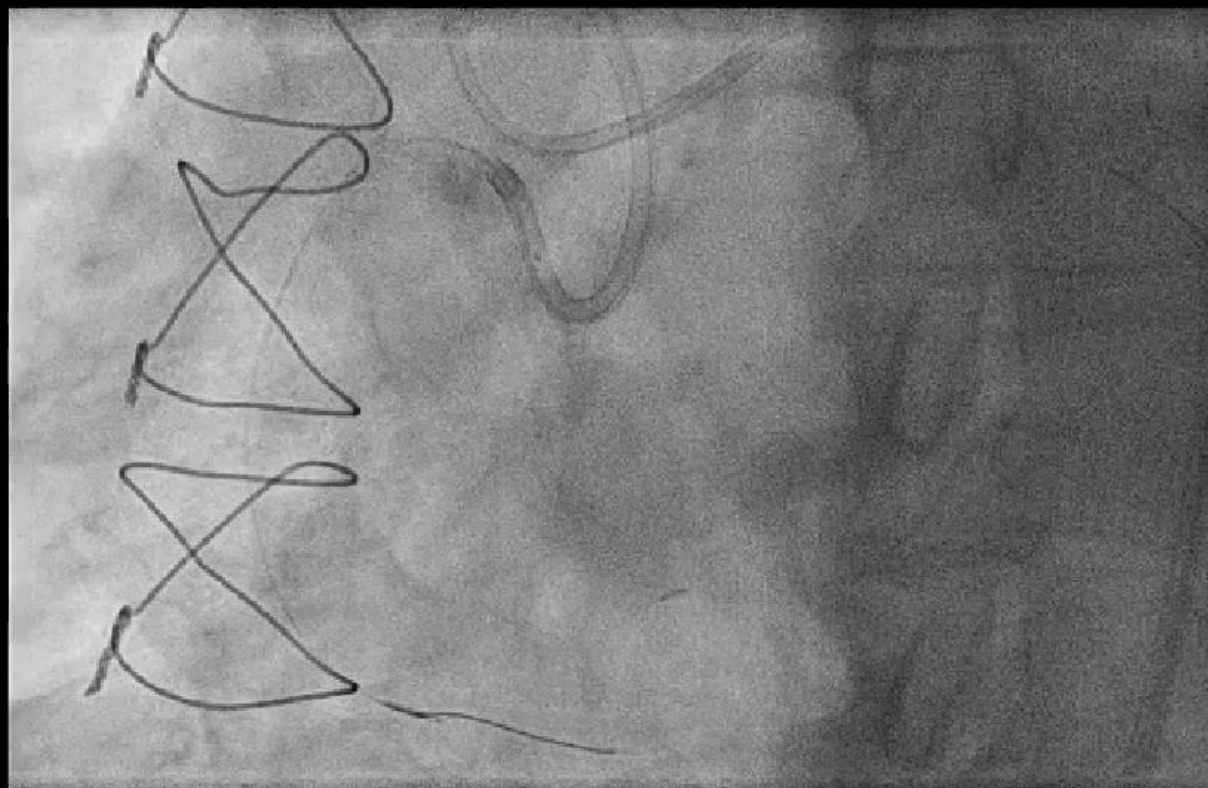
KV: 80.594
SE: 11 / IMA: 11
Lat: LAO / Ang: 29.200000762939
Long: Caudal / Ang: -13.10000038147

HCK STANDAARD HARTKATHETERISATIE
Coronary-SCH 7.5 fps Low



1951 / M
PID: 8834470
PCN: 100000

Amphia Ziekenhuis
HCK MG
Study Date: 13-01-2020
Series Time: 15:15:36
Content Time: 15:15:36
Beeld 01



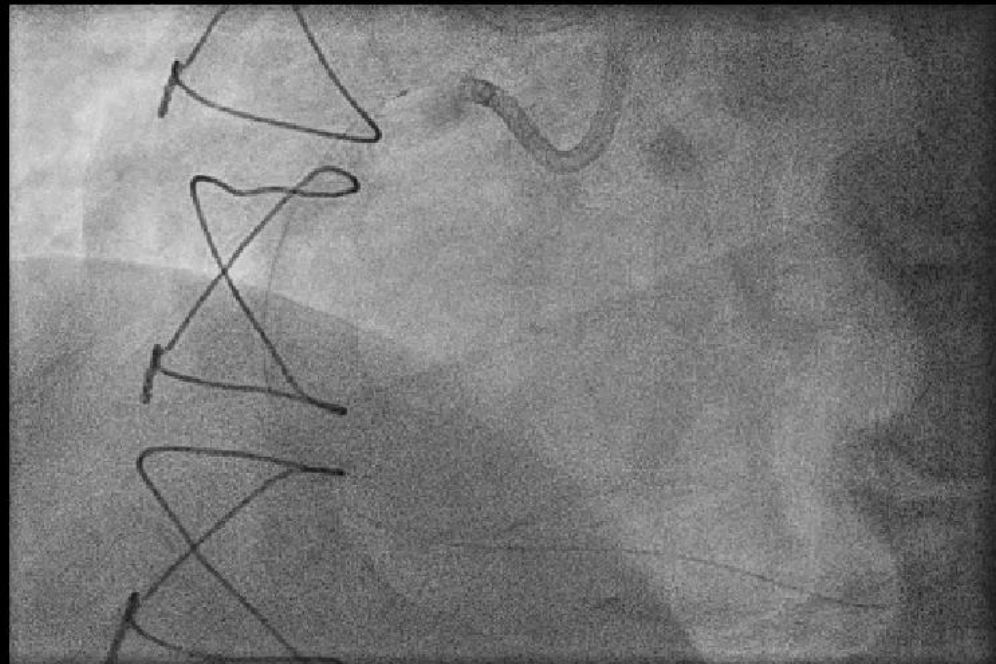
5 cm

KV: 77.751
SE: 12 / IMA: 12
Lat: LAO / Ang: 29.200000762939
Long: Caudal / Ang: -13.10000038147

HCK STANDAARD HARTKATHETERISATIE
Coronary-SCH 7.5 fps Low

1951 / M
PID: 8834470
ES: 100

Amphia Ziekenhuis
HCK MG
Study Date: 13-01-2020
Series Time: 15:51:37
Content Time: 15:51:37
Beeld 01

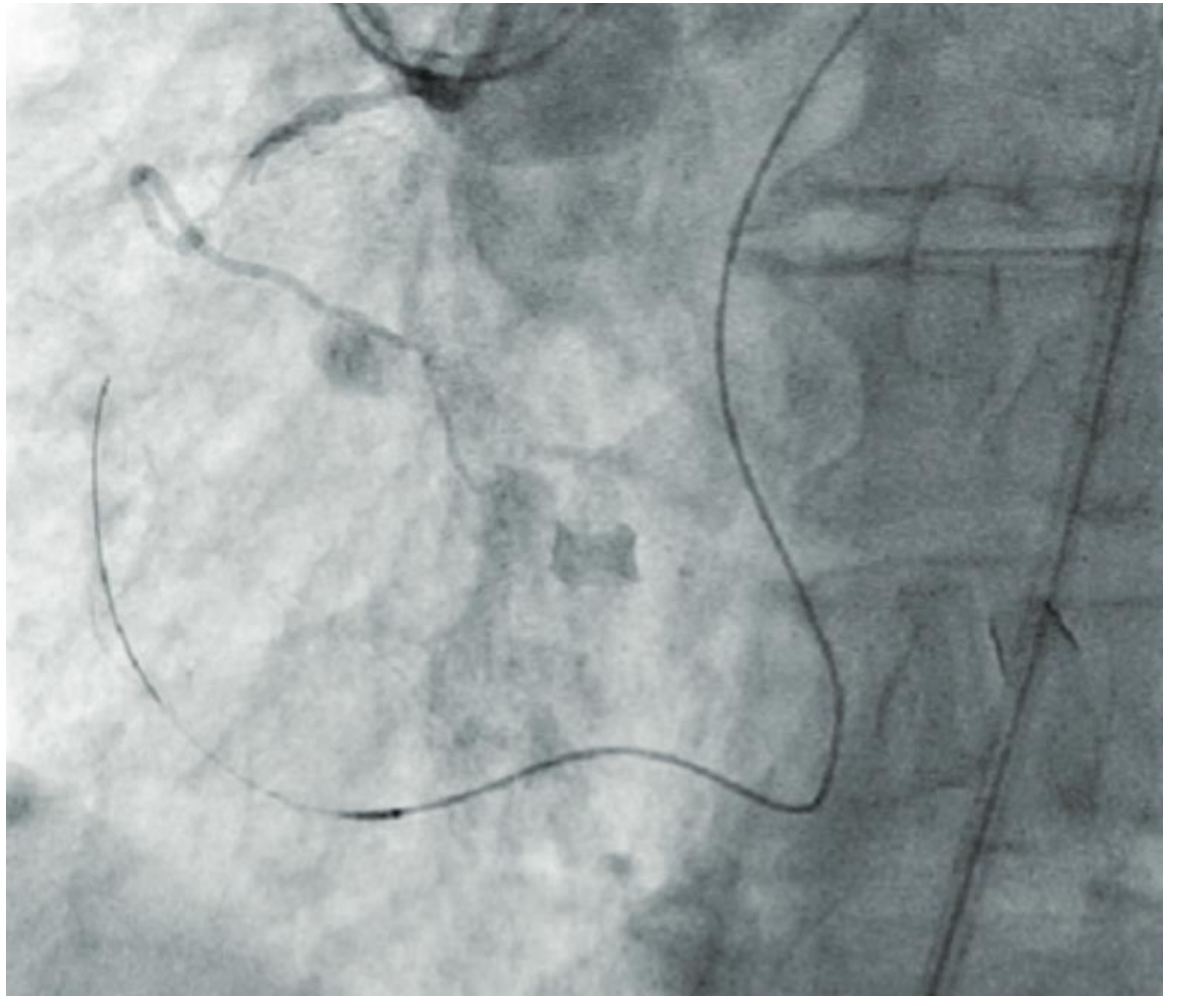


KV: 75.703
SE: 34 / IMA: 34
Lat: LAO / Ang: 34.799999237061
Long: Cranial / Ang: 0.60000002384186

HCK STANDAARD HARTKATHETERISATIE
Coronary-SCH 7.5 fps Low



Retrograde approach



♂ R, 1944

Voorgeschiedenis

1989: CABG (Ao-vene-PLCX-RDP)

1991: PCI LAD

2008: PCI venegraft

2009: occlusie venegraft-> medicamenteuze behandeling

Second opinion (Rotterdam): AP CCS-II.

Echocardiografie:
Normal

SPECT:
Inferolateraal ischemie.



2-1944 / M

PID: 7756188

B: 0015

Amphia Ziekenhuis

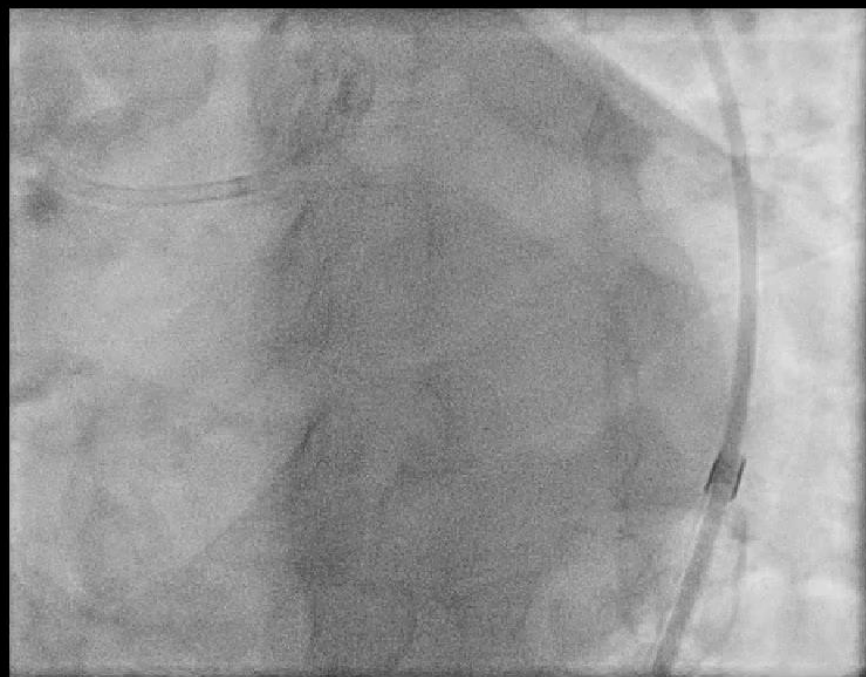
HCK MG

Study Date: 08-07-2020

Series Time: 09:51:25

Content Time: 09:51:25

Beeld 01



KV: 88.405

SE: 1 / IMA: 1

Lat: LAO / Ang: 40

Long: Caudal / Ang: -29.5

HCK STANDAARD HARTKATHETERISATIE

Coronary-SCH 7.5 fps Low



5 cm



~~CONFIDENTIAL~~

Beeld 01



Long: Cranial / Ang: 26.200000762939

Coronary-SCH 7.5 fps Low



P-1944 / M
PID: 7756188

Amphia Ziekenhuis
HCK MG
Study Date: 12-06-2020
Series Time: 09:01:52
Content Time: 09:01:52
Beeld 001



5 cm

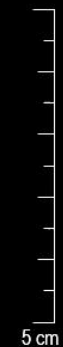
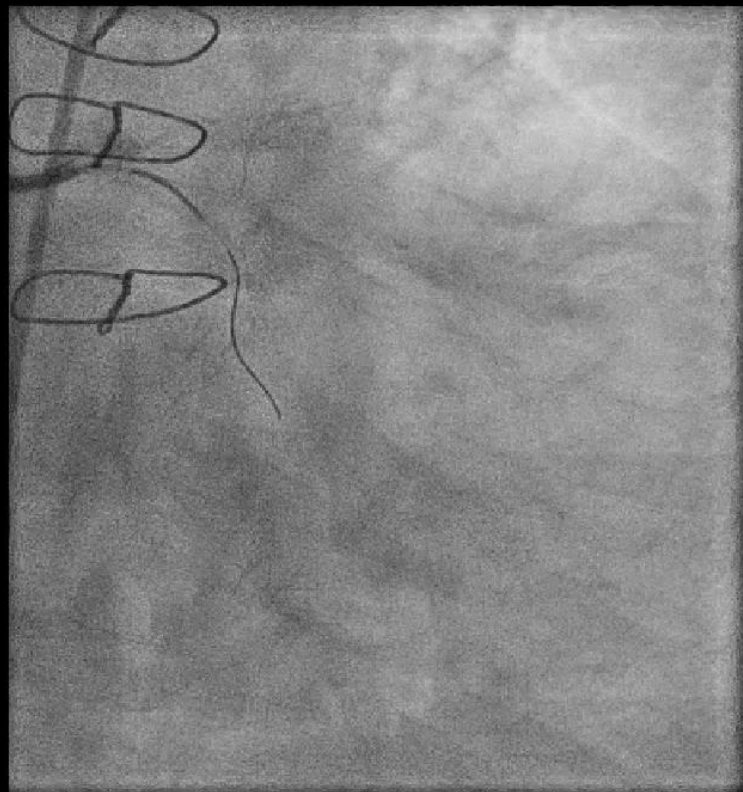
KV: 74.365
SE: 8 / IMA: 8
Lat: RAO / Ang: -24.639999389648
Long: Caudal / Ang: -28.090000152588

HCK STANDAARD HARTKATHETERISATIE
Coronary-BRA 15 fps Low



1944 / M
PID: 7756188
BS

Amphia Ziekenhuis
HCK MG
Study Date: 08-07-2020
Series Time: 10:02:08
Content Time: 10:02:08
Beeld 01



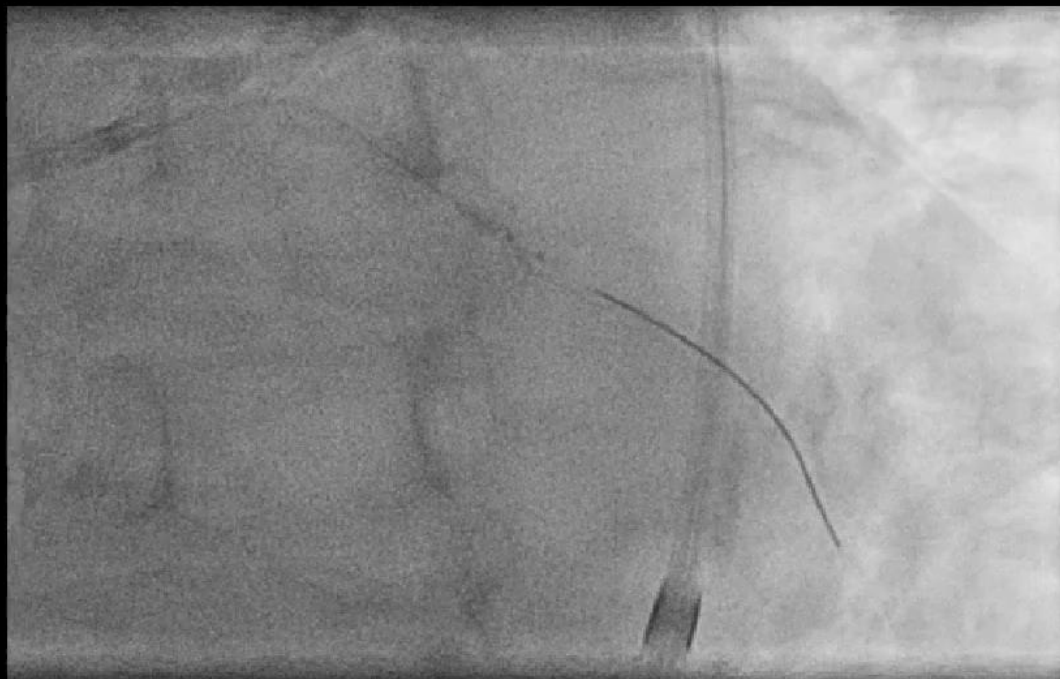
KV: 73.031
SE: 5 / IMA: 5
Lat: RAO / Ang: -14.199999809265
Long: Caudal / Ang: -24.10000038147

HCK STANDAARD HARTKATHETERISATIE
Coronary-SCH 7.5 fps Low



1944 / M
PID: 7756188
BOM

Amphia Ziekenhuis
HCK MG
Study Date: 08-07-2020
Series Time: 10:20:01
Content Time: 10:20:01
Beeld 01



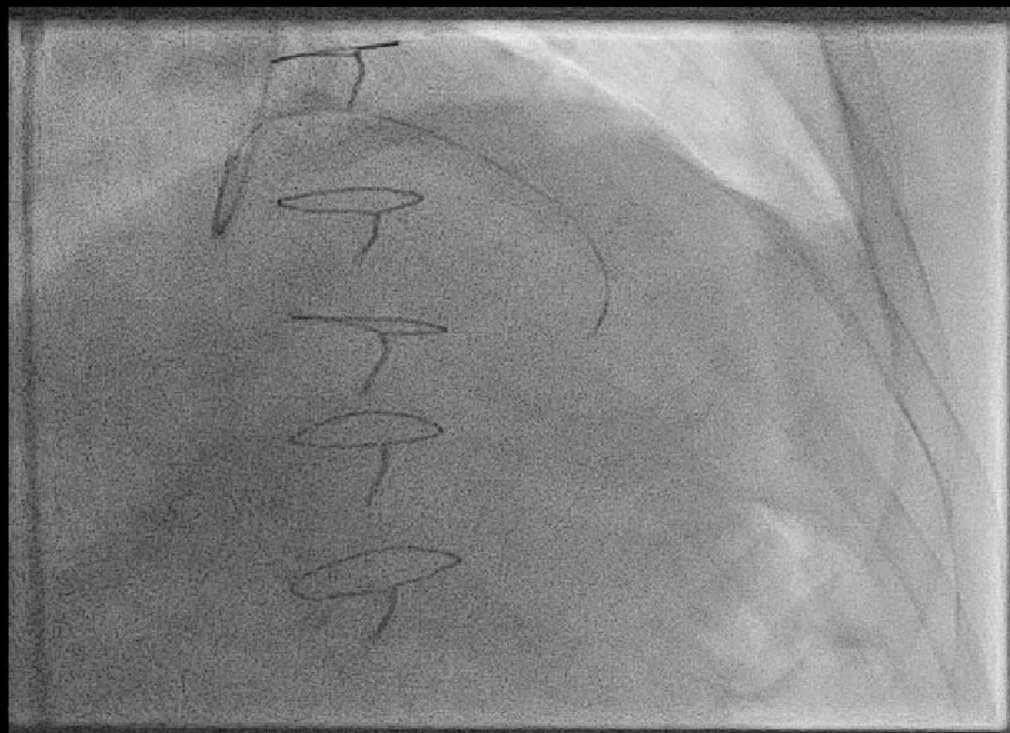
KV: 81.458
SE: 10 / IMA: 10
Lat: LAO / Ang: 27.700000762939
Long: Caudal / Ang: -24.299999237061

HCK STANDAARD HARTKATHETERISATIE
Coronary-SCH 7.5 fps Low



1944 / M
PID: 7756188
E 5

Amphia Ziekenhuis
HCK MG
Study Date: 08-07-2020
Series Time: 10:25:28
Content Time: 10:25:28
Beeld 001



KV: 90.367
SE: 12 / IMA: 12
Lat: RAO / Ang: -30.299999237061
Long: Cranial / Ang: 26.200000762939

HCK STANDAARD HARTKATHETERISATIE
Fluoroscopy - stored



1944 / M

PID: 7756188

Amphia Ziekenhuis

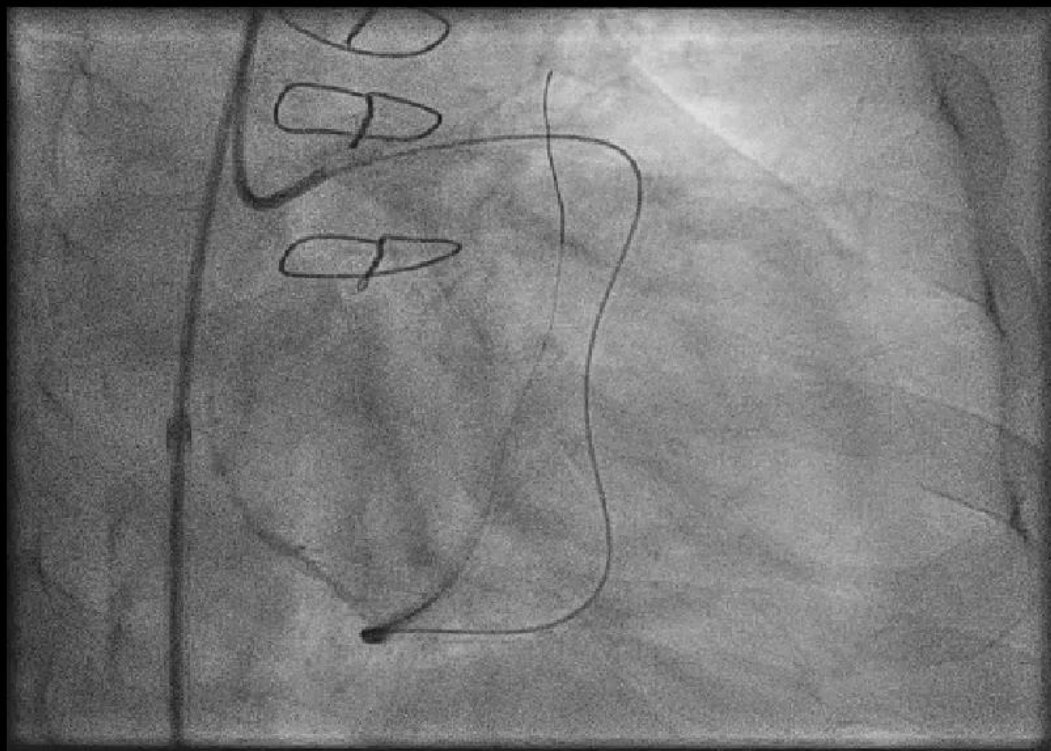
HCK MG

Study Date: 08-07-2020

Series Time: 10:27:38

Content Time: 10:27:38

Beeld 01



10 cm

KV: 71.734

SE: 15 / IMA: 15

Lat: RAO / Ang: -19.89999961853

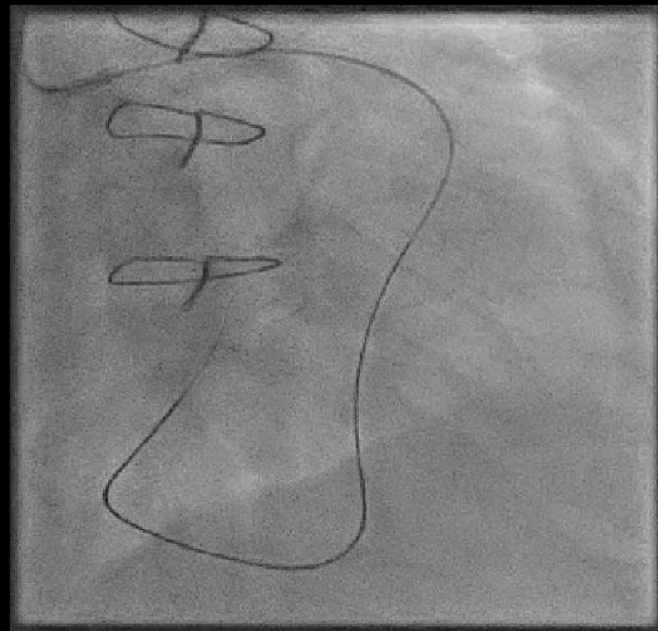
Long: Caudal / Ang: -22.299999237061

HCK STANDAARD HARTKATHETERISATIE

Coronary-SCH 7.5 fps Low

Z: 1944 / M
PID: 7756188

Amphia Ziekenhuis
HCK MG
Study Date: 08-07-2020
Series Time: 10:34:38
Content Time: 10:35:10
Beeld 001



KV: 100
SE: 17 / IMA: 17
Lat: RAO / Ang: -20.200000762939
Long: Caudal / Ang: -12.89999961853

HCK STANDAARD HARTKATHETERISATIE
Fluoroscopy - stored



1344 / M
PID: 7756188

Amphia Ziekenhuis
HCK MG
Study Date: 08-07-2020
Series Time: 10:39:02
Content Time: 10:39:02
Beeld 1



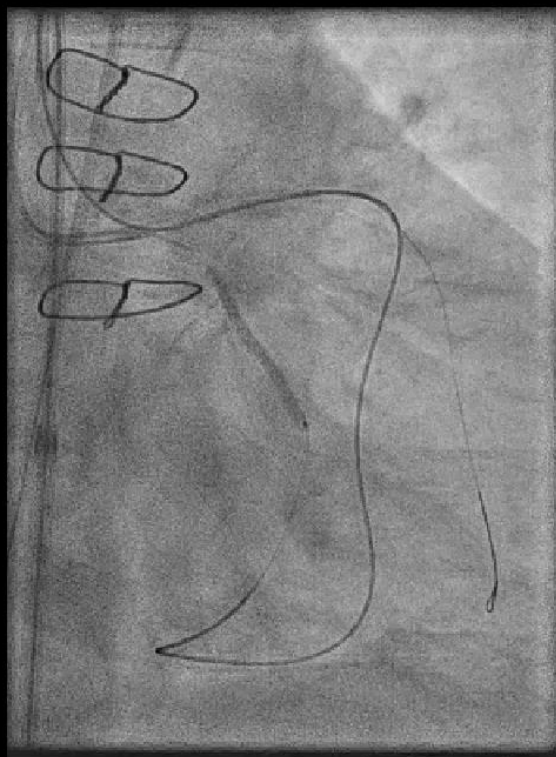
KV: 77.683
SE: 18 / IMA: 18
Lat: LAO / Ang: 38.099998474121
Long: Caudal / Ang: -21.299999237061

HCK STANDAARD HARTKATHETERISATIE
Coronary-SCH 7.5 fps Low



2-1944 / M
PID: 7756188
BSN: [REDACTED]

Amphia Ziekenhuis
HCK MG
Study Date: 08-07-2020
Series Time: 11:50:24
Content Time: 11:50:24
Beeld 1



10 cm

KV: 70.458
SE: 19 / IMA: 19
Lat: RAO / Ang: -14.60000038147
Long: Caudal / Ang: -24.299999237061

HCK STANDAARD HARTKATHETERISATIE
Coronary-SCH 7.5 fps Low



1944 / M
PID: 7756188
B: 1944-07-03

Amphia Ziekenhuis
HCK MG
Study Date: 08-07-2020
Series Time: 12:15:28
Content Time: 12:15:28
Beeld 01



KV: 83.477
SE: 31 / IMA: 31
Lat: LAO / Ang: 40.299999237061
Long: Caudal / Ang: -21.799999237061

HCK STANDAARD HARTKATHETERISATIE
Coronary-SCH 7.5 fps Low

Conclusie

- Technische ontwikkelingen en meer expertise heeft geleid tot hogere succespercentage op het gebied van CTO
- Het beheersen van antegrade en retrograde technieken is essentieel als bekwame CTO operator



