PCI and Coronary Access Post TAVR(TAVI): Tips and Tricks

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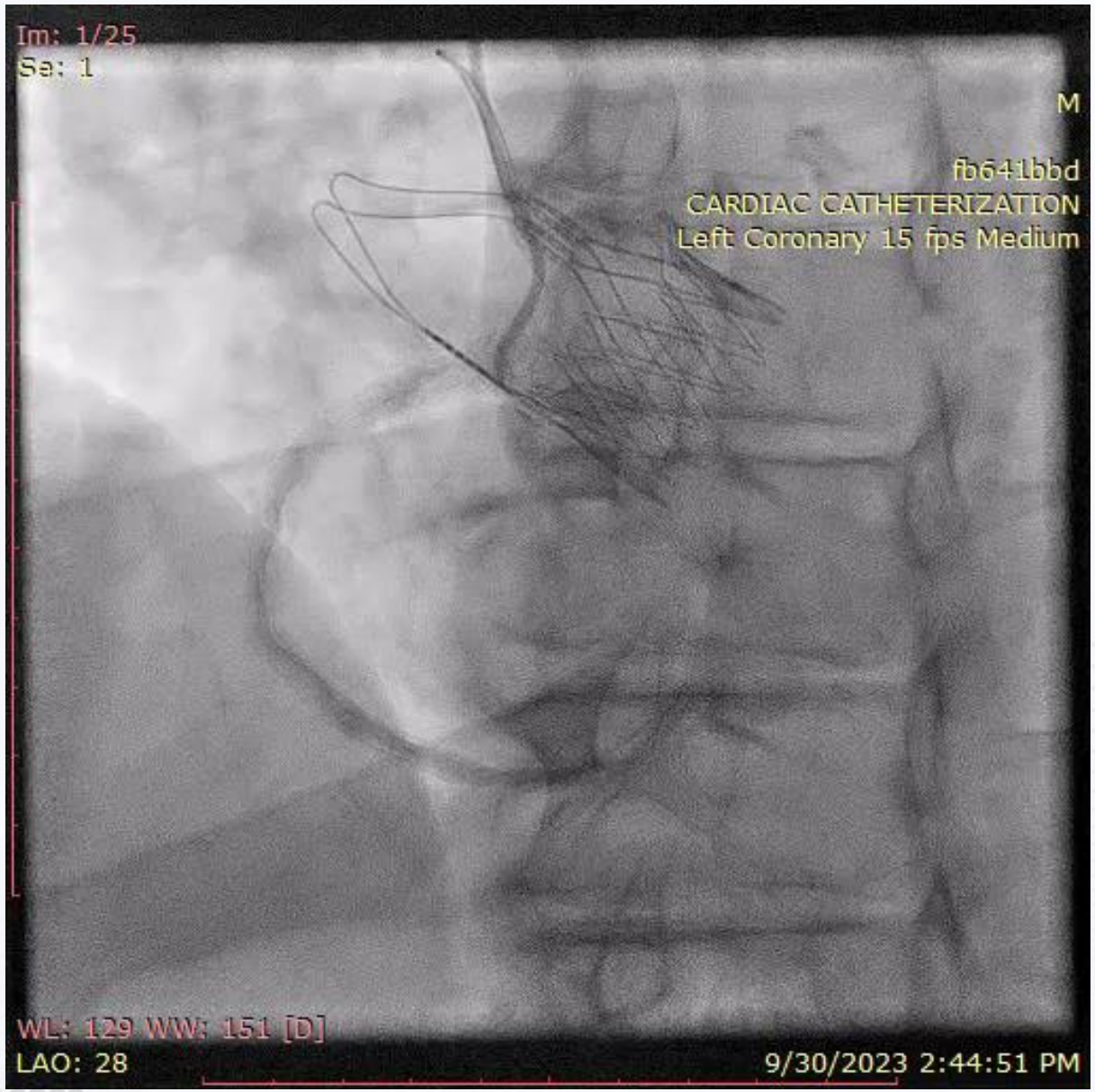
Disclosure

- I, Jonathan X Fang, MBBB, have nothing relevant to disclose

Case 1. Inferior STEMI post TAVR

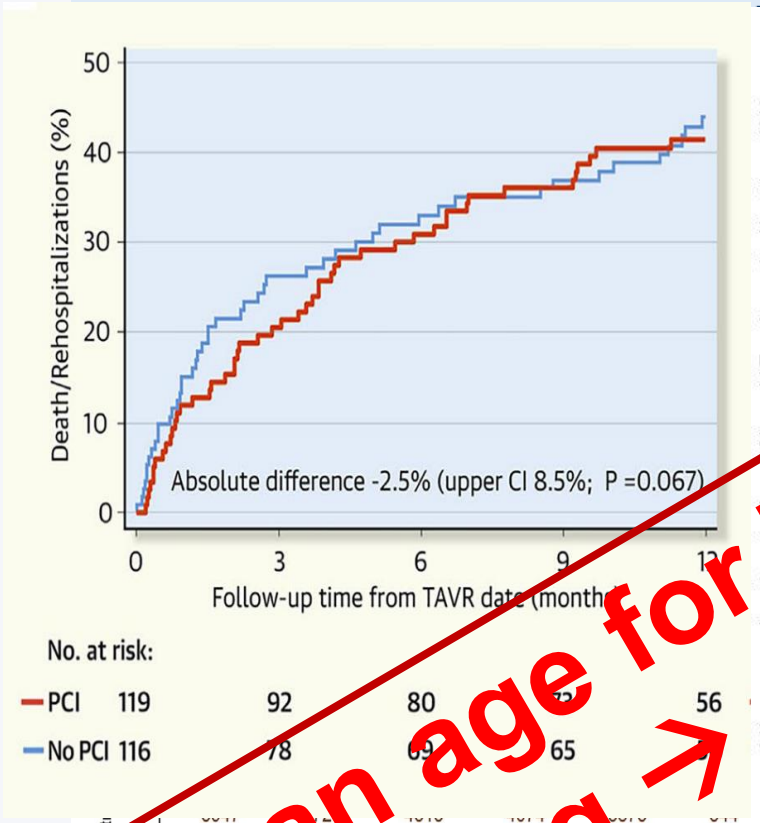


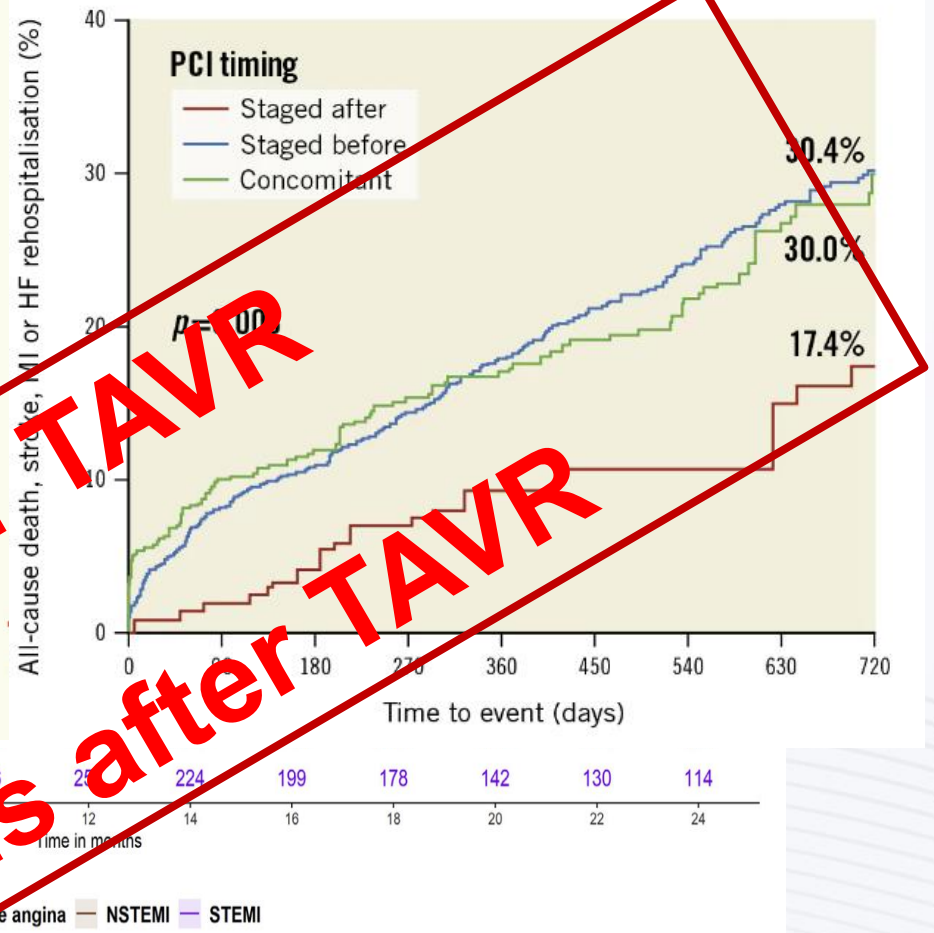
A. Call you senior partner in ?

B. Call the CT surgeon ?

C. Call the relative ?

Background

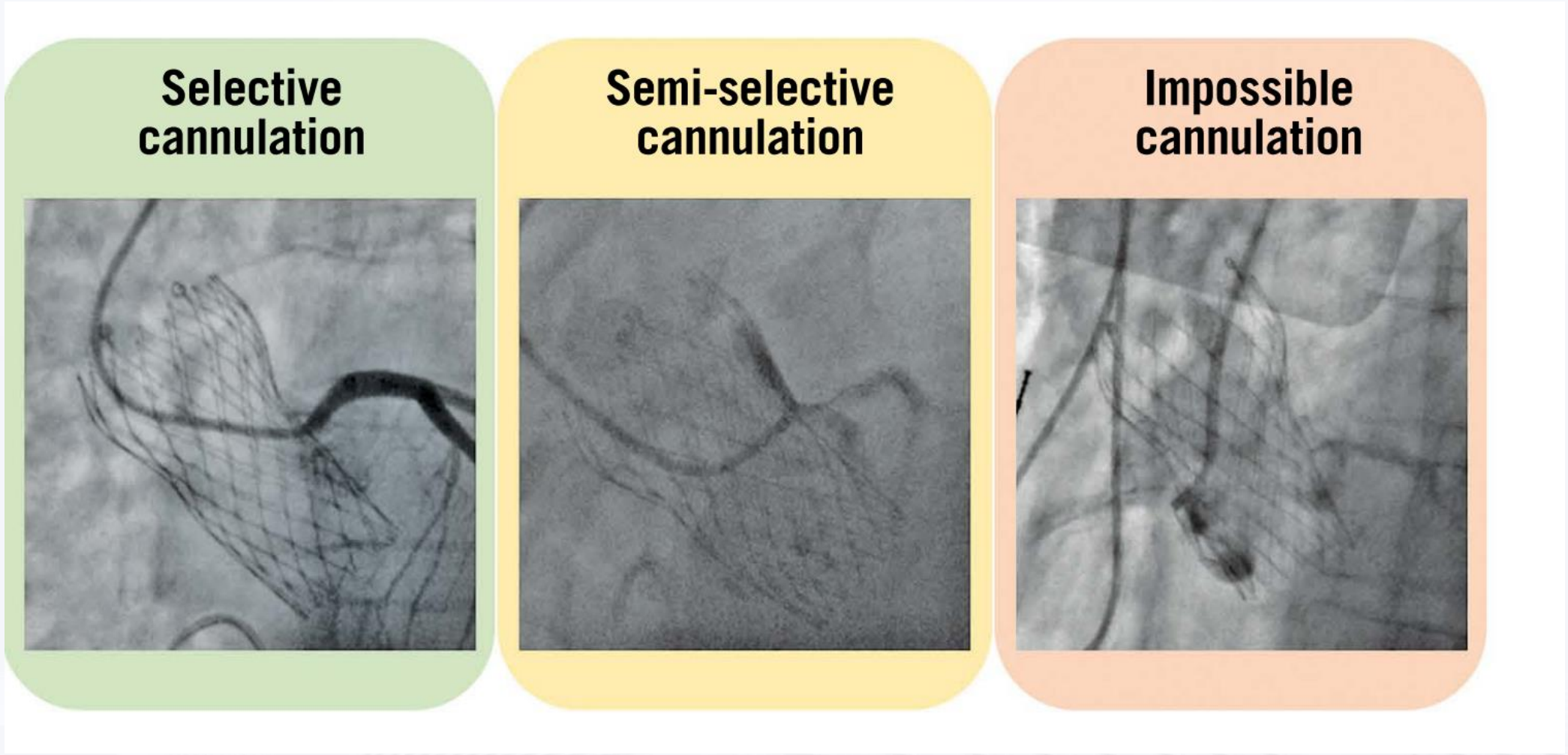




Mean age for TAVR lowering → More PCIs after TAVR

- Coronary access post-TAVI required 16% within 5 years.
- 2/3 cases ACS , incidence 2-10% 2 years
- 2 year mortality is -40% after ACS
- PCI before TAVI does not reduce MACE (ACTIVATION trial), Revasc-TAVI registry: PCI after TAVR associated with better outcomes

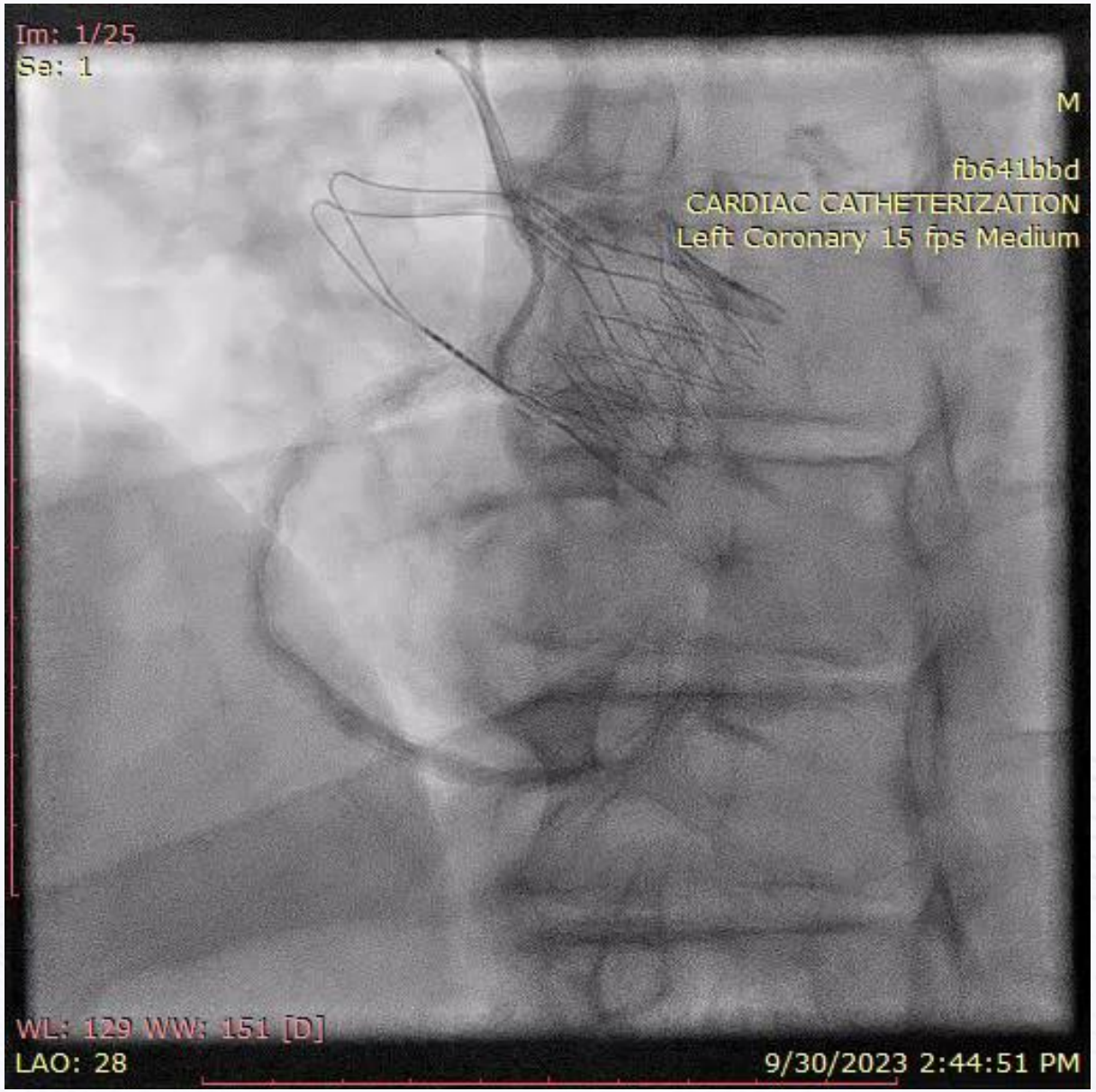
1. Mentias A, Desai MY, Sa… M, Horwitz …, Rossen JD, Panaich S, et al. Incidence and Outcomes of Acute Coronary Syndrome After Transcatheter Aortic Valve Replacement. 2020;13(8):938-50.
2. Hermiller Jr JB, Gunnarsso… C, Ryan MP, Moore KA, Clancy SJ, Irish W. The need for future coronary access following surgical or transcatheter aortic valve replacement. 2021;98(5):950-6.
3. Faroux L, Guimaraes L, Wint…er-Wehekind …, Junquera L, Ferreira-Neto AN, Del Val D, et al. Coronary Artery Disease and Transcatheter Aortic Valve Replacement: JACC State-of-the-Art Review. Journal of the American College of Cardiology. 2019;74(3):362-72.
4. Ochiai T, Chakravarty T, Yoon S-H, Kaewkes D, Flint N, Patel V, et al. Coronary Access After TAVR. JACC: Cardiovascular Interventions. 2020;13(6):693-705Vilalta V, Asmarats L, Ferreira-Neto AN, Maes F, Guimarães LdFC, Couture T, et al. Incidence, Clinical Characteristics, and Impact of Acute Coronary Syndrome Following Transcatheter Aortic Valve Replacement. JACC Cardiovascular Interventions 2018;11(24):2523-33.
5. Vilalta V, Asmarats L, Ferreira-Neto AN, Maes F, Guimarães LdFC, Couture T, et al. Incidence, Clinical Characteristics, and Impact of Acute Coronary Syndrome Following Transcatheter Aortic Valve Replacement. JACC Cardiovascular Interventions 2018;11(24):2523-33.
6. Patterson T, Clayton T, Dodd M, Khawaja Z, Morice MC, Wilson K, et al. ACTIVATION (PercutAneous Coronary inTervention prIor to transcatheter aortic VAlve implantaTION): A Randomized Clinical Trial. JACC: Cardiovascular Interventions. 2021;14(18):1965-74.
7. Rheude T, Costa G, Ribichini Flavio L, Pilgrim T, Amat-Santos Ignacio J, De Backer O, et al. Comparison of different percutaneous revascularisation timing strategies in patients undergoing transcatheter aortic valve implantation. EuroIntervention. 2023.



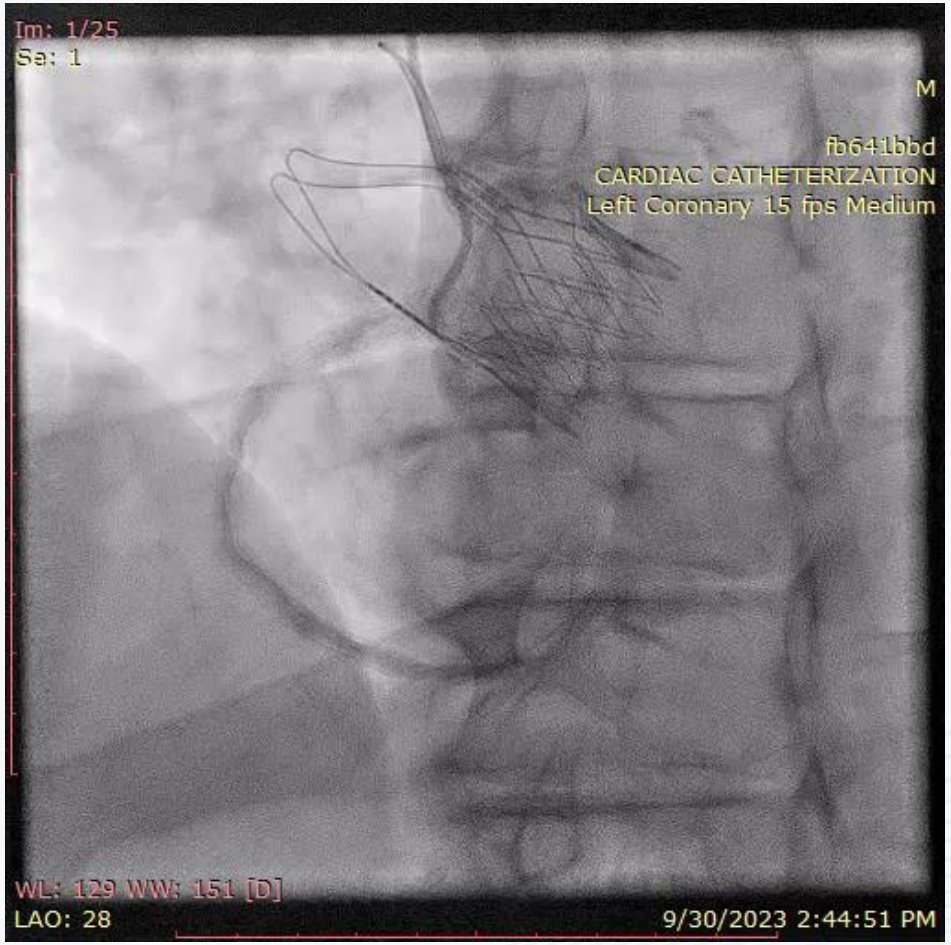
Overall success 95%

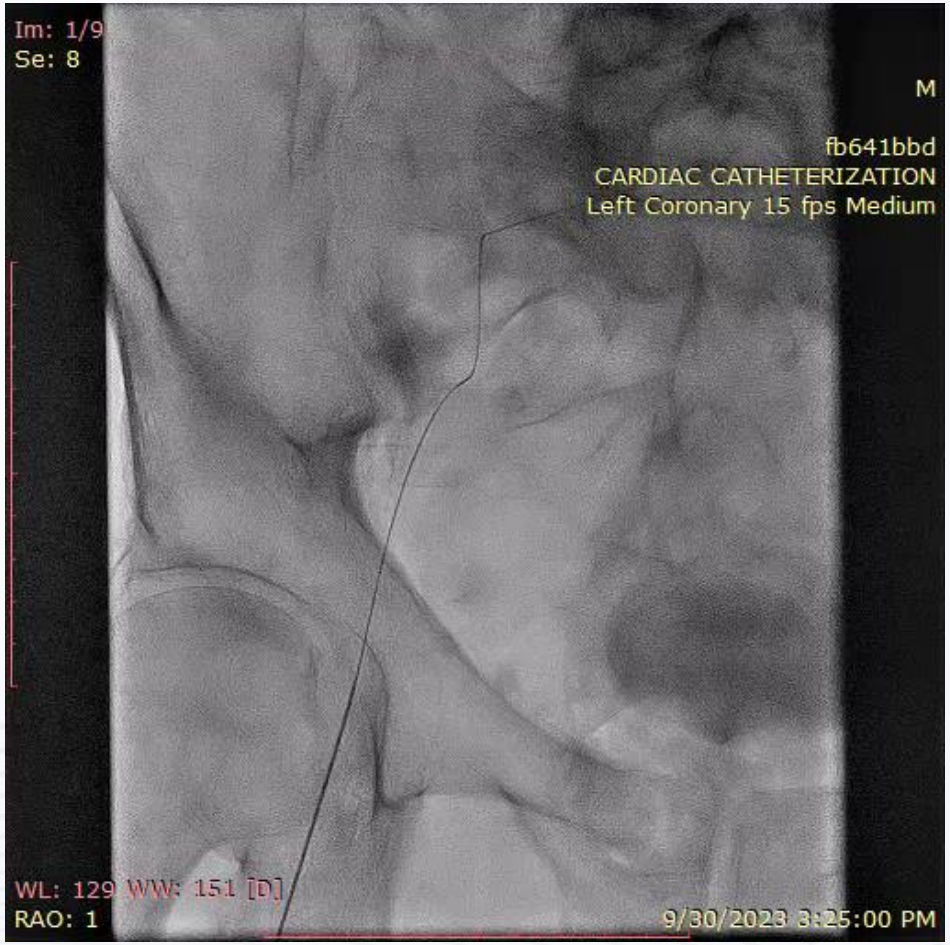
Roberto V, Giuliano C, Corrado T, Marco B. Coronary artery cannulation after transcatheter aortic valve implantation. EuroIntervention. 2021;17(10):835-47

Case 1. Inferior STEMI post TAVR



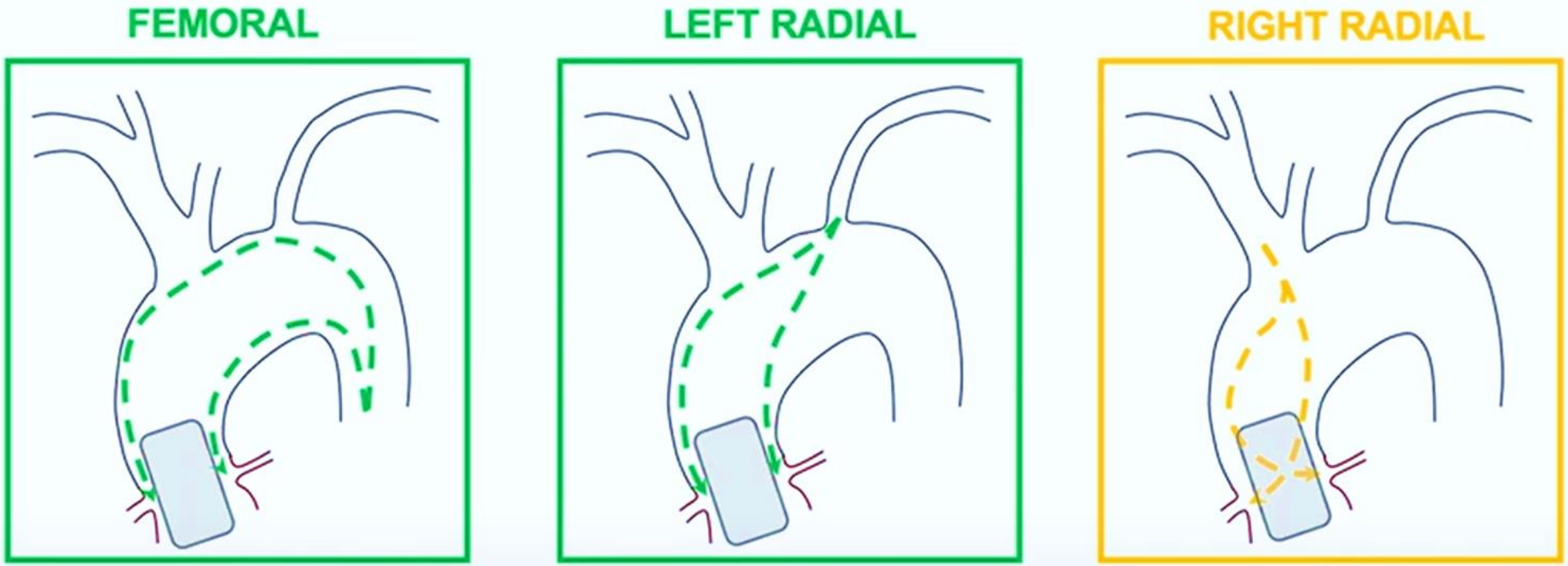
1: Choose the correct access: (femoral/left radial)





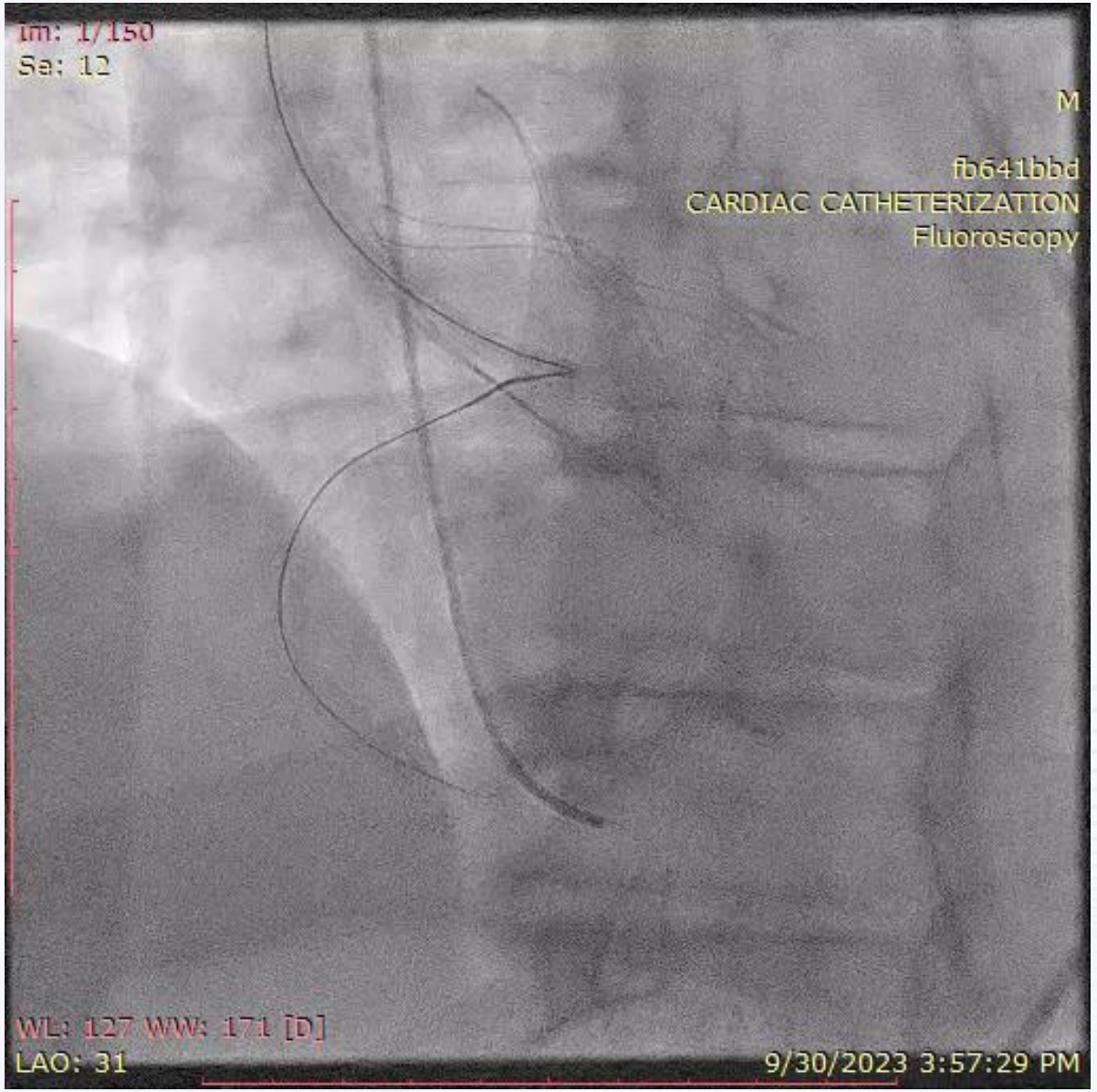
Case 1. Inferior STEMI

Tip 1: Choose the correct access: (femoral/left radial)



Courtesy: Arif Khokhar, BCh BM. Imperial College London

Twitter: @DrArifK | taviaccess@gmail.com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Se: 12
M
fb641bbd
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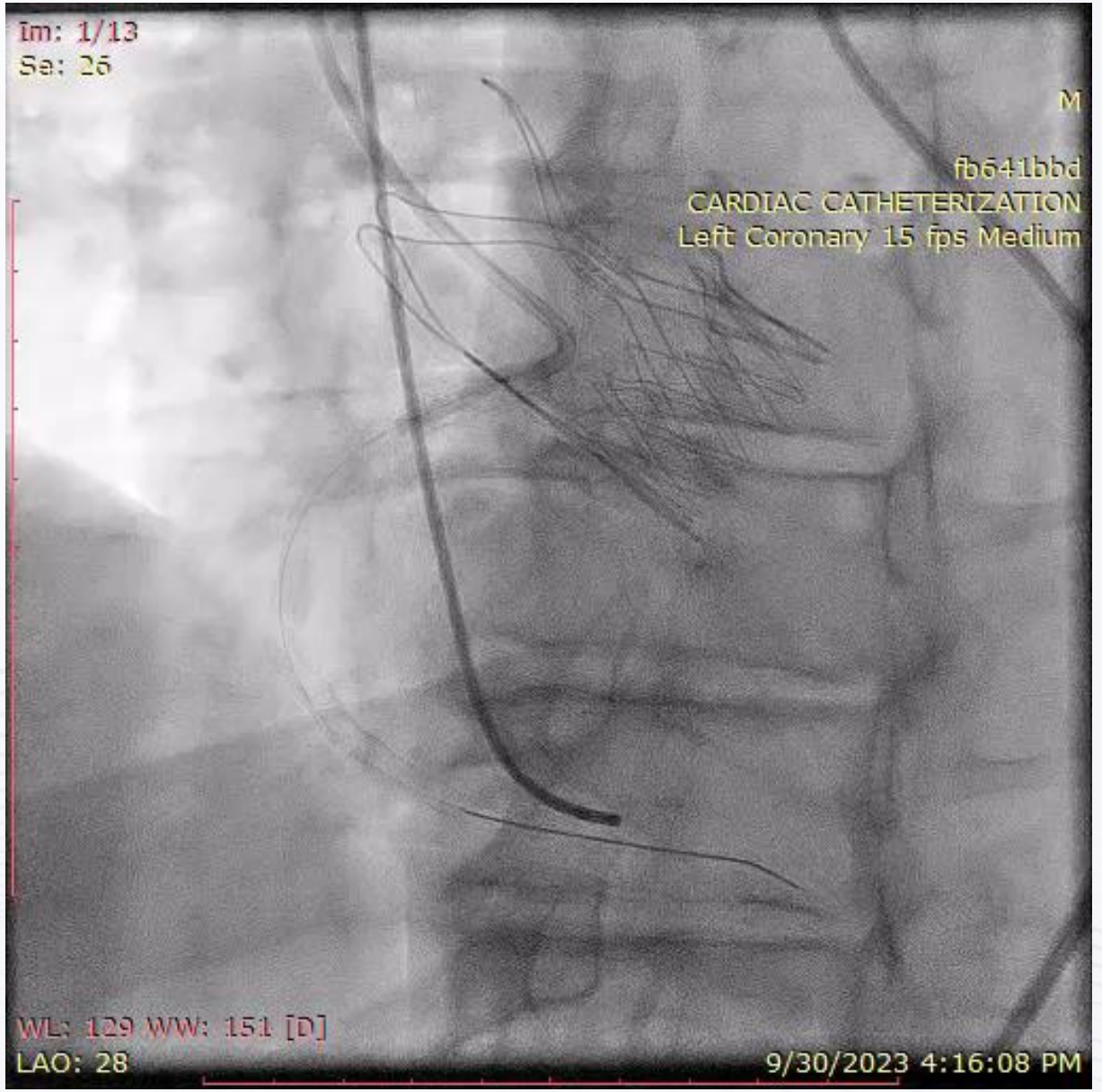
Fluoroscopy
WL: 127 WW: 171 [D]
LAO: 31
9/30/2023 3:57:29 PM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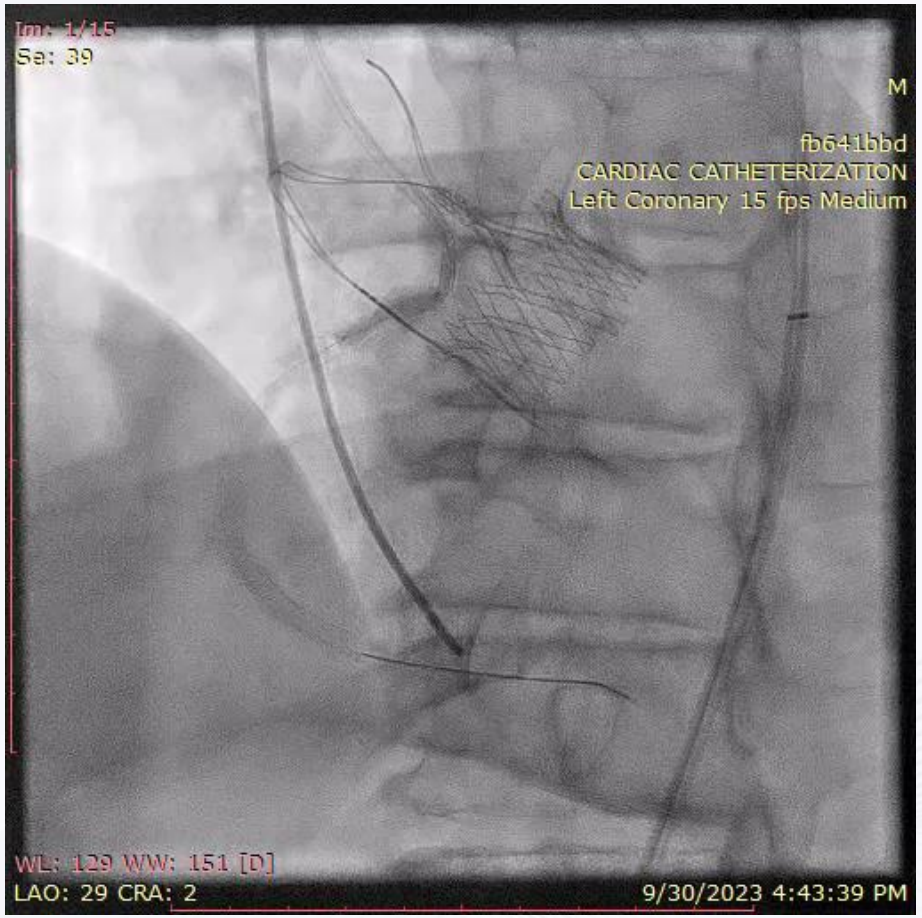
Left Coronary 15 fps Medium
WL: 129 WW: 151 [D]
LAO: 28
9/30/2023 4:16:08 PM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M
fb641bbd
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Left Coronary 15 fps Medium
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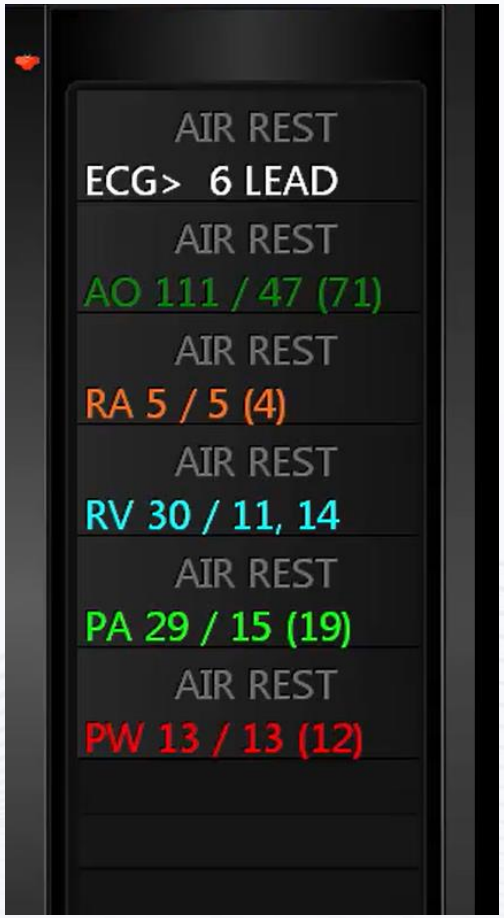
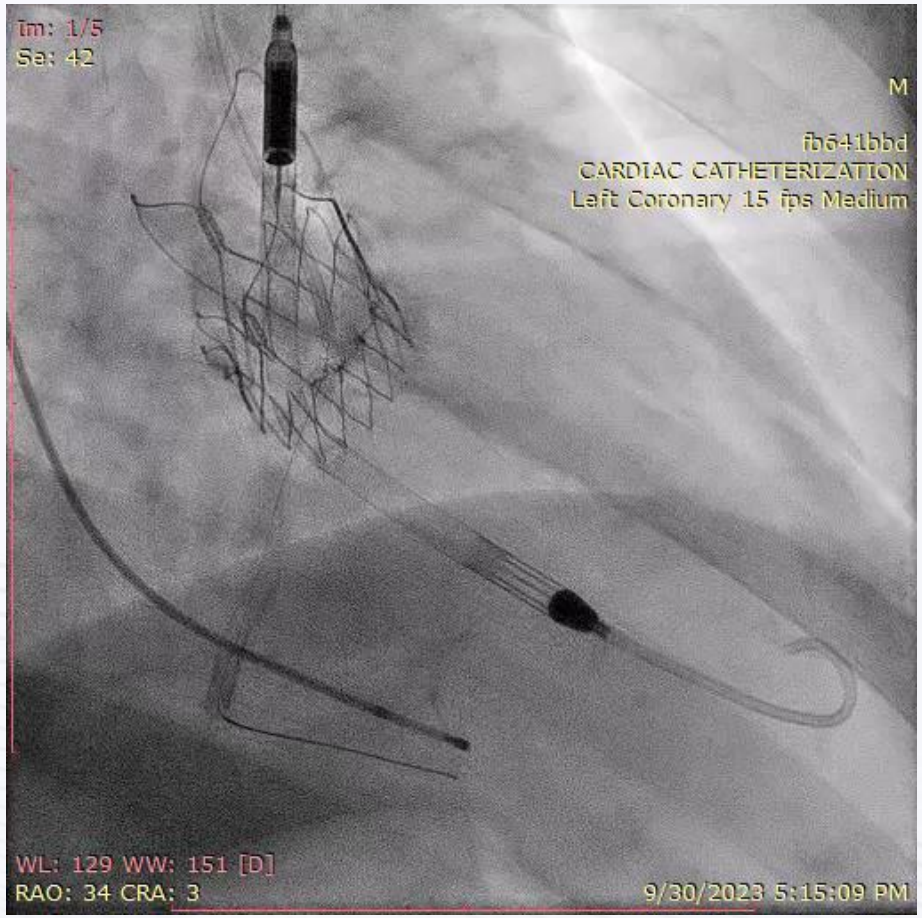
LAO: 29 CRA: 2
9/30/2023 4:43:39 PM


AIR REST
ECG> 6 LEAD
AIR REST
AO 111 / 47 (71)
AIR REST
RA 5 / 5 (4)
AIR REST
RV 30 / 11, 14
AIR REST
PA 29 / 15 (19)
AIR REST
PW 13 / 13 (12)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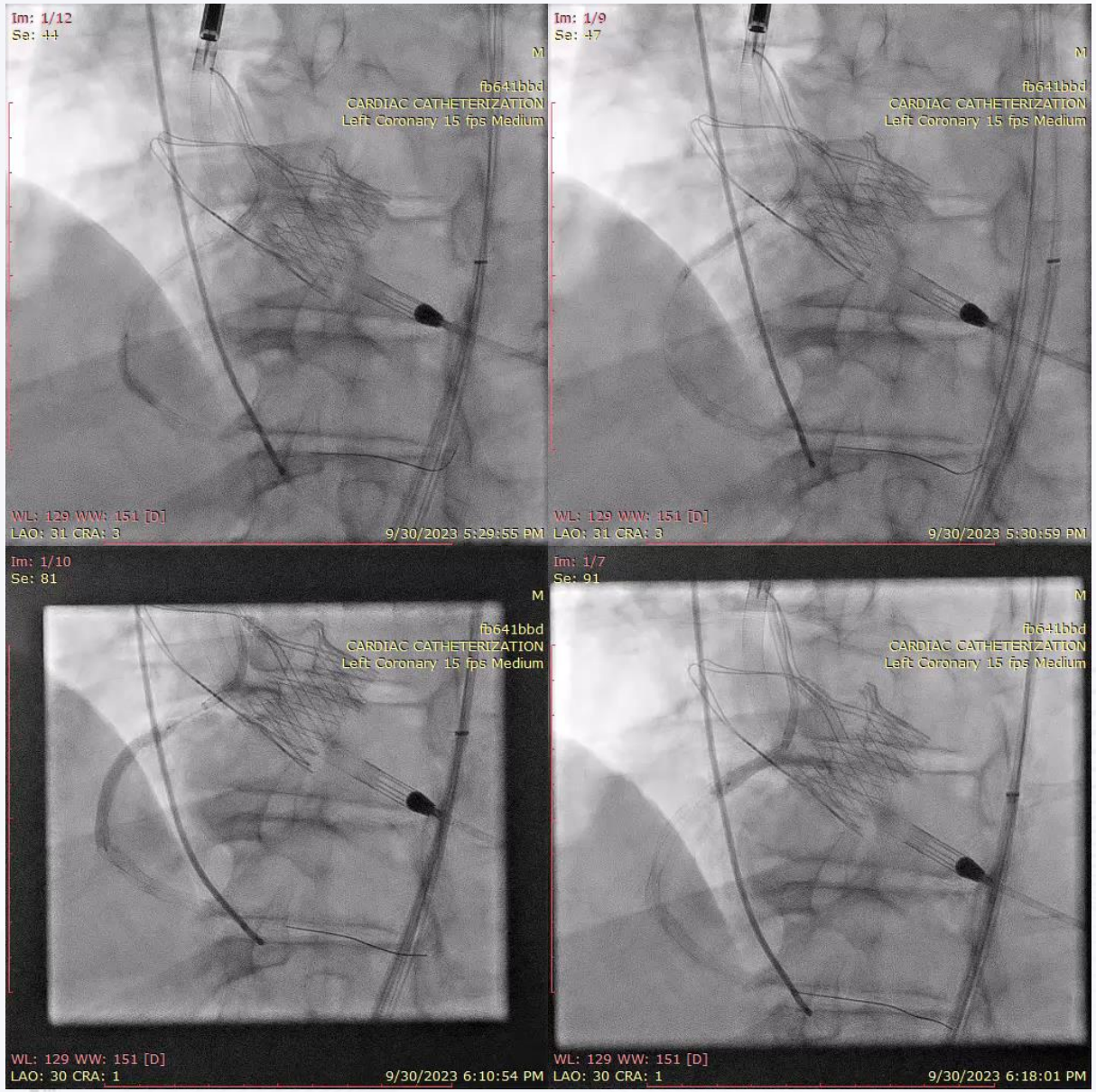
Left Coronary 15 fps Medium
WL: 129 WW: 151 [D]
RAO: 34 CRA: 3
9/30/2023 5:15:09 PM


Im: 1/12
Se: 44
M
fb641bbd
CARDIAC CATHETERIZATION
Left Coronary 15 fps Medium
WL: 129 WW: 151 [D]
LAO: 31 CRA: 3
9/30/2023 5:29:55 PM
Im: 1/9
Se: 47
M
fb641bbd
CARDIAC CATHETERIZATION
Left Coronary 15 fps Medium
WL: 129 WW: 151 [D]
LAO: 31 CRA: 3
9/30/2023 5:30:59 PM
Im: 1/10
Se: 81
M
fb641bbd
CARDIAC CATHETERIZATION
Left Coronary 15 fps Medium
WL: 129 WW: 151 [D]
LAO: 30 CRA: 1
9/30/2023 6:10:54 PM
Im: 1/7
Se: 91
M
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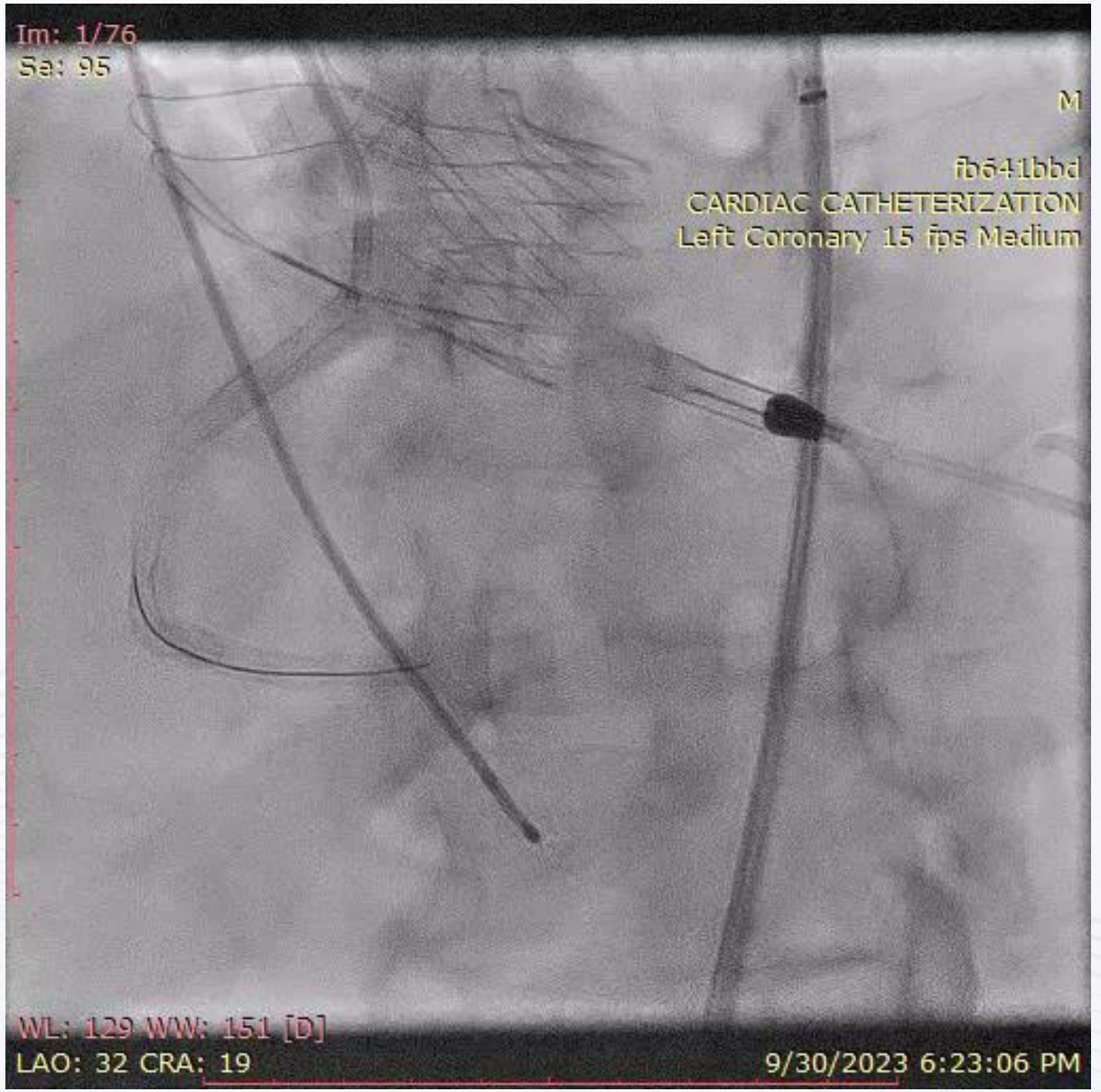
CARDIAC CATHETERIZATION
Left Coronary 15 fps Medium
WL: 129 WW: 151 [D]
LAO: 30 CRA: 1
9/30/2023 6:18:01 PM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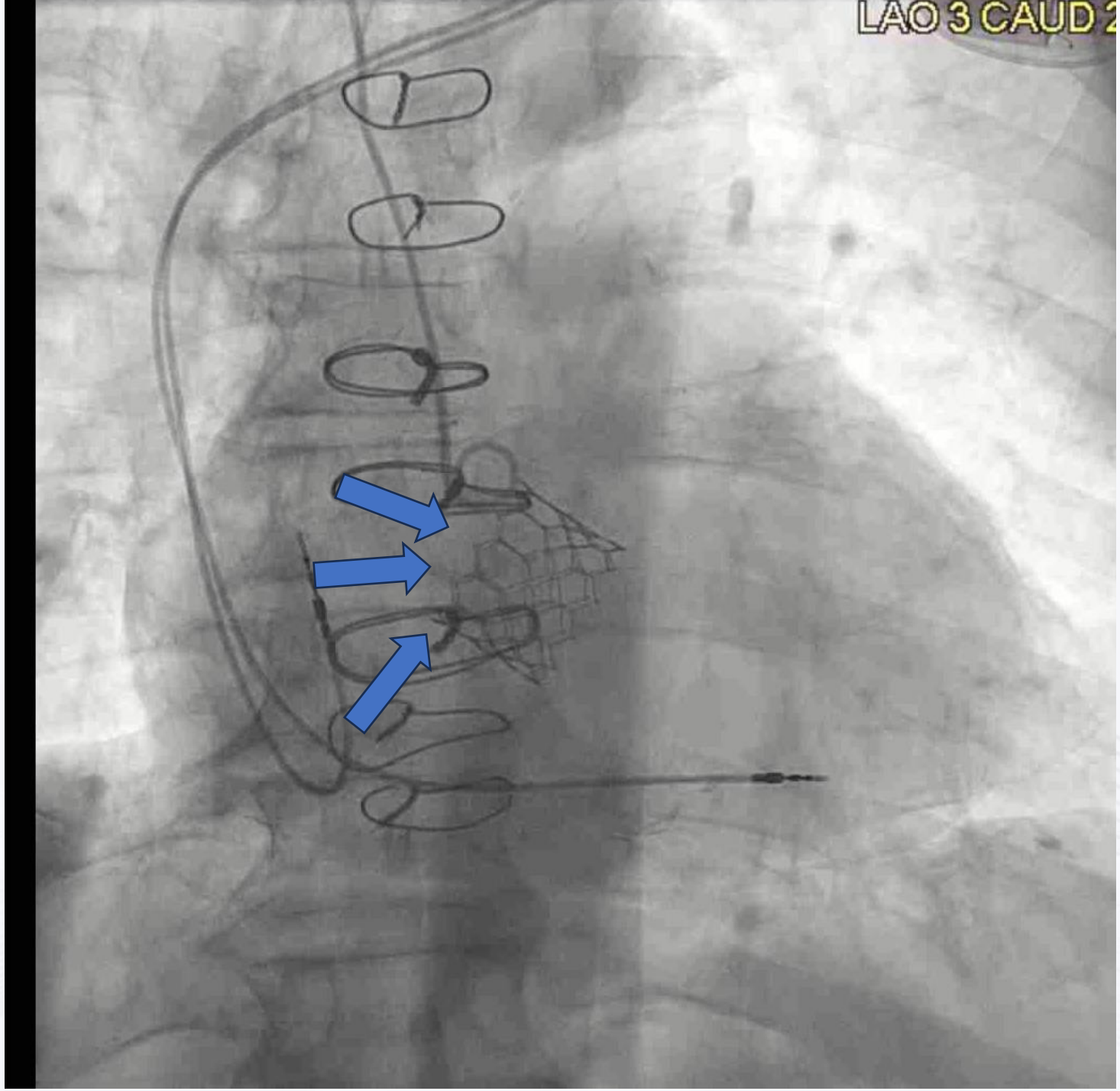
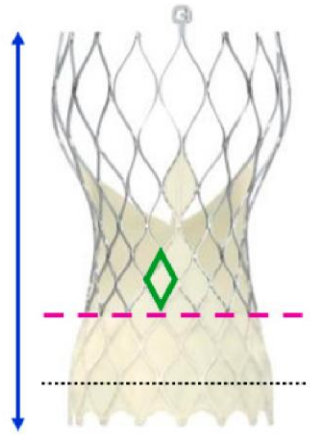
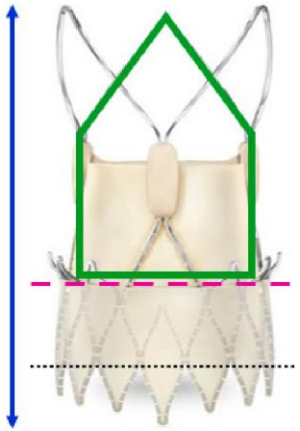
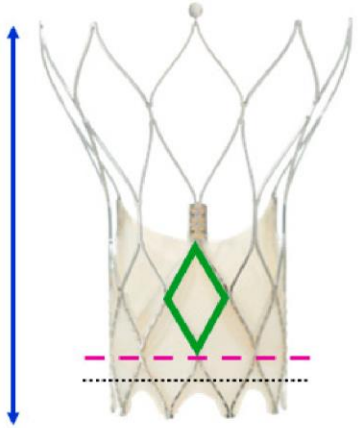
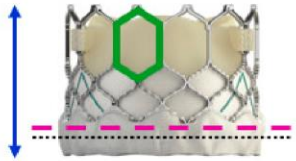
M
fb641bbd
CARDIAC CATHETERIZATION
Left Coronary 15 fps Medium
WL: 129 WW: 151 [D]
LAO: 32 CRA: 19
9/30/2023 6:23:06 PM

2: Use aortogram


LAO 3 CAUD 2

3. Know the valve

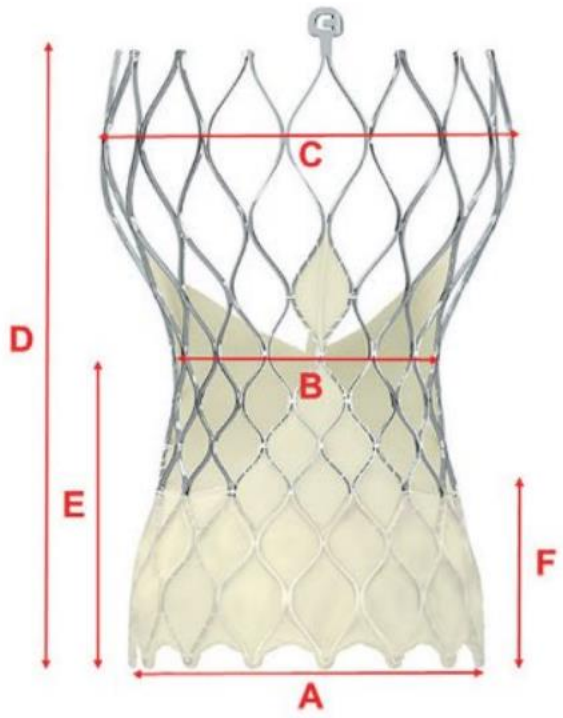
Evolut R/Pro	ACURATE neo2	Portico	SAPIEN
			
Tall stent frame	Tall stent frame	Tall stent frame	Low stent frame
Supra-annular leaflet position	Supra-annular leaflet position	Intra-annular leaflet position	Intra-annular leaflet position
Small stent cells, high density	Open frame	Large stent cells	Small stent cell, high density

Quagliana A, Montarello NJ, Willemen Y, Bække PS, Jørgensen TH, De Backer O, et al. Commissural Alignment and Coronary Access after Transcatheter Aortic Valve Replacement. Journal of clinical medicine. 2023;12(6).

CORONARY ACCESS AFTER TAVI

EVOLUT DIMENSIONS RELATIVE TO CORONARY ACCESS

FIGURE 1 Repositionable Self-Expanding Valves With and Without an External Pericardial Wrap: Features and Dimensions



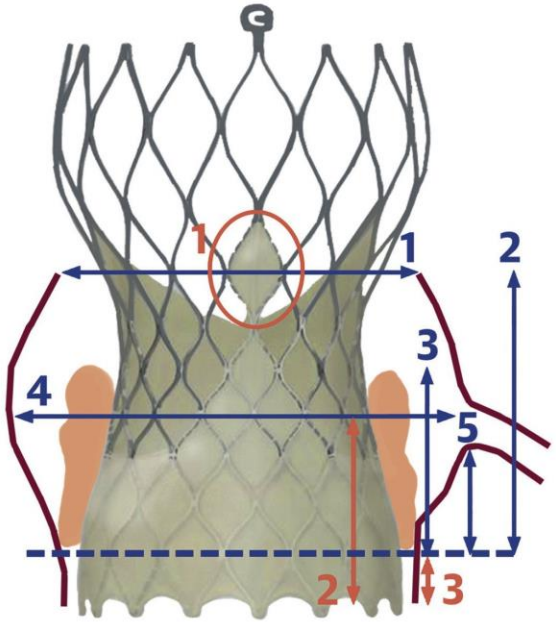
	23mm Evolut R / PRO	26 mm Evolut R / PRO	29mm Evolut R / PRO	34mm Evolut R
A. Inflow Diameter	23 mm	26 mm	29 mm	34 mm
B. Waist Diameter	20 mm	22 mm	23 mm	24 mm
C. Outflow Diameter	34 mm	32 mm	34 mm	38 mm
D. Frame height	45 mm	45 mm	45 mm	46 mm
E. Commissure Height	26 mm	26 mm	26 mm	26 mm
F. Skirt Height	13 mm	13 mm	13 mm	14 mm

Various dimensions of the Evolut-R and Evolut-PRO CoreValve (Medtronic, Galway, Ireland) are listed for comparison.

Yudi, et al., JACC 2018; 71(12): 1360-78

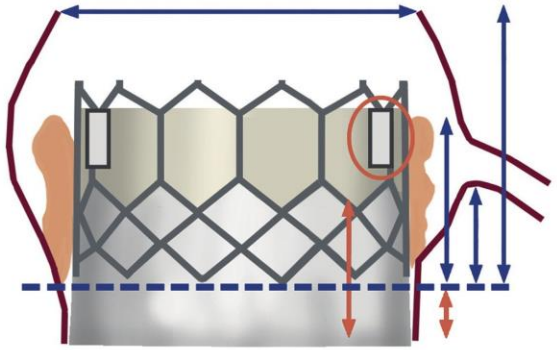
CENTRAL ILLUSTRATION: Coronary Reaccess After TAVR

Factors Impacting Coronary Access



Anatomical

1. Sinotubular junction dimensions
2. Sinus height
3. Leaflet length and bulkiness
4. Sinus of Valsalva width
5. Coronary height

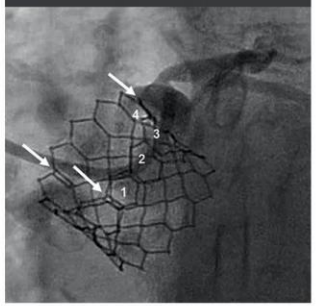


Device and Procedural

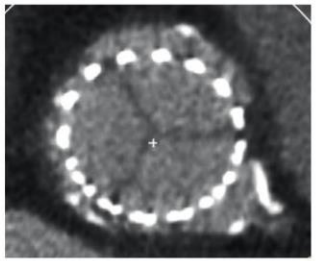
1. Commissural tab orientation
2. Sealing skirt height
3. Valve implant depth

Imaging Evaluation

Fluoroscopy



MDCT



Yudi, M.B. et al. J Am Coll Cardiol. 2018;71(12):1360-78.

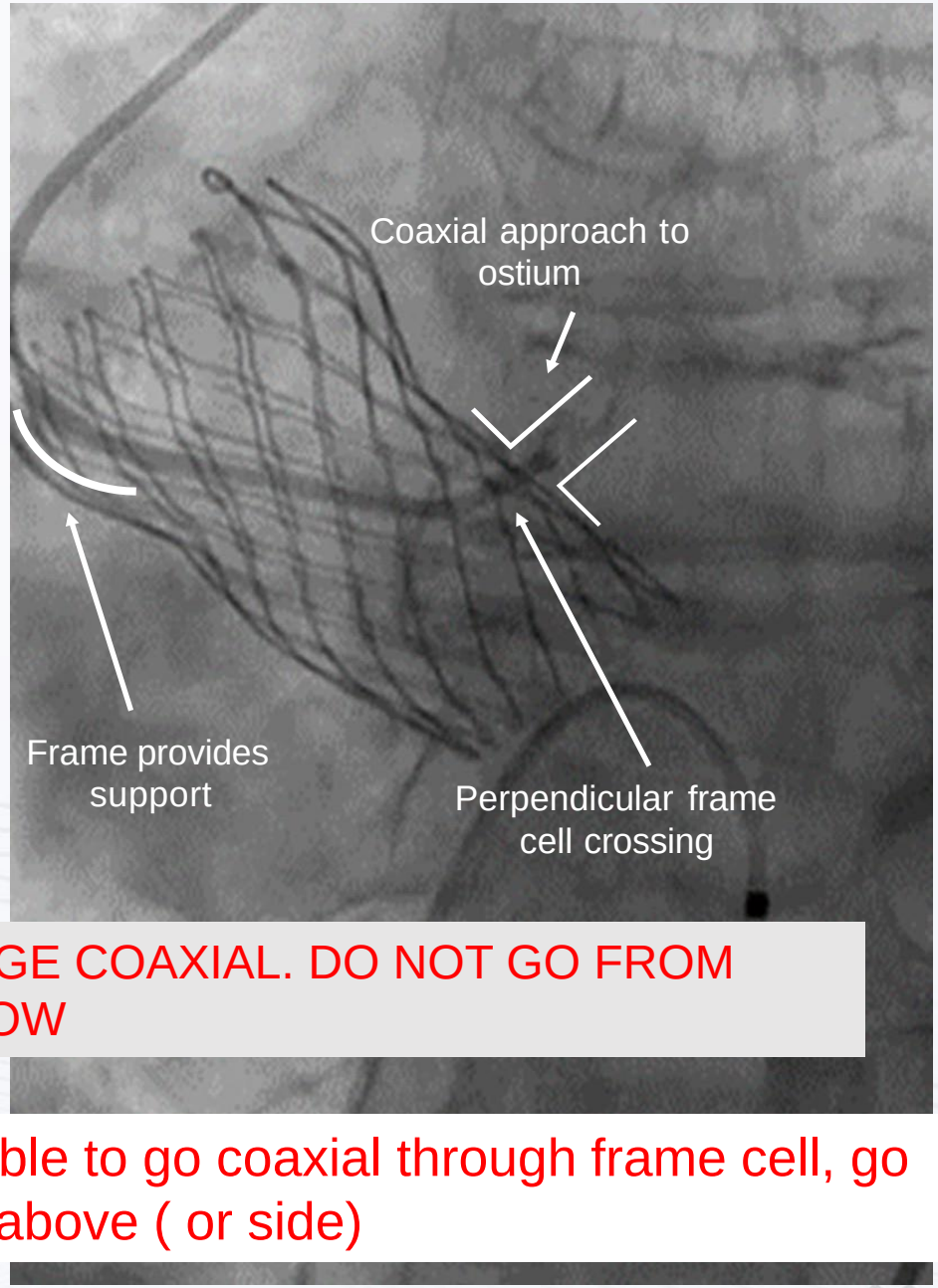
4. Select a correct guide

Catheter should allow:

1. Perpendicular crossing of the frame 2. Coaxial approach to the ostium

Downsize catheter choice by 0.5cm for evolut.

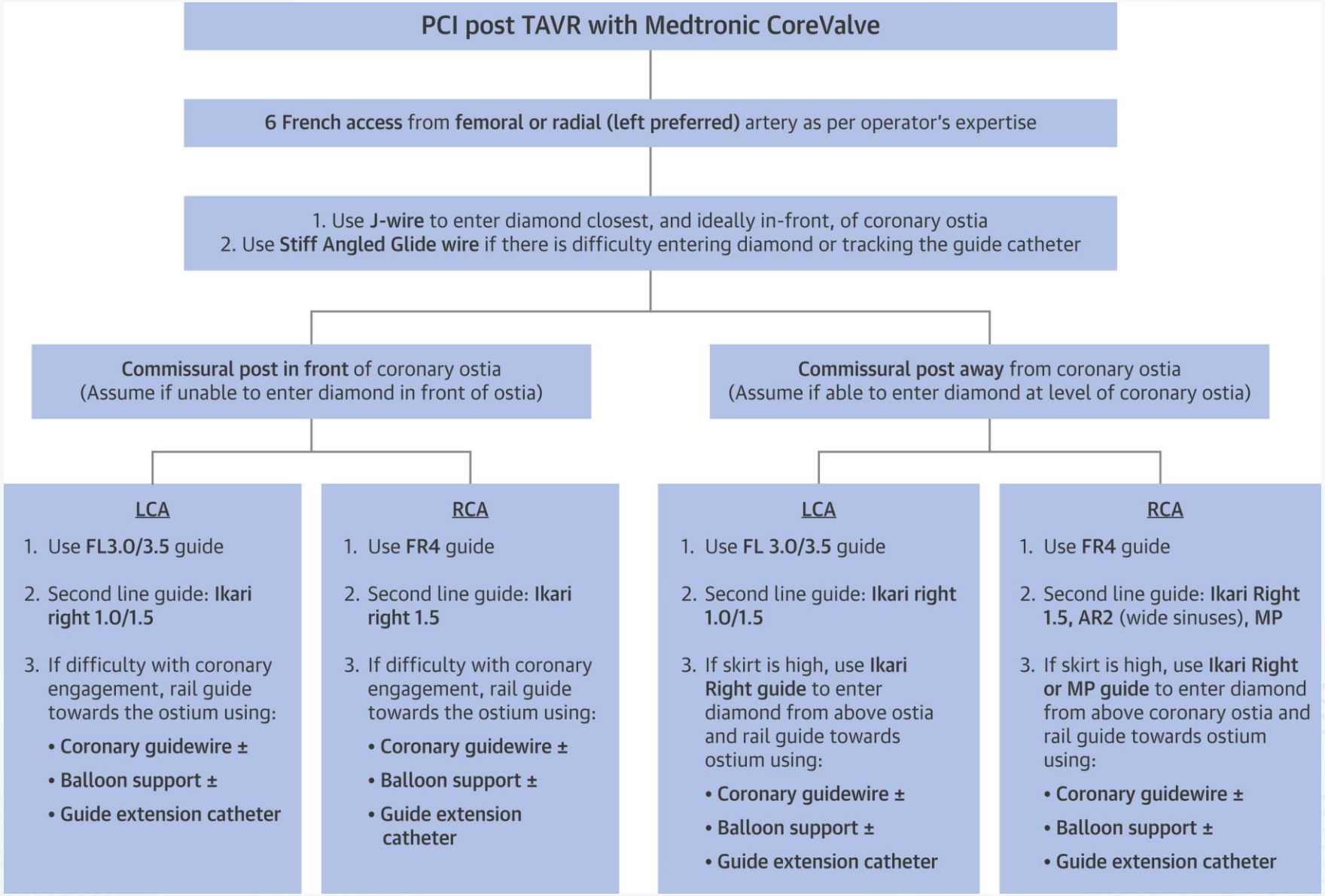
For Sapien, no need to downsize



ENAGE COAXIAL. DO NOT GO FROM BELOW

If unable to go coaxial through frame cell, go from above (or side)

1. Harhash et al. STEMI After TAVI. JACC: Cardiovascular Interventions 2016
Yudi et al. Coronary Angiography and Percutaneous Coronary Intervention After Transcatheter Aortic Valve Replacement. JACC 2018



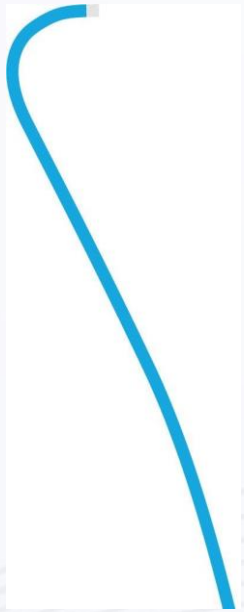
Going from above:
Ikari right/ MP

Yudi MB, Sharma SK, Tang GHL, Kini A. Coronary Angiography and Percutaneous Coronary Intervention After Transcatheter Aortic Valve Replacement. Journal of the American College of Cardiology. 2018;71(12):1360-78.

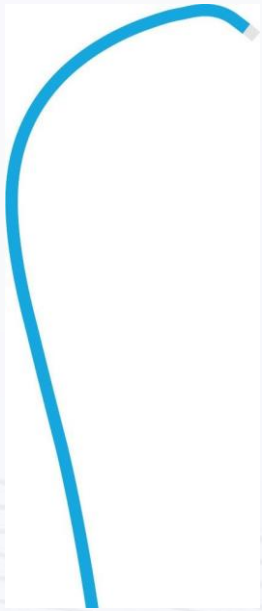
Catheter considerations for small, effaced root

Judkins Left
(LCA)

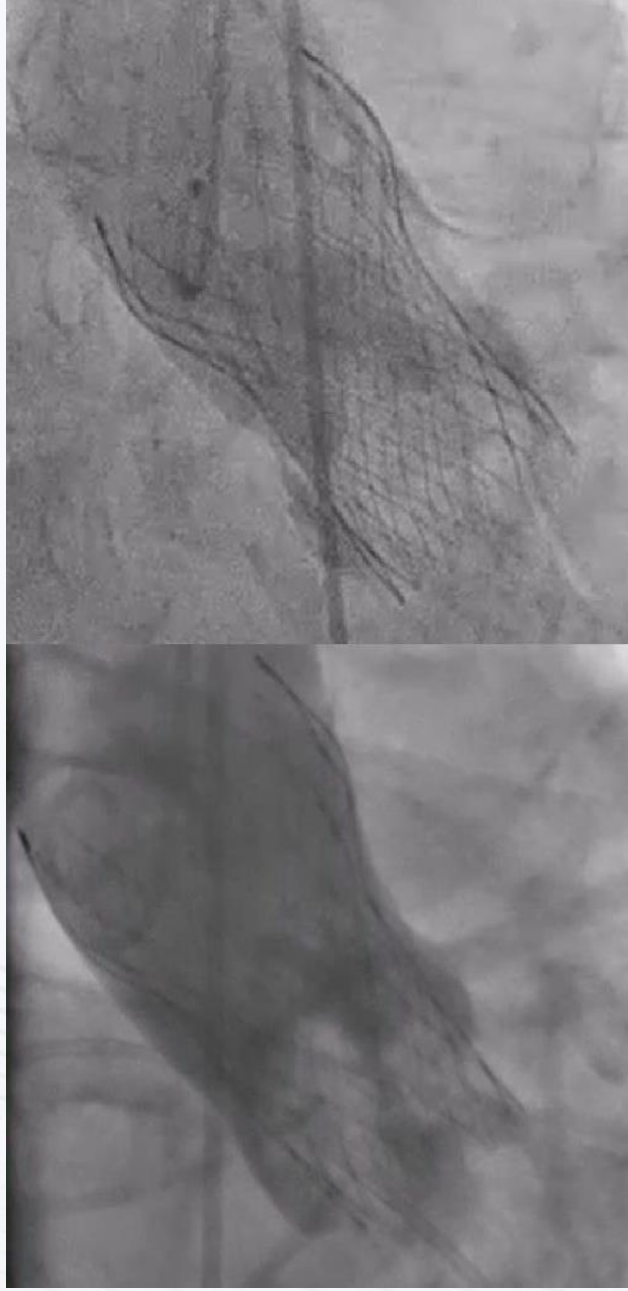
Judkins Right
(LCA/RCA)



Williams Right/3DRC
(RCA)



LCB
(LCA)



Yudi et al. Coronary Angiography and Percutaneous Coronary Intervention After Transcatheter Aortic Valve Replacement. JACC 2018

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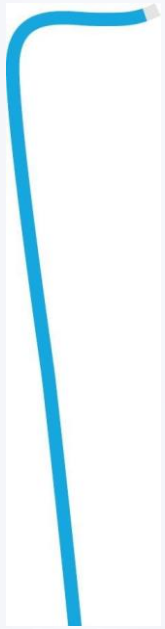
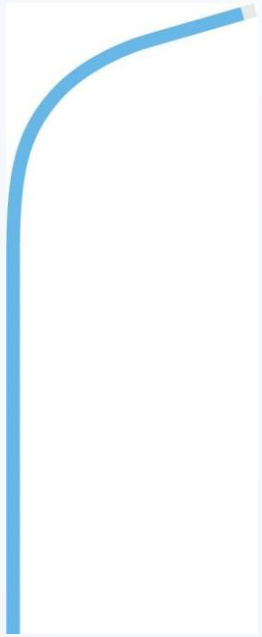
Courtesy: Ausra Stancikiene. Medtronic Structural Heart Training & Education specialist.

Catheter considerations for capacious or angulated root or if there is need to maneuver around a commissure

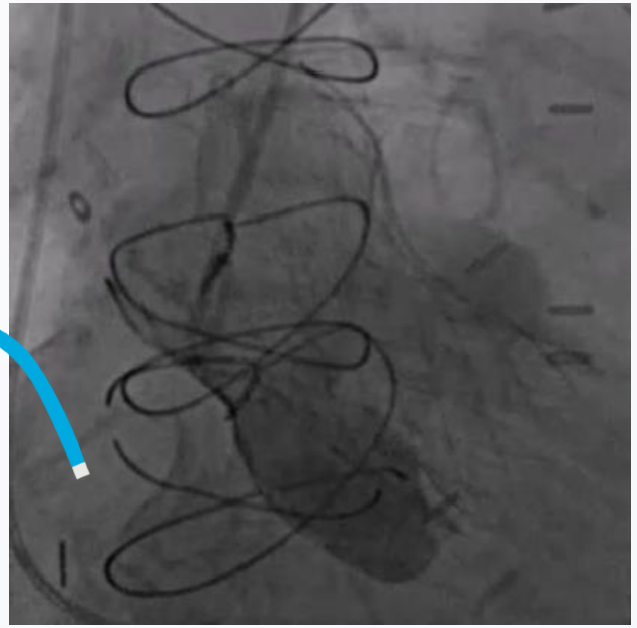


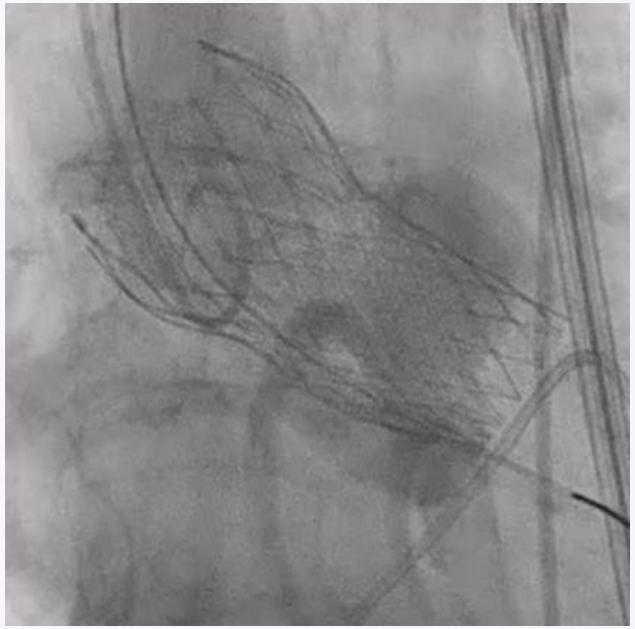
Amplatz Right (LCA/RCA)

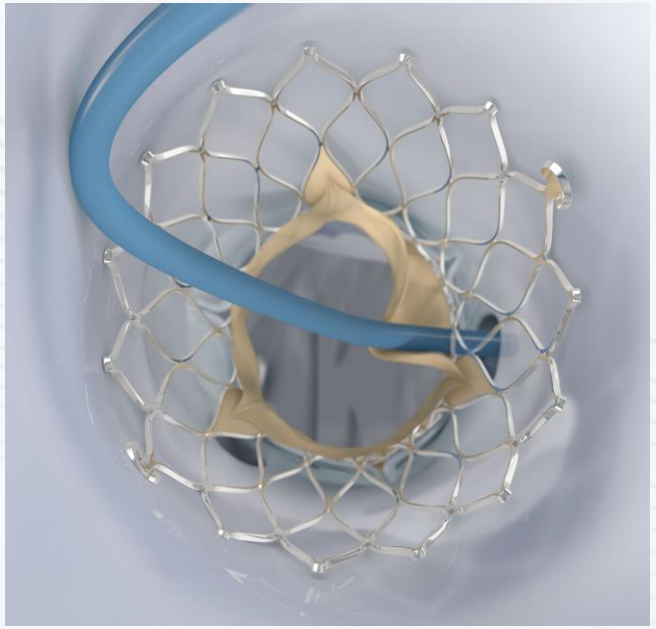


Multipurpose (LCA/RCA)

Ikari Right (LCA/RCA)







Yudi et al. Coronary Angiography and Percutaneous Coronary Intervention After Transcatheter Aortic Valve Replacement. JACC 2018

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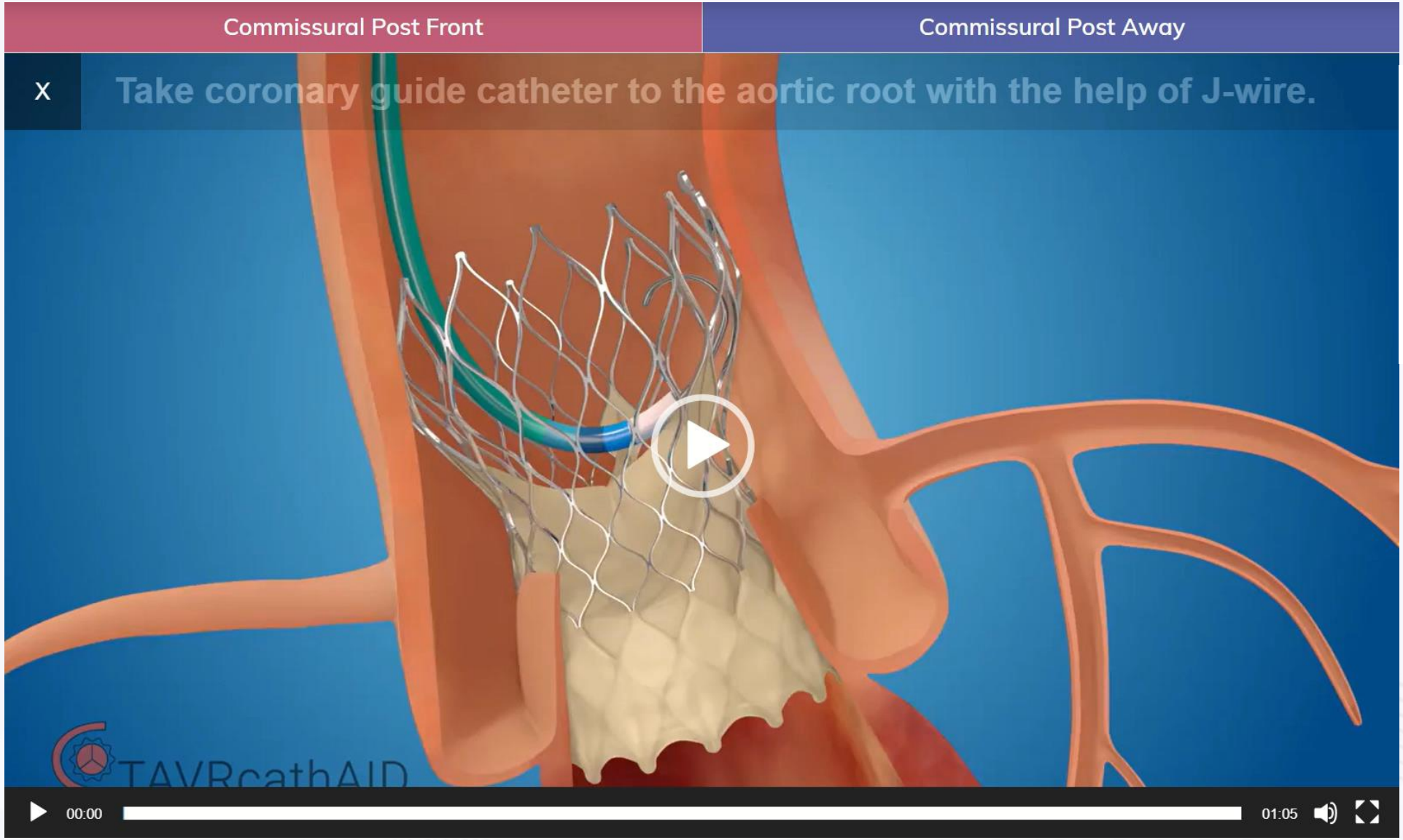
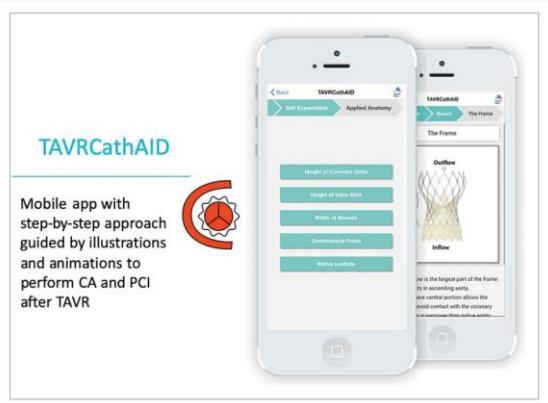
Courtesy: Ausra Stancikiene. Medtronic Structural Heart Training & Education specialist.

5. Use guide extensions and microcatheters, rail in the guide, and hydrophilic wires

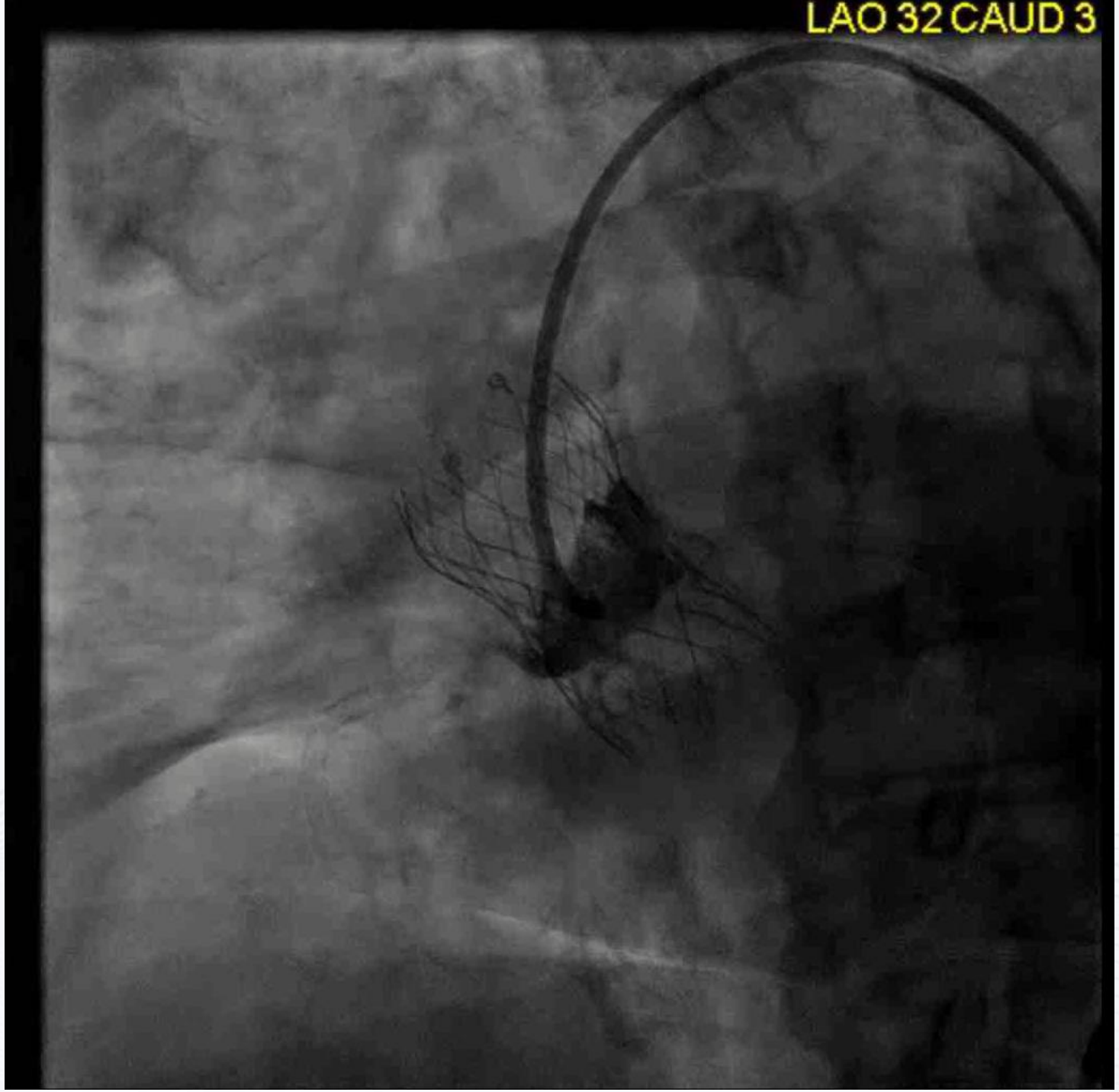


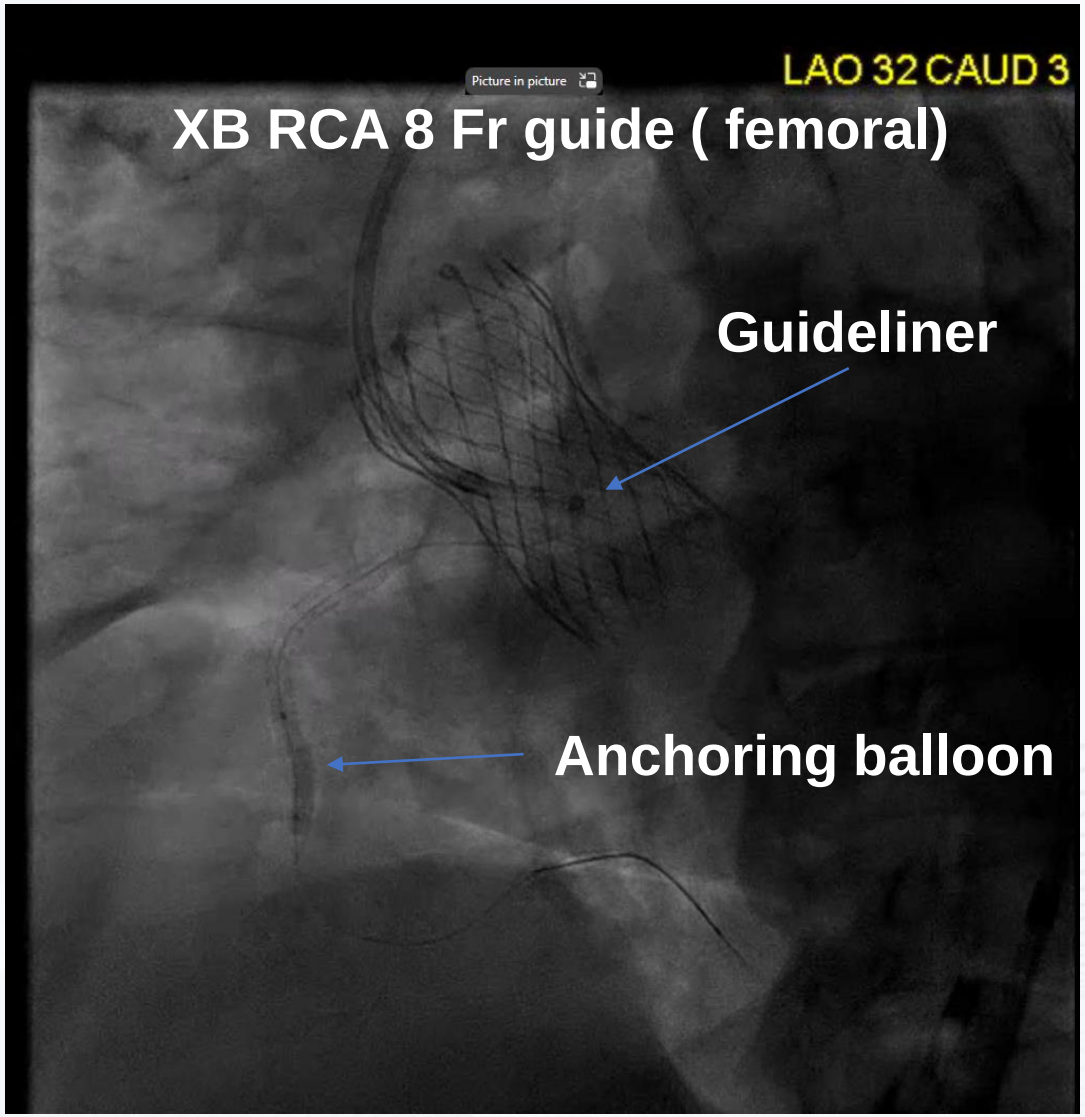


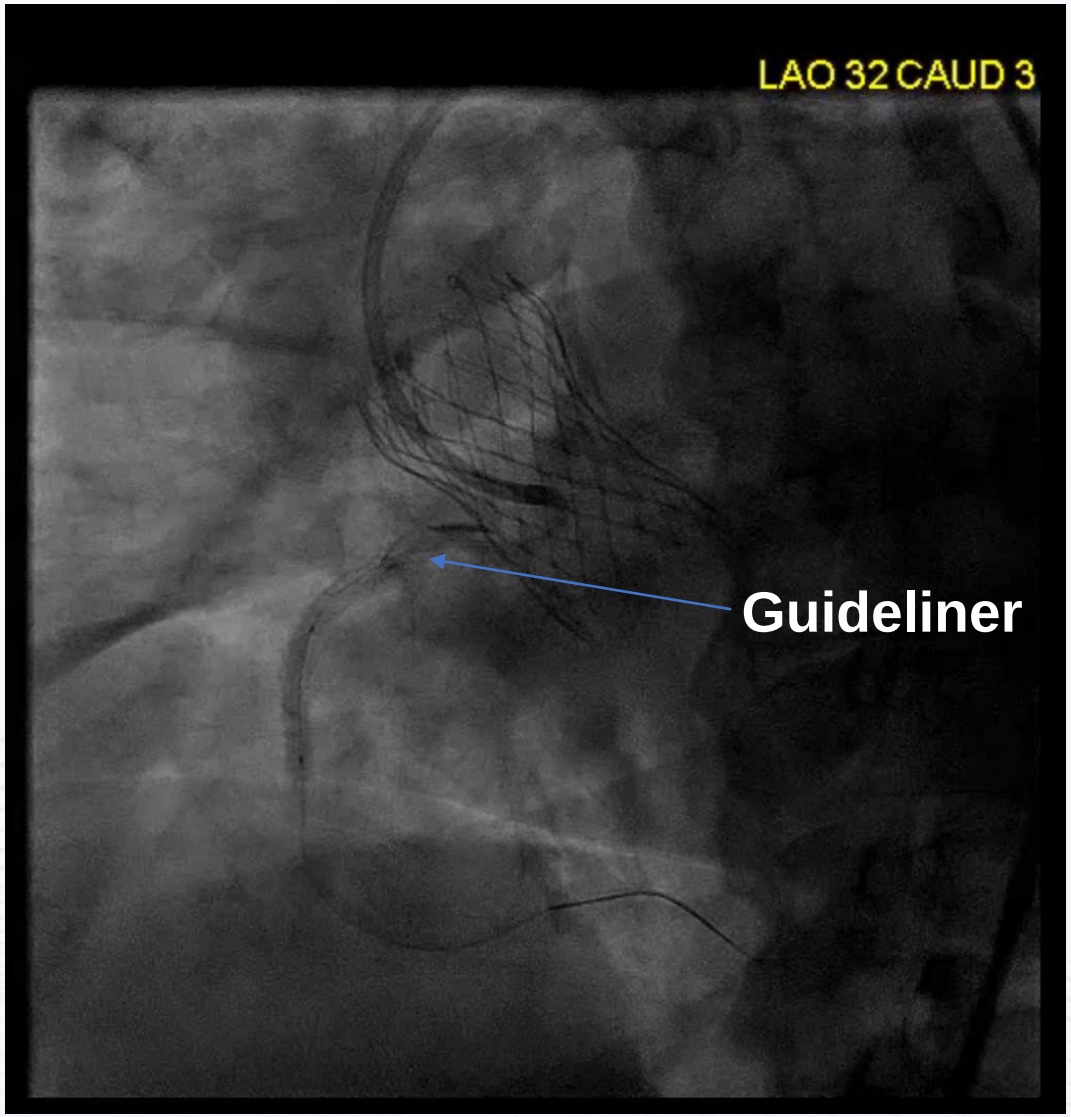
RAIL IN THE GUIDE EXTENSION

Yudi MB, Sharma SK, Tang GHL, Kini A. Coronary Angiography and Percutaneous Coronary Intervention After Transcatheter Aortic Valve Replacement. Journal of the American College of Cardiology. 2018;71(12):1360-78.

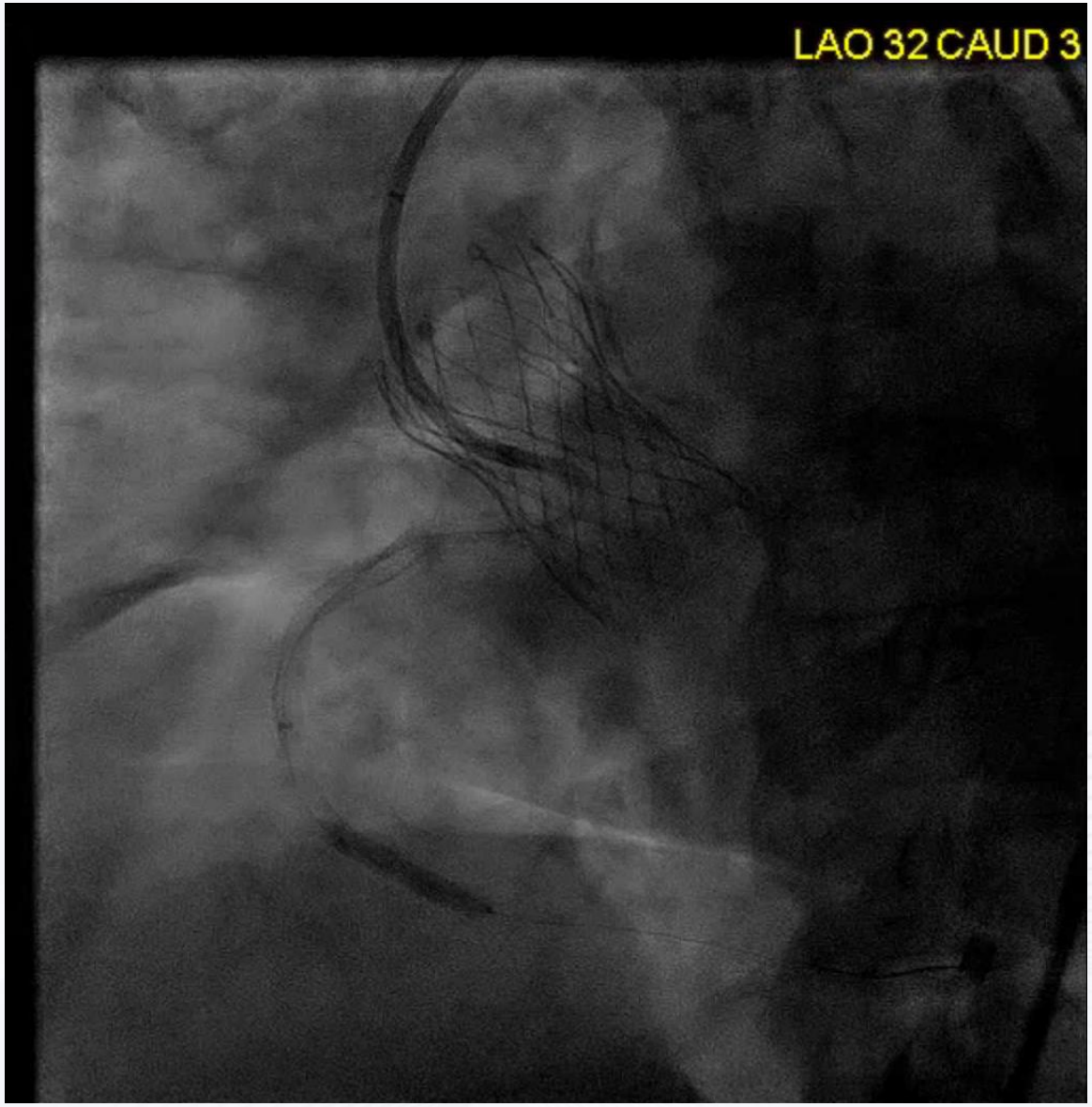
Case 2. RCA, rail in guideliner





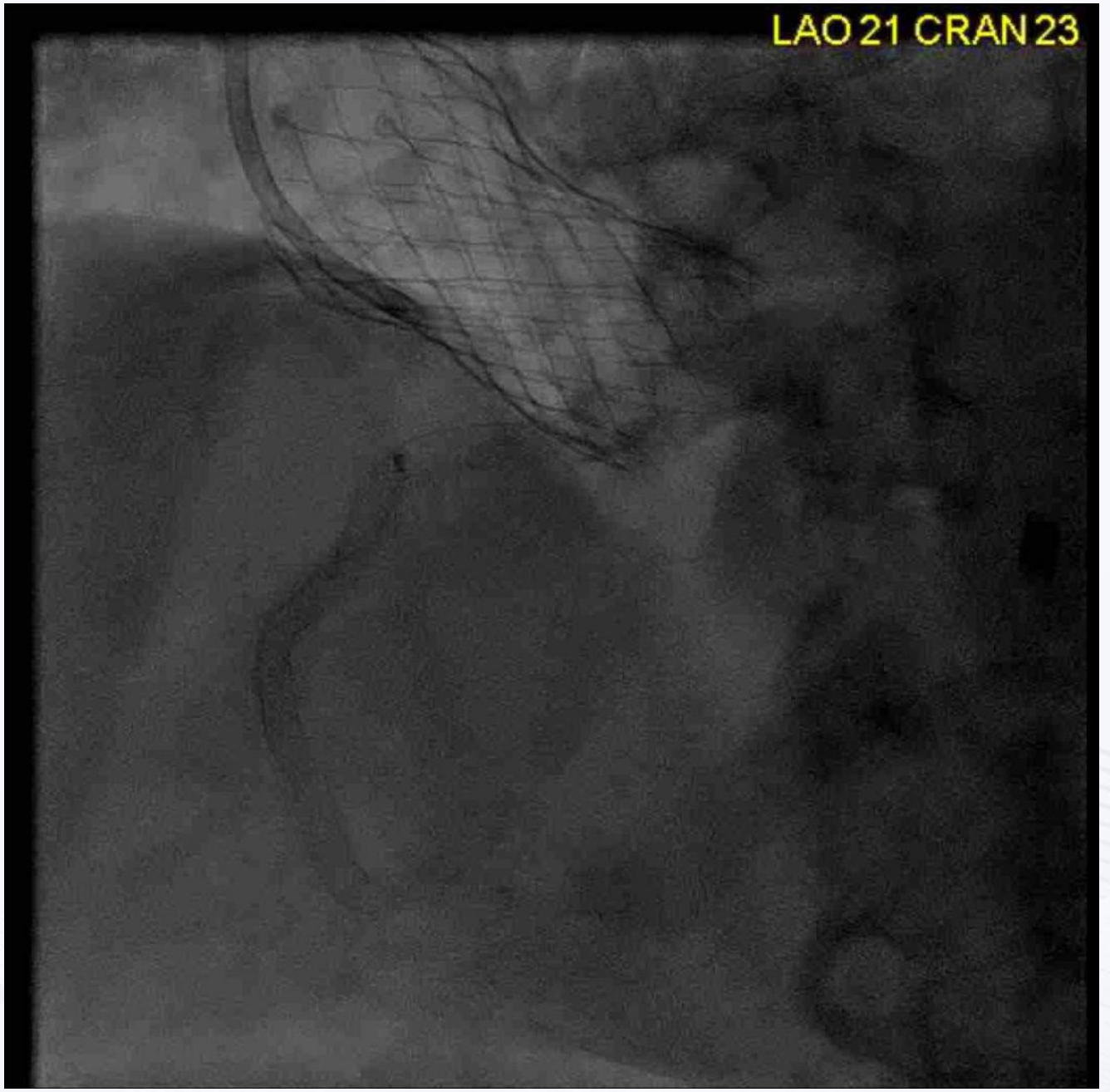


Initial wiring with turnpike microcatheter and spectre wire

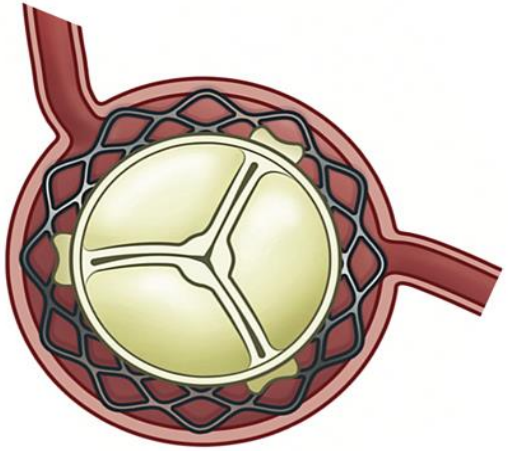


Predilate 3.0, 3.5 4.0

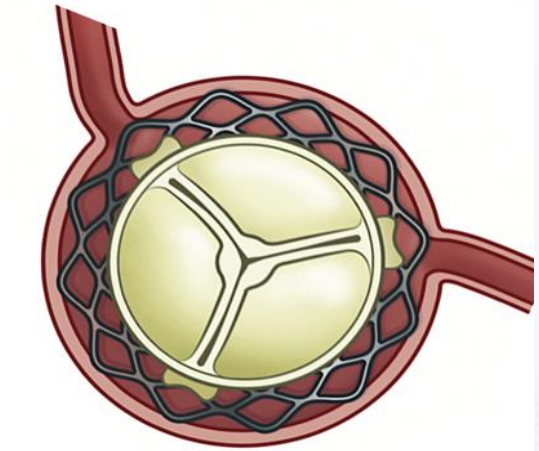
IVUS guided PCI, 3.5x24 , 4.0x48, 4.0x28 stents. IVUS. Postdilate 4.0/5.0 N


LAO 21 CRAN 23

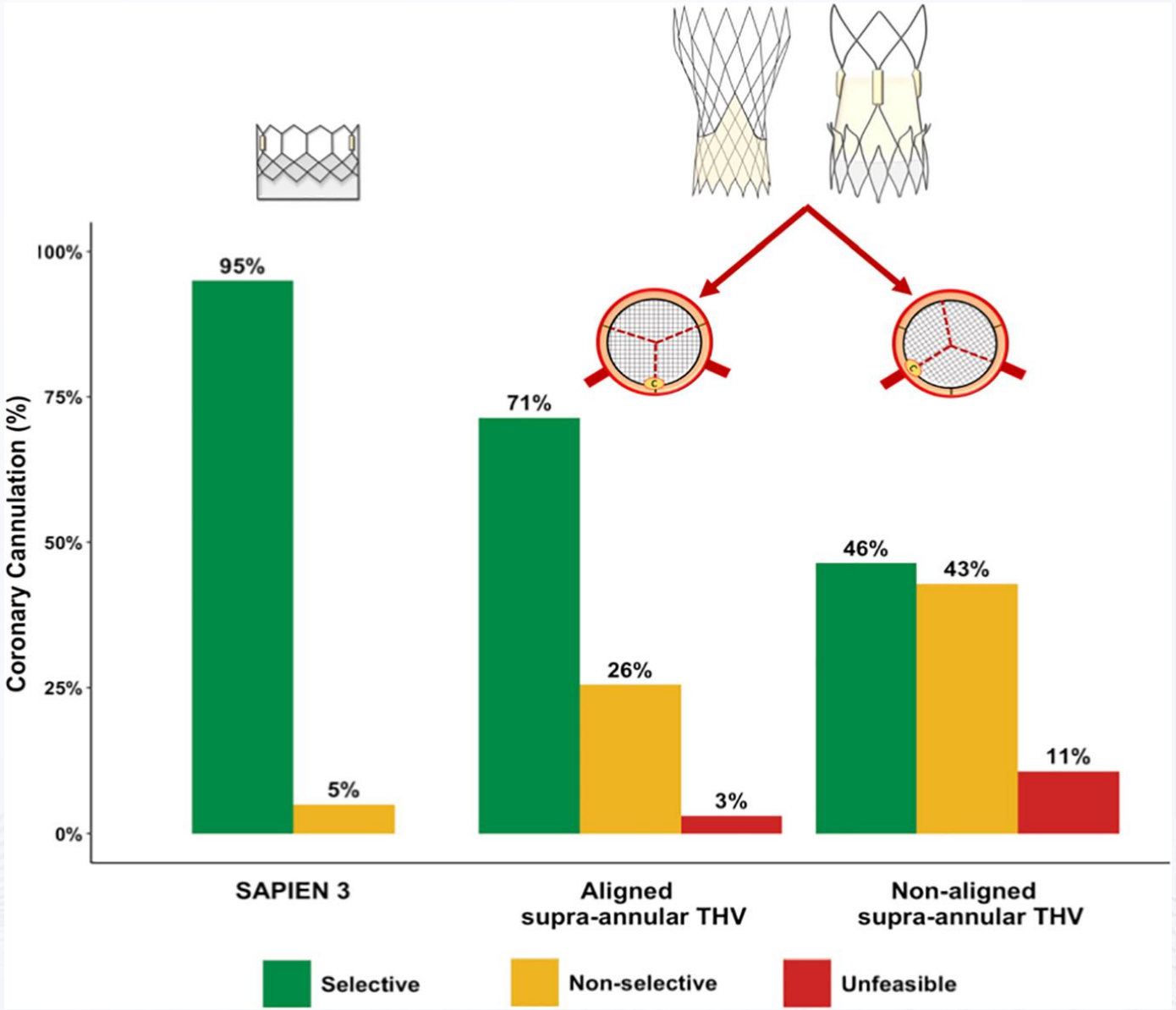
6. Know the commissural alignment



✓ Commissural alignment



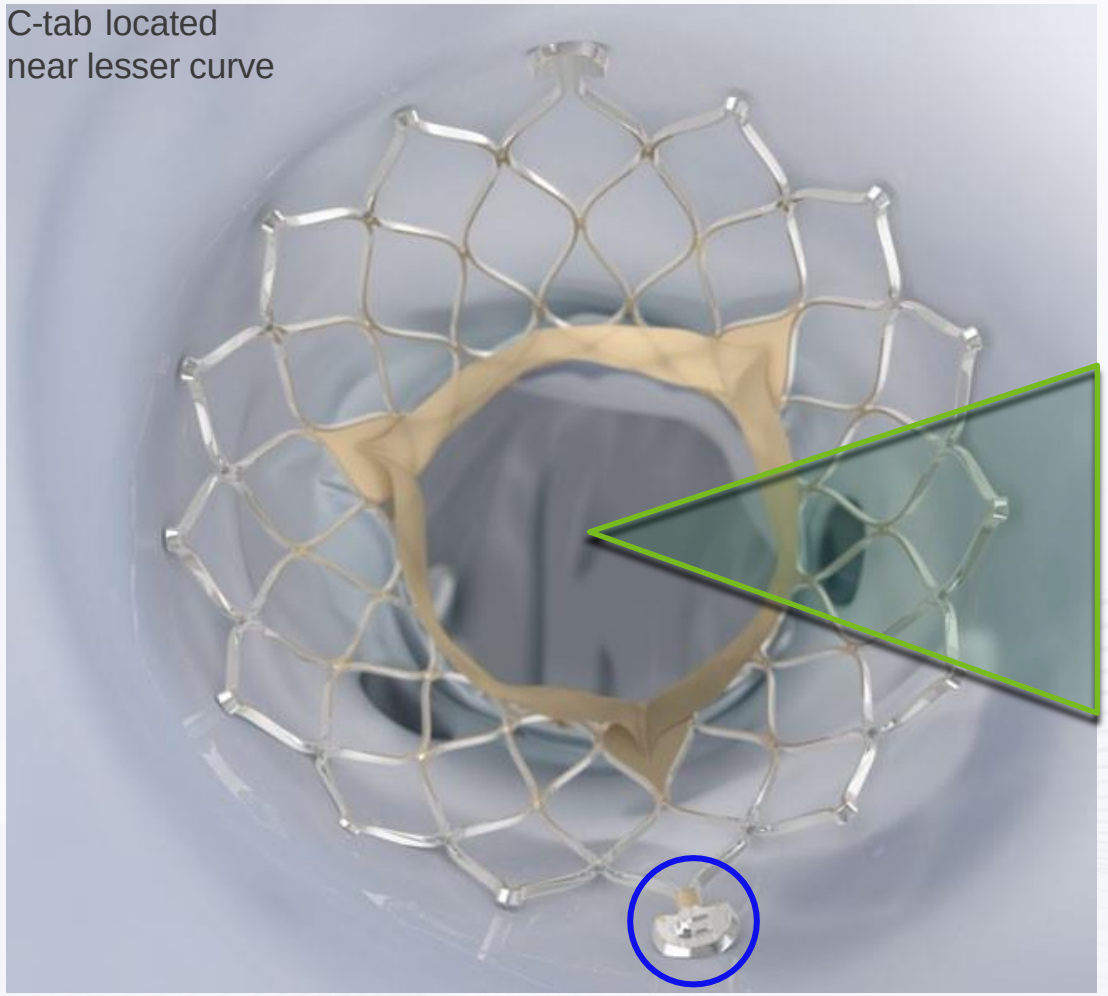
X Commissural misalignment (CMA)

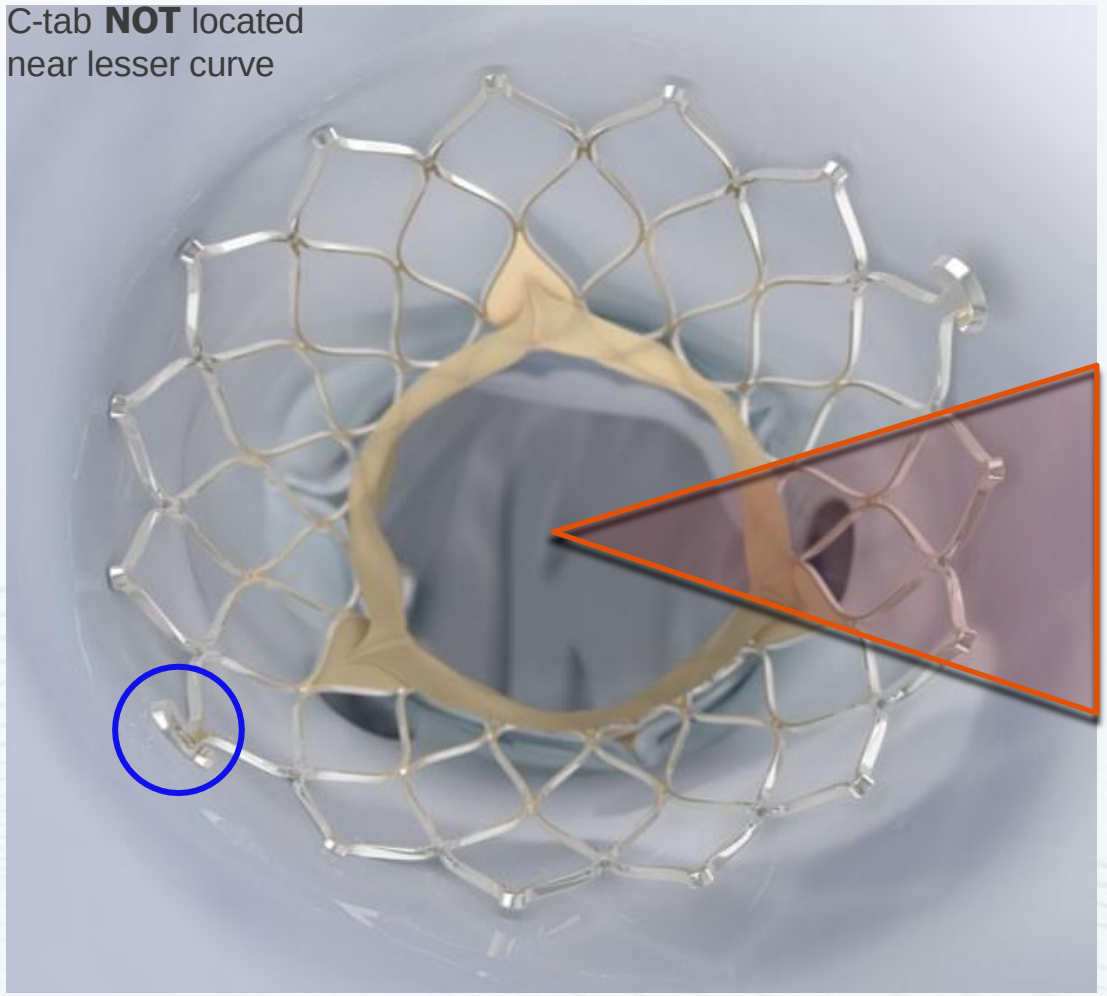


Tarantini G, Fovino LN, Scotti A, Massussi M, Cardaioli F, Rodinò G, et al. Coronary Access After Transcatheter Aortic Valve Replacement With Commissural Alignment: The ALIGN-ACCESS Study. 2022;15(2):e011045.

Bieliauskas G, Wong I, Bajoras V, et al. Patient-Specific Implantation Technique to Obtain Neo-Commissural Alignment With Self-Expanding Transcatheter Aortic Valves. *J Am Coll Cardiol Intv.* 2021 Oct, 14 (19)

Pre-procedure: Commissural position considerations





Permission for use obtained from Medtronic. Courtesy: Ausra Stancikiene. Medtronic Structural Heart Training & Education specialist.

Pre-procedure: Commissural position considerations

Confirm "C" Tab Position

- image valve frame in 20–25° LAO projection
- Typical position is on the anterior portion of the lesser curve
- Consider longer tip catheter if misaligned valve

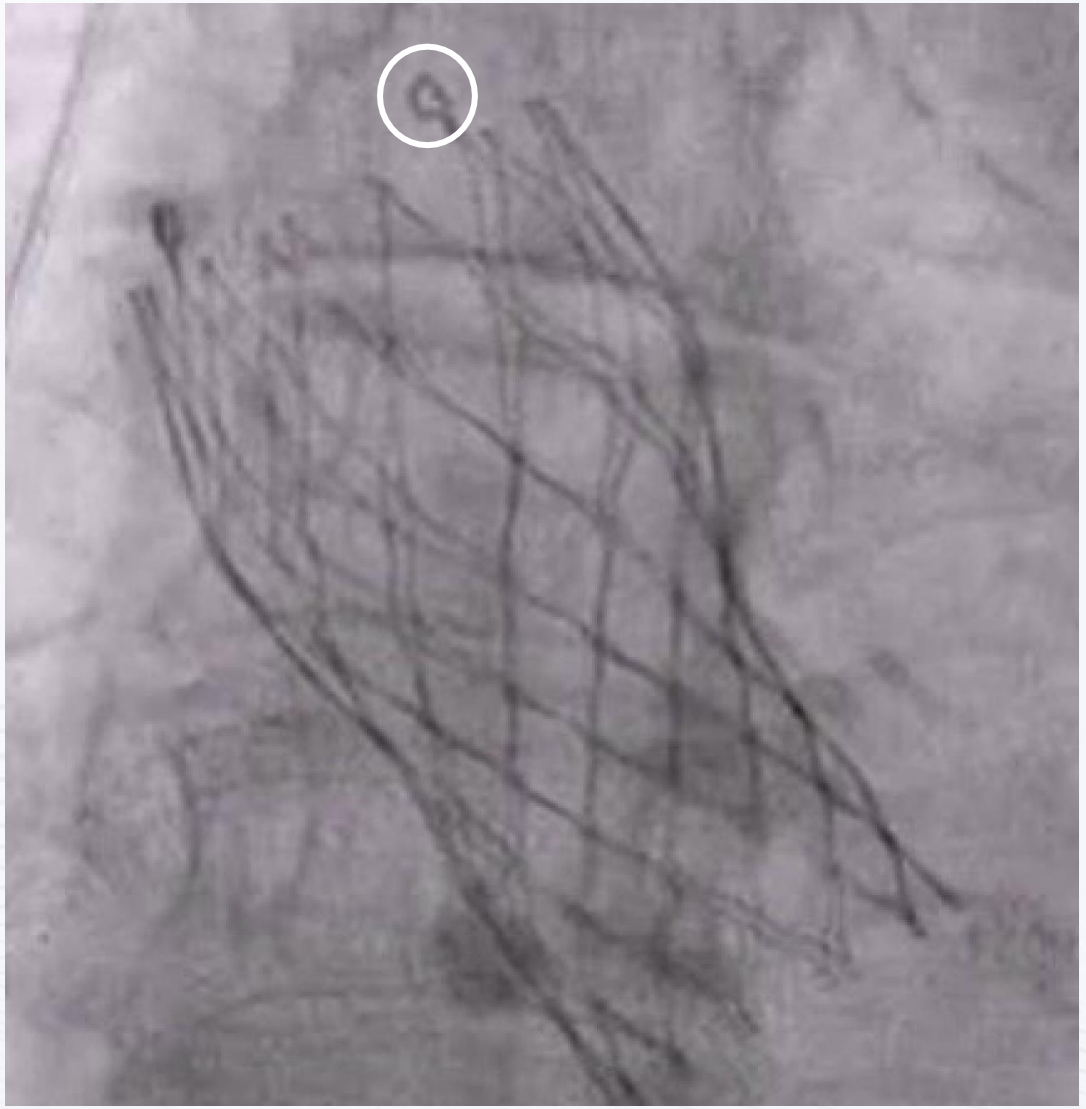
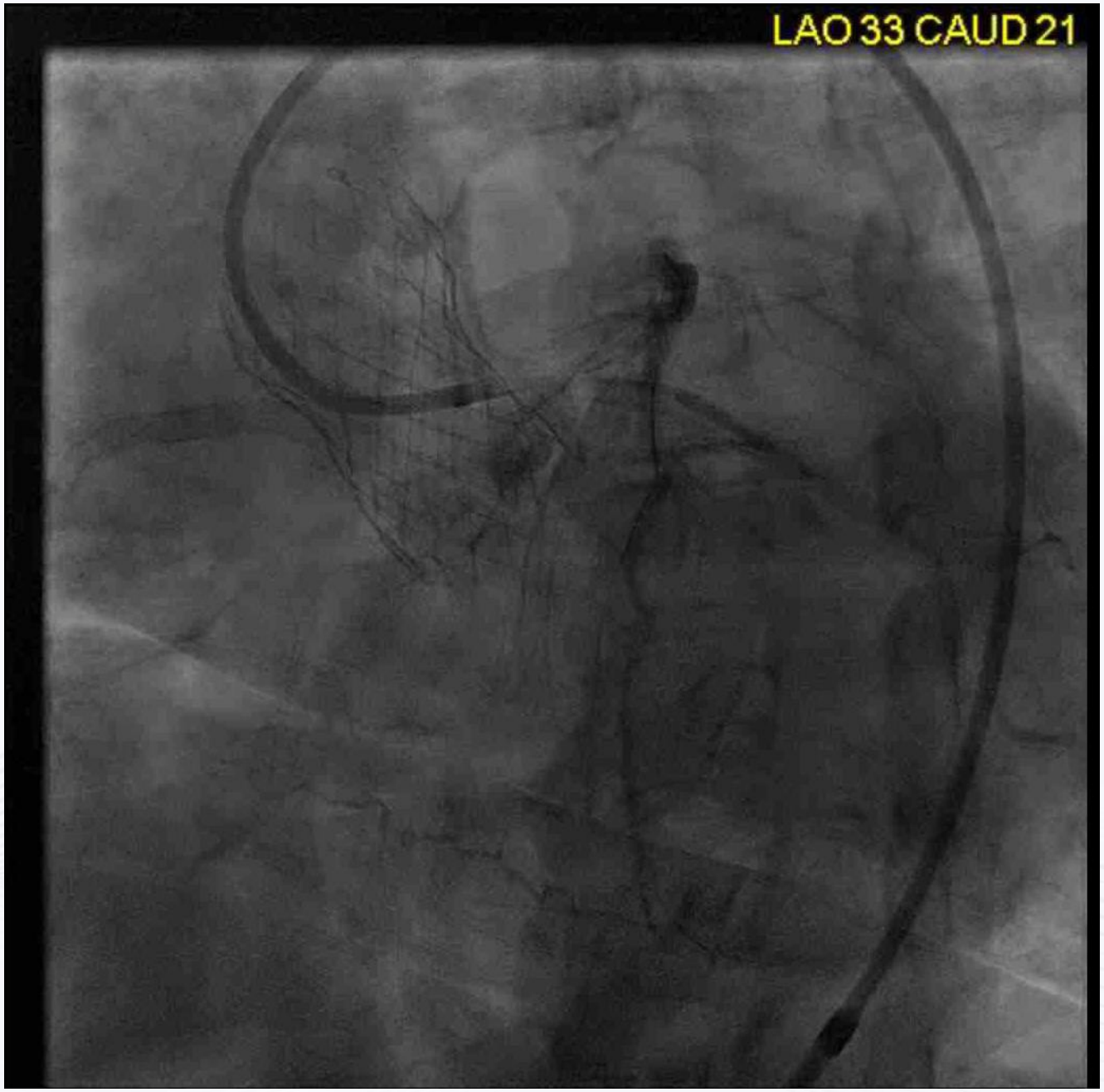


Image courtesy of Gilbert Tang, M.D.

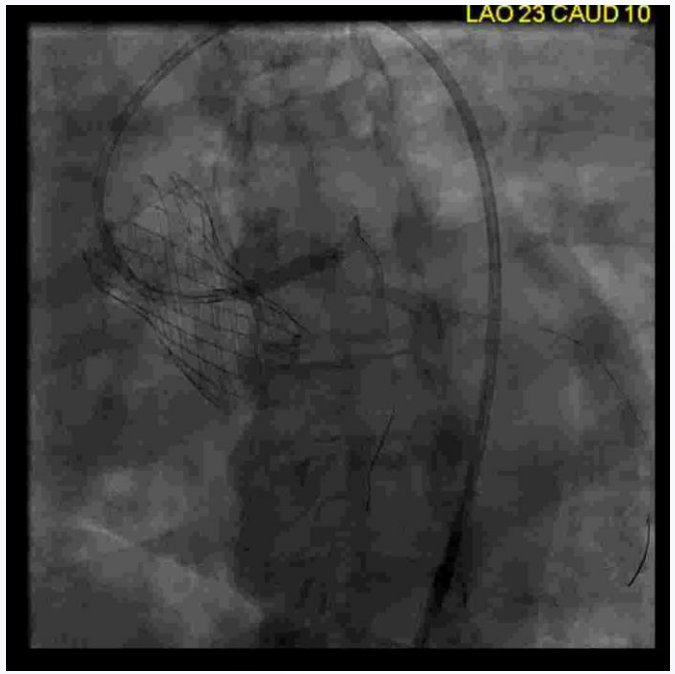
Permission for use obtained from Medtronic. Courtesy: Ausra Stancikiene. Medtronic Structural Heart Training & Education specialist.

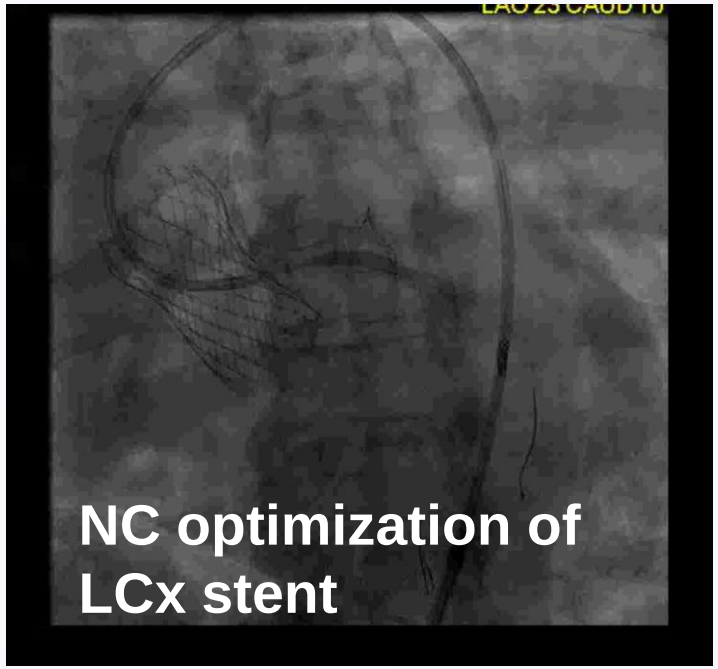
Case 3. LM bifurcation made simple with good commissural alignment

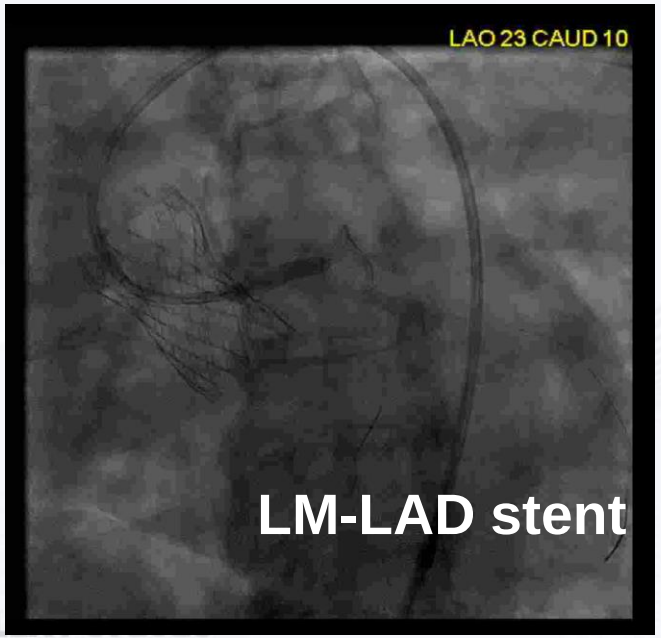


8 French guide Right femoral access EBU 3.5

LM/LAD/LCx completion DK culotte IVUS-guided (pre-existing LM-LCX stent)







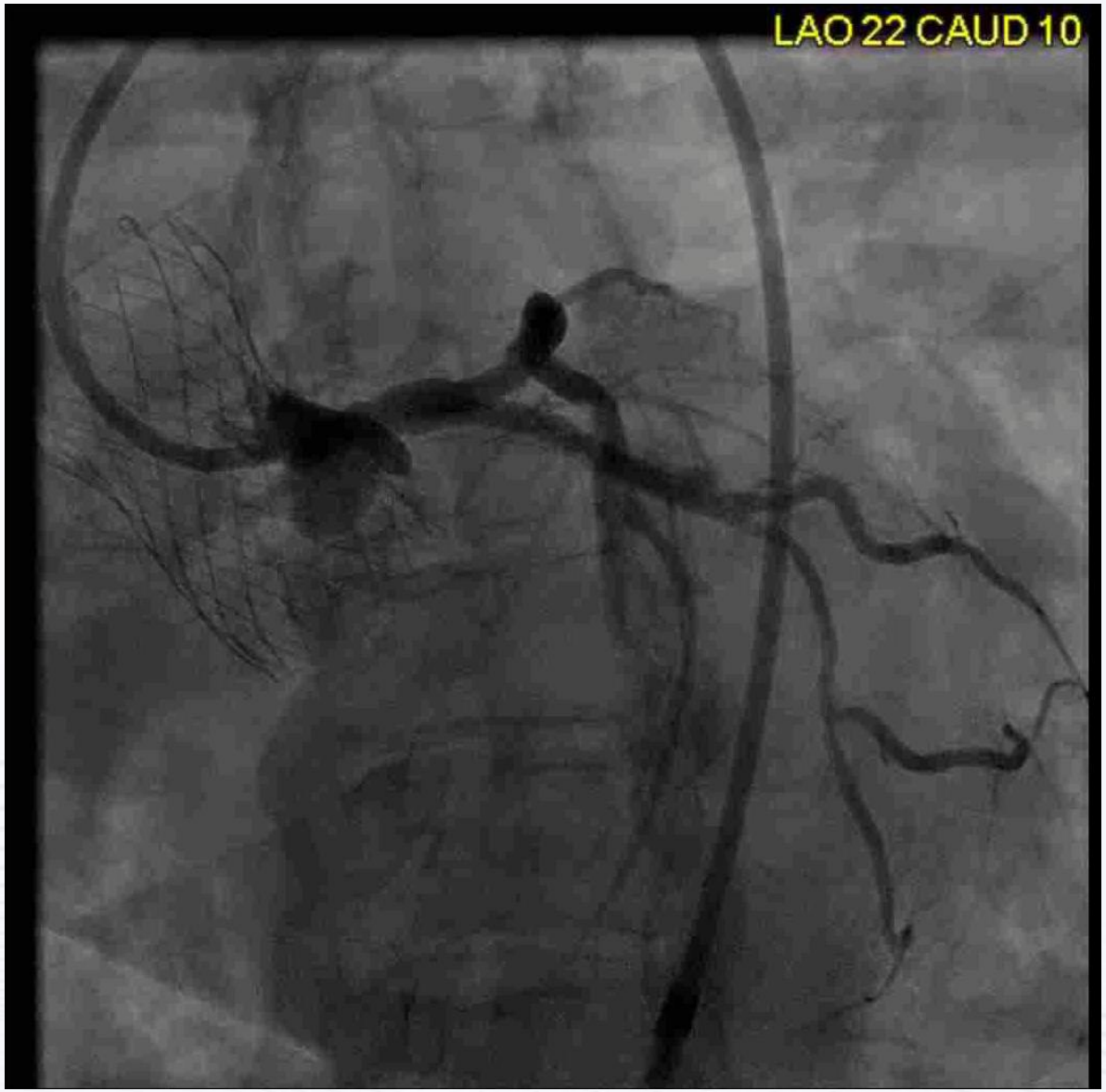
Predilated with a 3.5 and a 4.0mm

KBI 4.0/3.5, POT

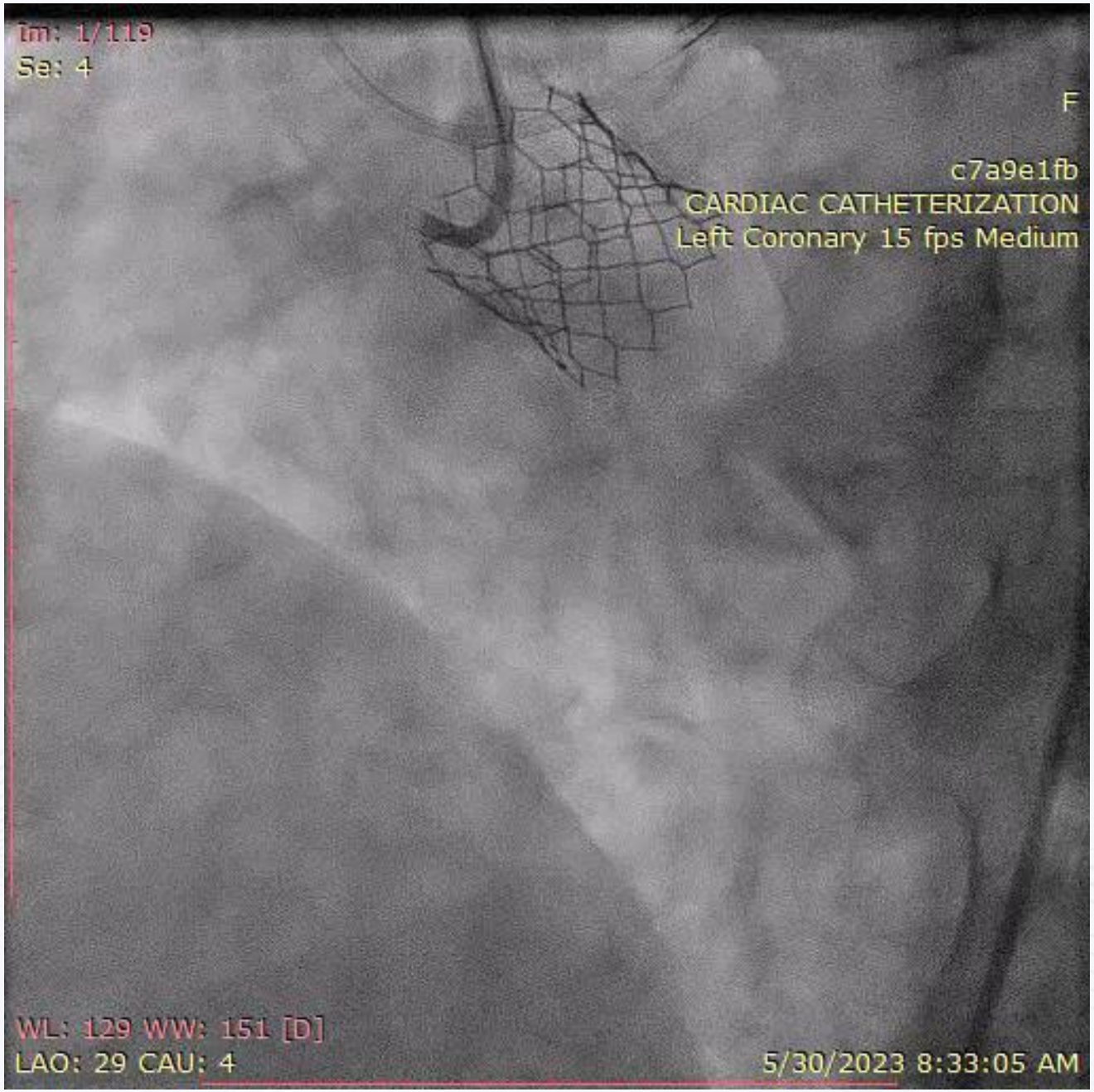
LM-LAD 4.0/24 DES. LM-LCx stent optimized

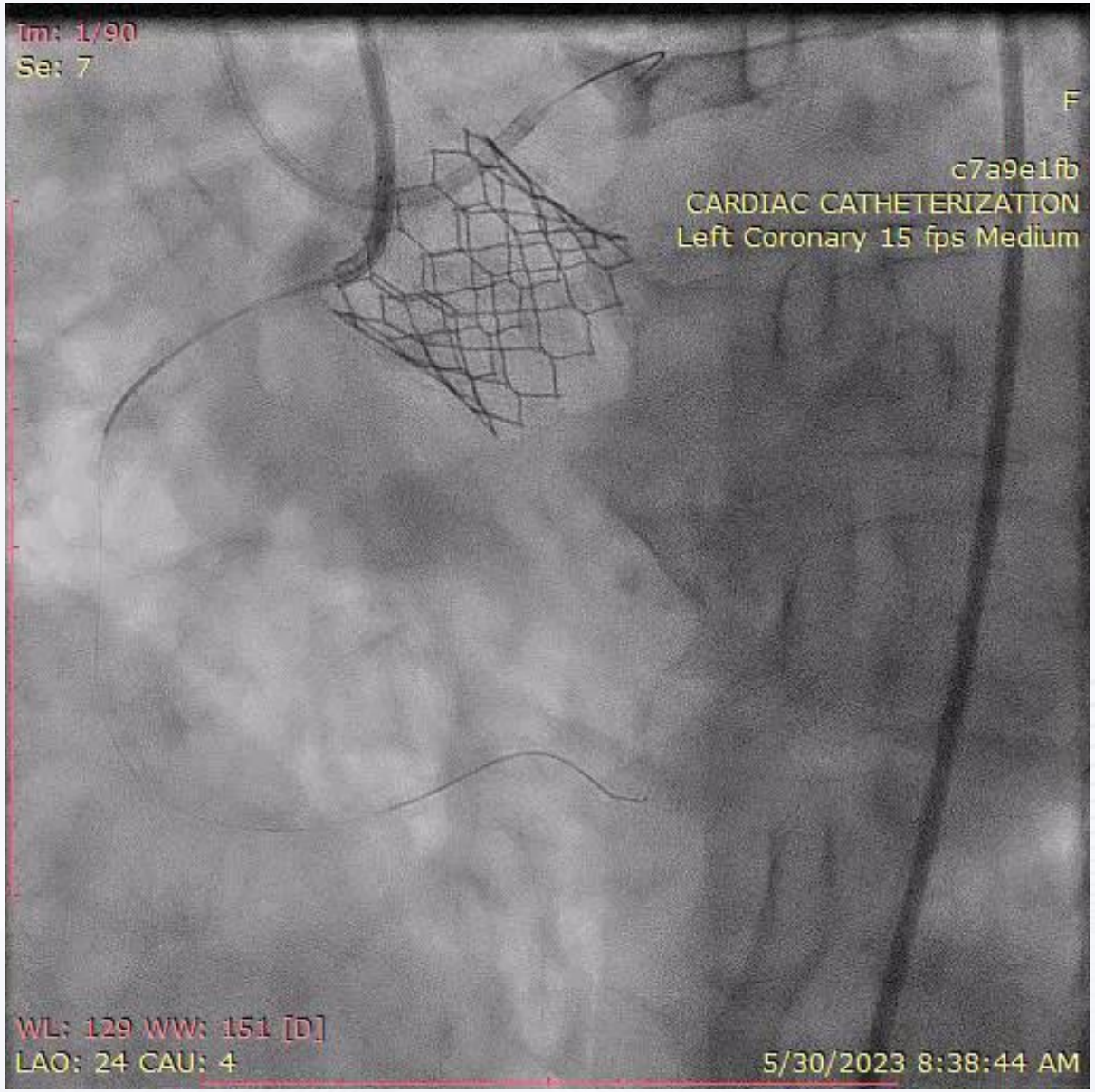
KBI 4.0 / 4.0 NC


RAO 11 CRAN 26


LAO 22 CAUD 10

Case 4. Post TAVR with S3: RCA CTO CHIP. Rotational atherectomy

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Se: 7
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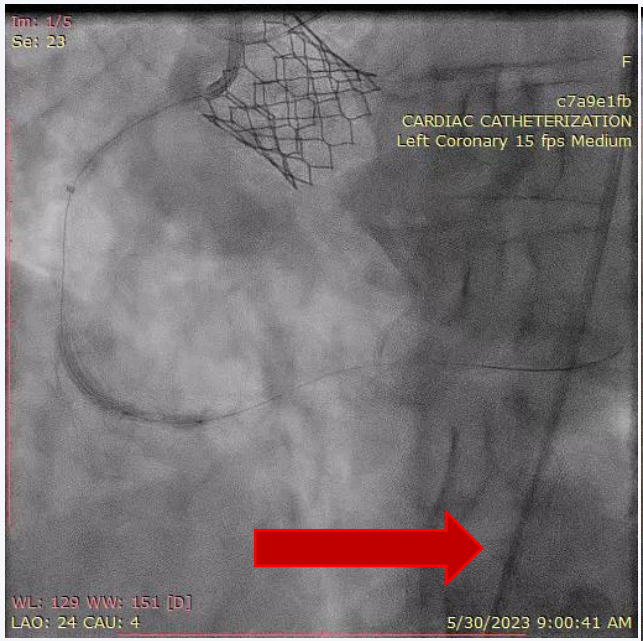
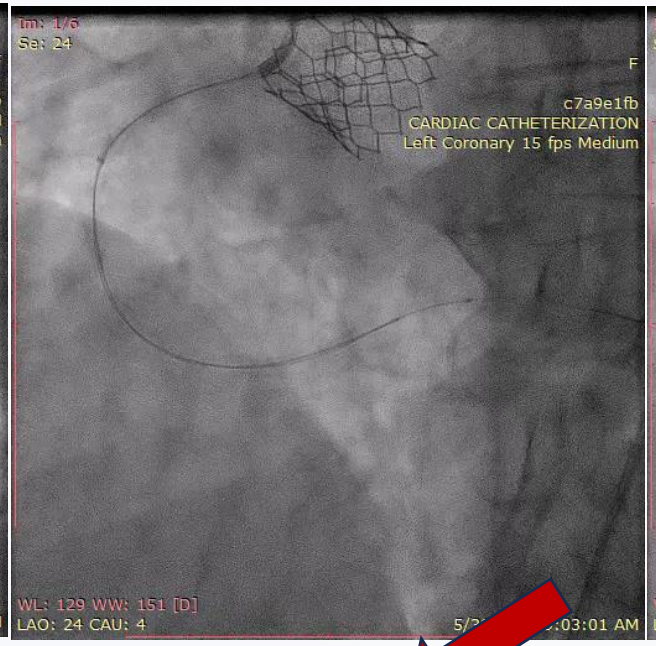
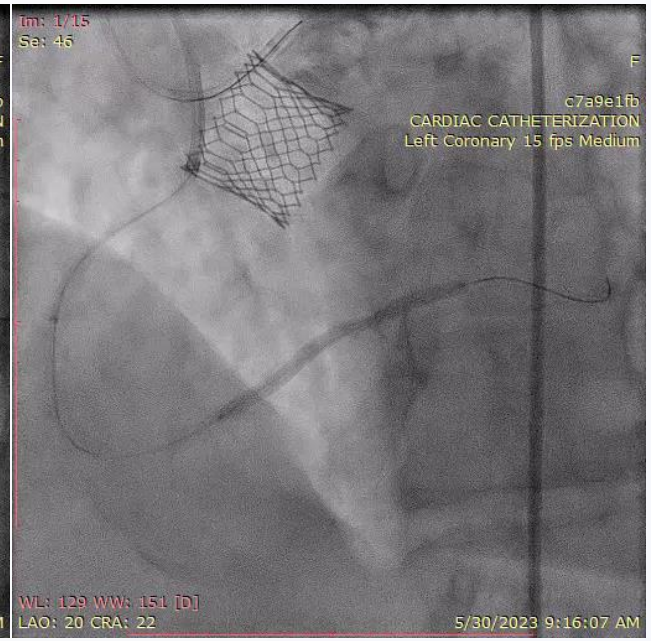
c7a9e1fb
CARDIAC CATHETERIZATION
Left Coronary 15 fps Medium
WL: 129 WW: 151 [D]
LAO: 24 CAU: 4
5/30/2023 8:38:44 AM

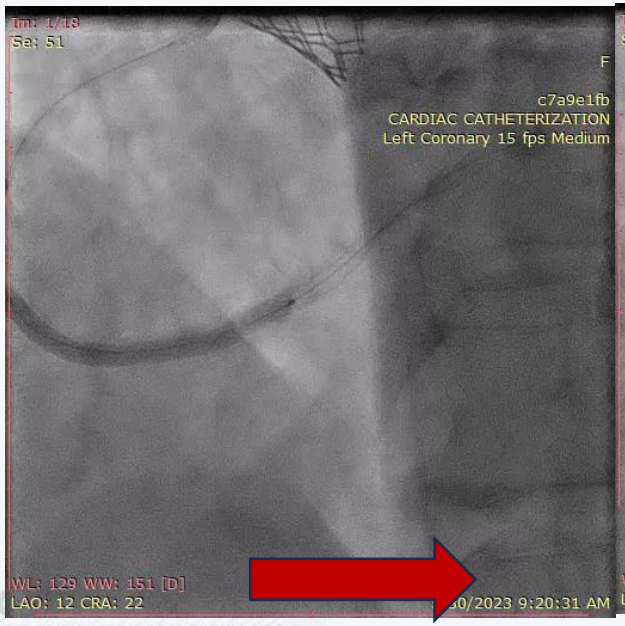

Im: 1/75
Se: 9
F
c7a9e1fb
CARDIAC CATHETERIZATION
Fluoroscopy
WL: 127 WW: 171 [D]
LAO: 24 CAU: 4
5/30/2023 8:48:09 AM

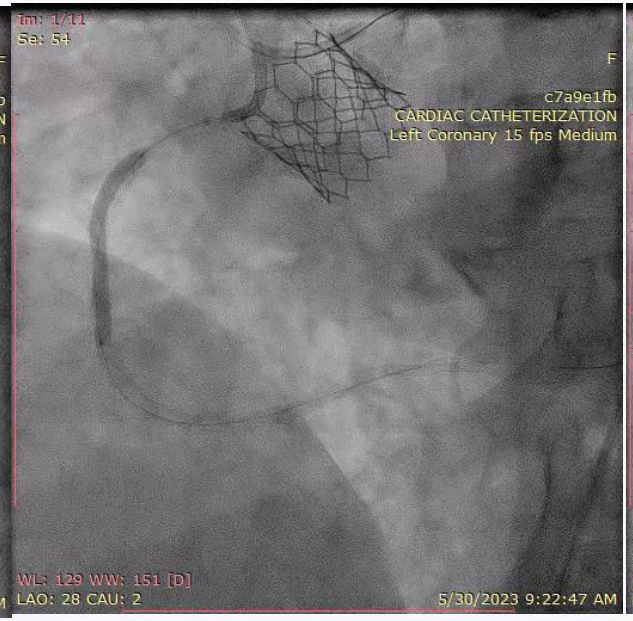


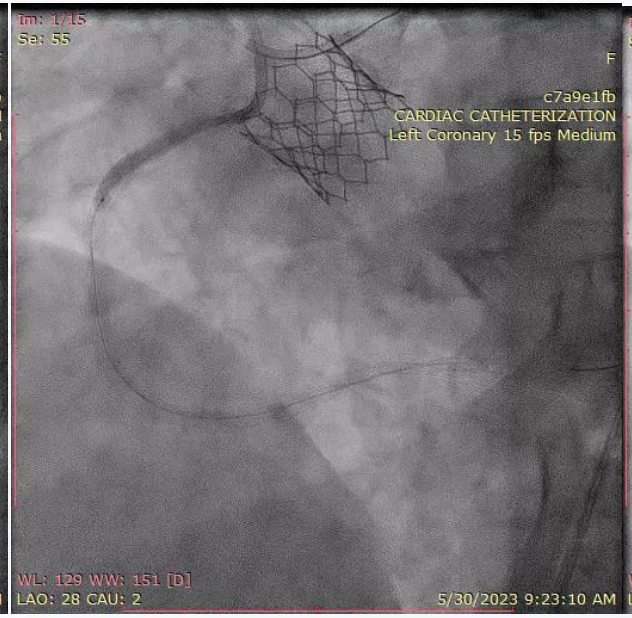


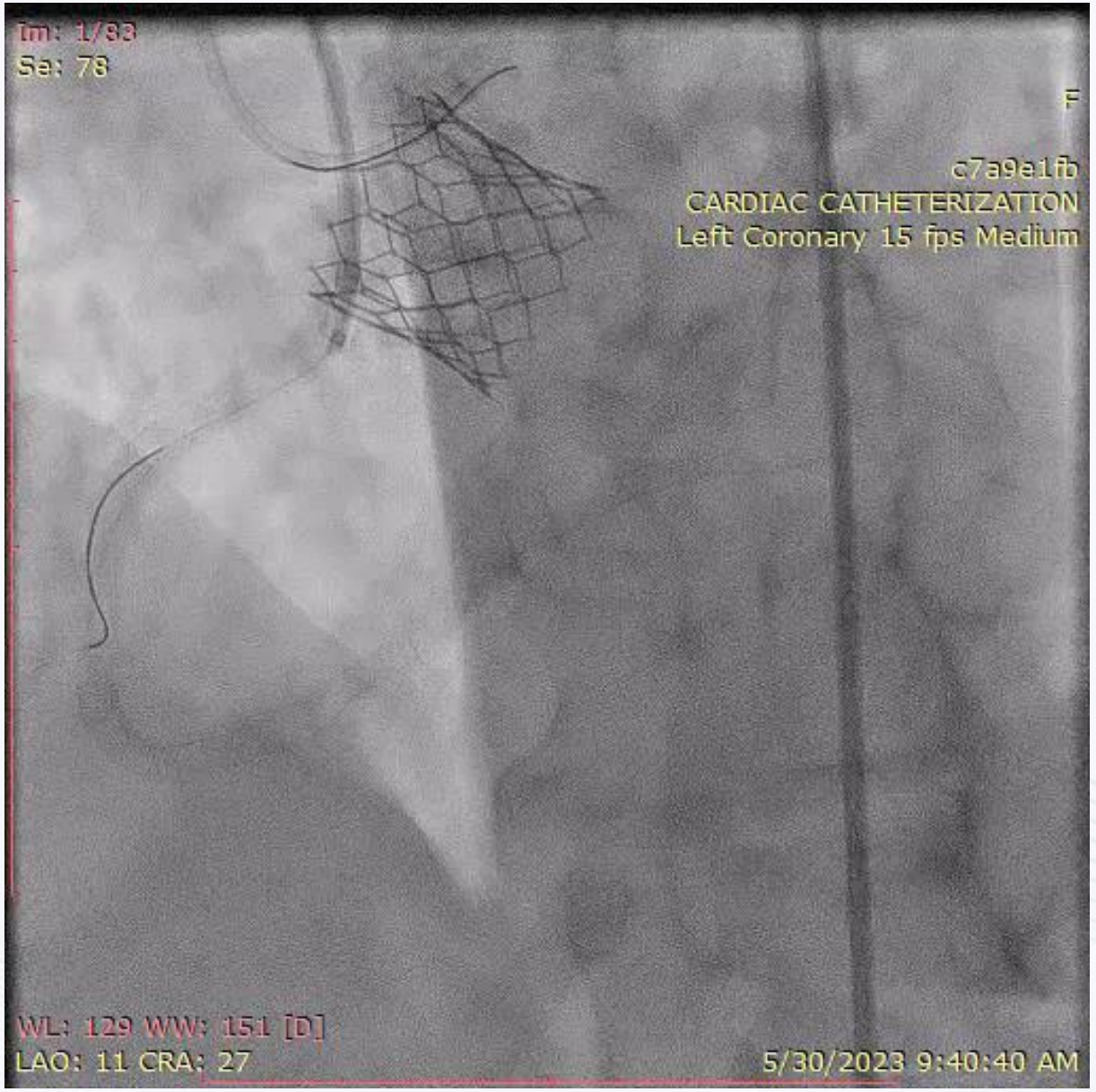


IVUS
RCA reconstructed from RPLV to ostium
DES x 5








Im: 1/83
Se: 78
F
c7a9e1fb
CARDIAC CATHETERIZATION
Left Coronary 15 fps Medium
WL: 129 WW: 151 [D]
LAO: 11 CRA: 27
5/30/2023 9:40:40 AM

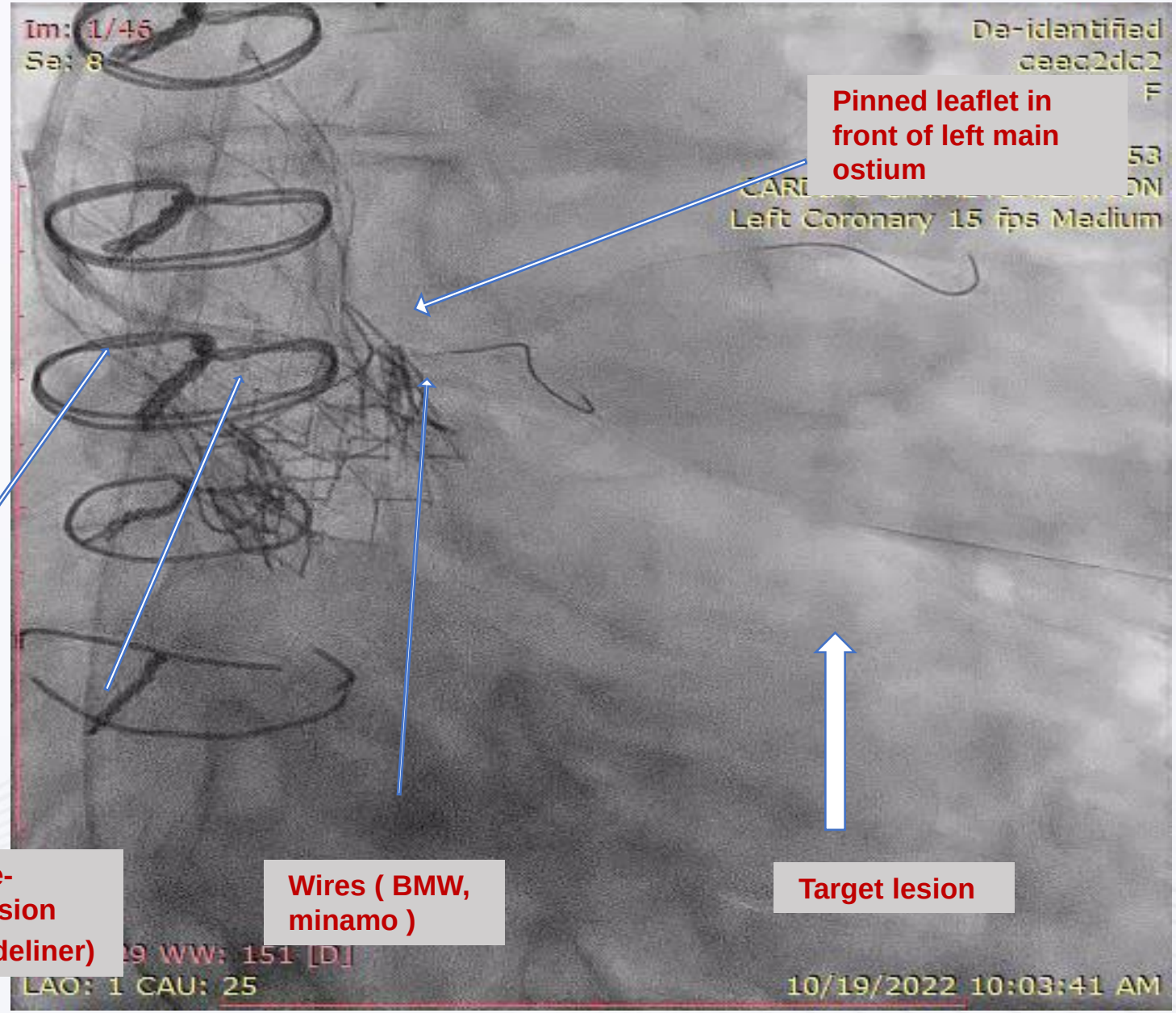
7. When the coronary is impossible to engage, wire from afar and attempt PCI (air-mailing)]

(use more than 1 wire for better anchoring. Eg 1 for LCx 1 for LAD)

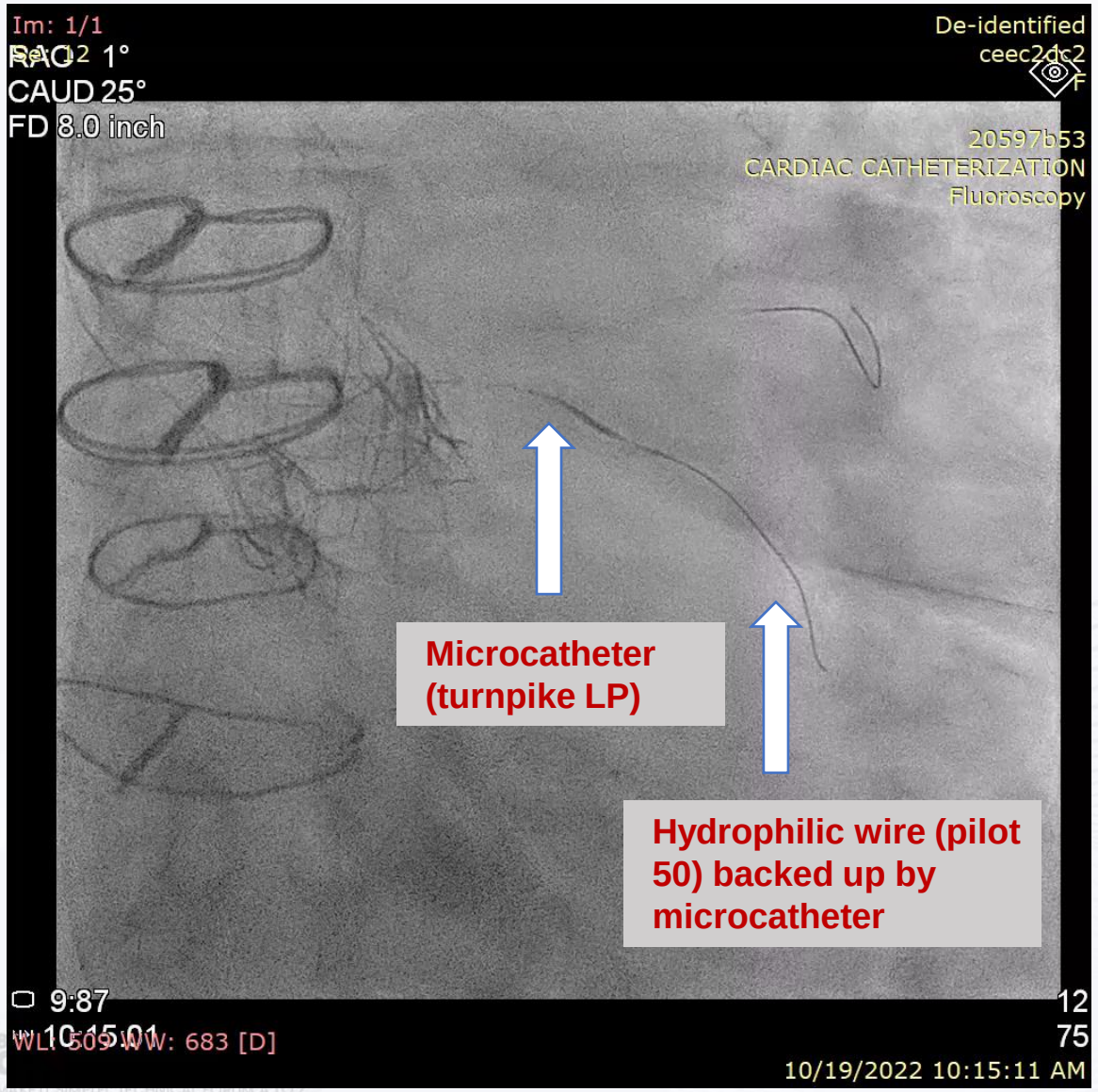
Case 5: Impossible to engage coronaries

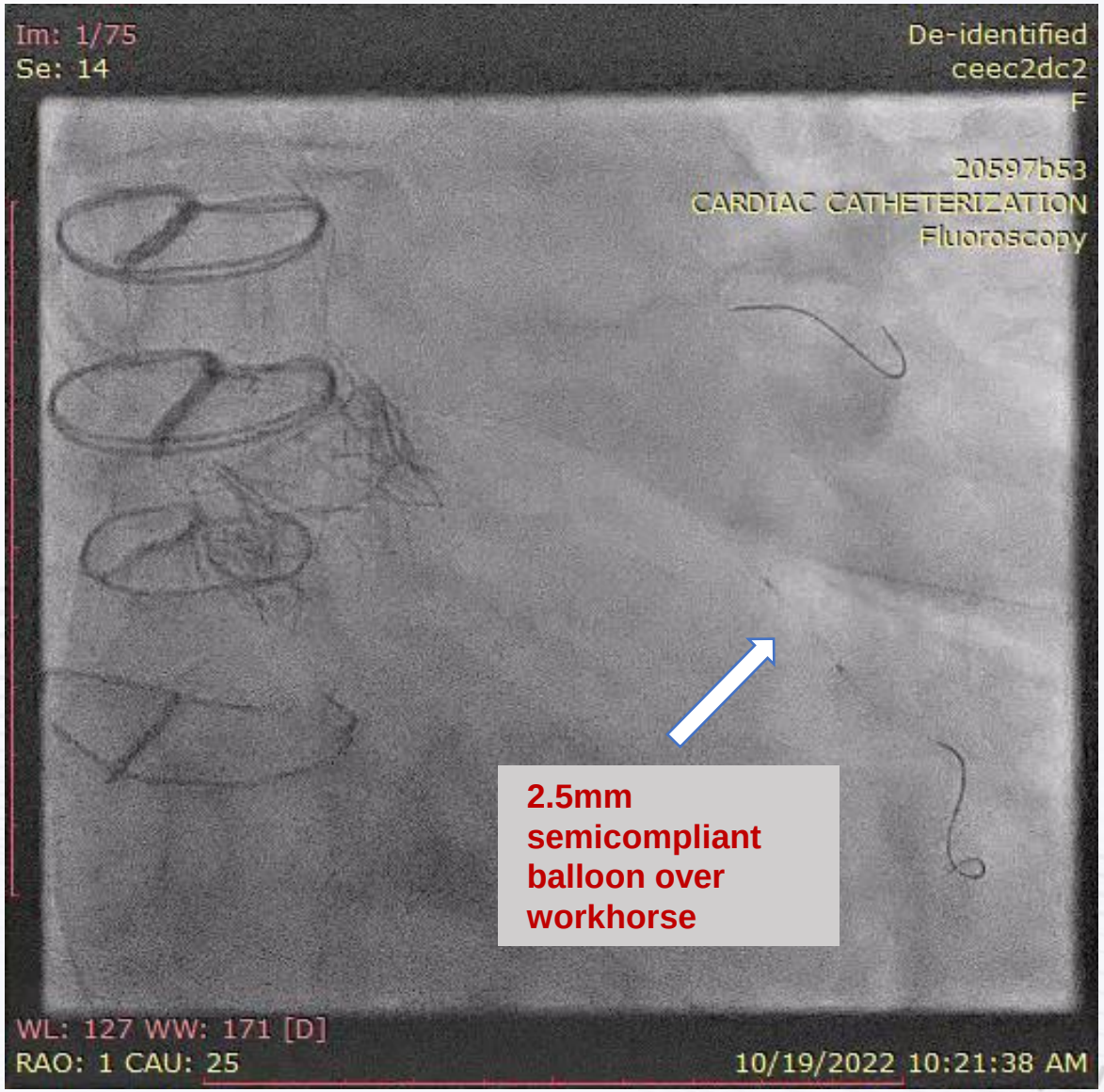
Coronary arteriogram:
RCA ; CTO at ostium. SVG-OM occluded.

LCx 90% disease

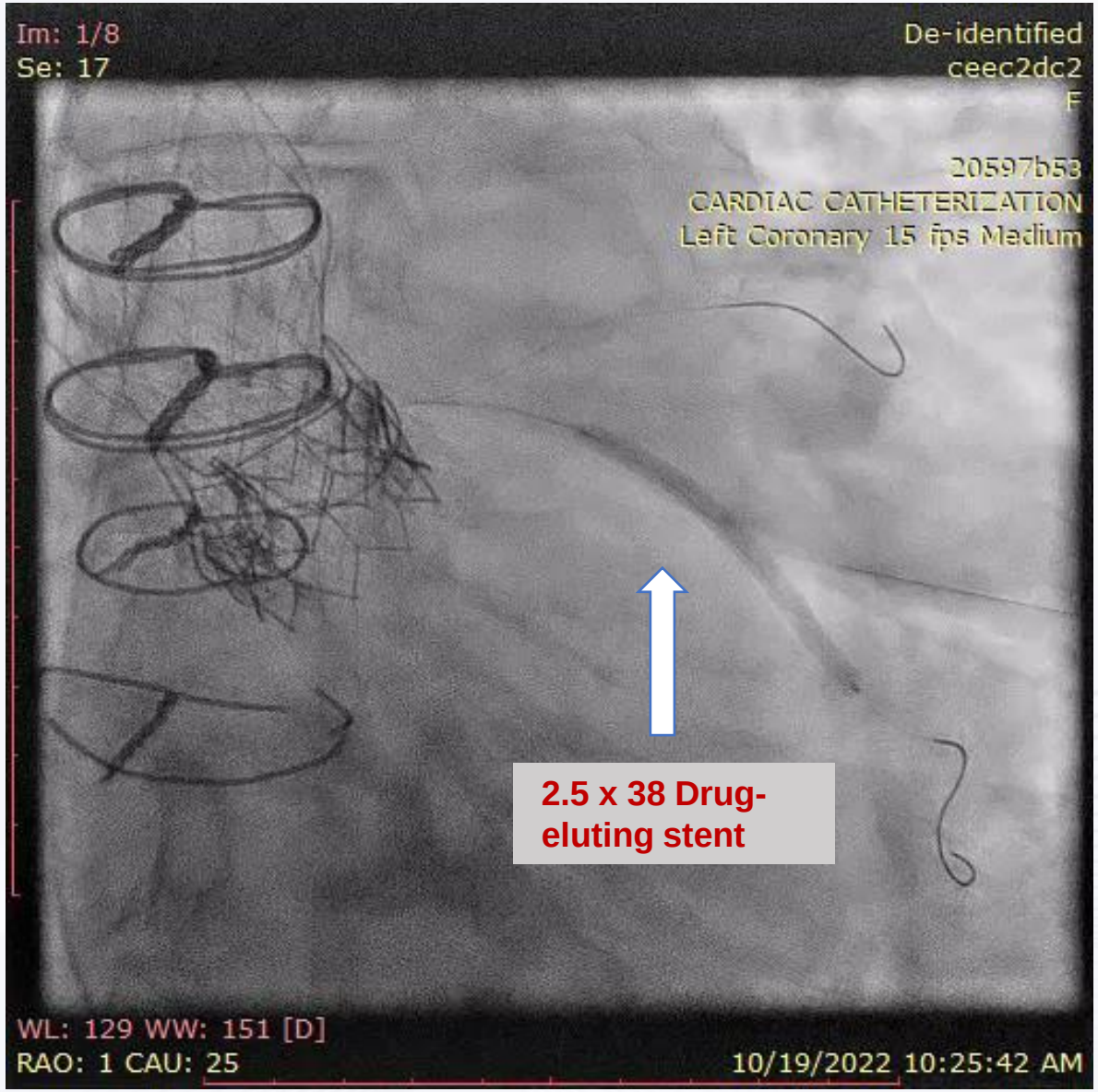


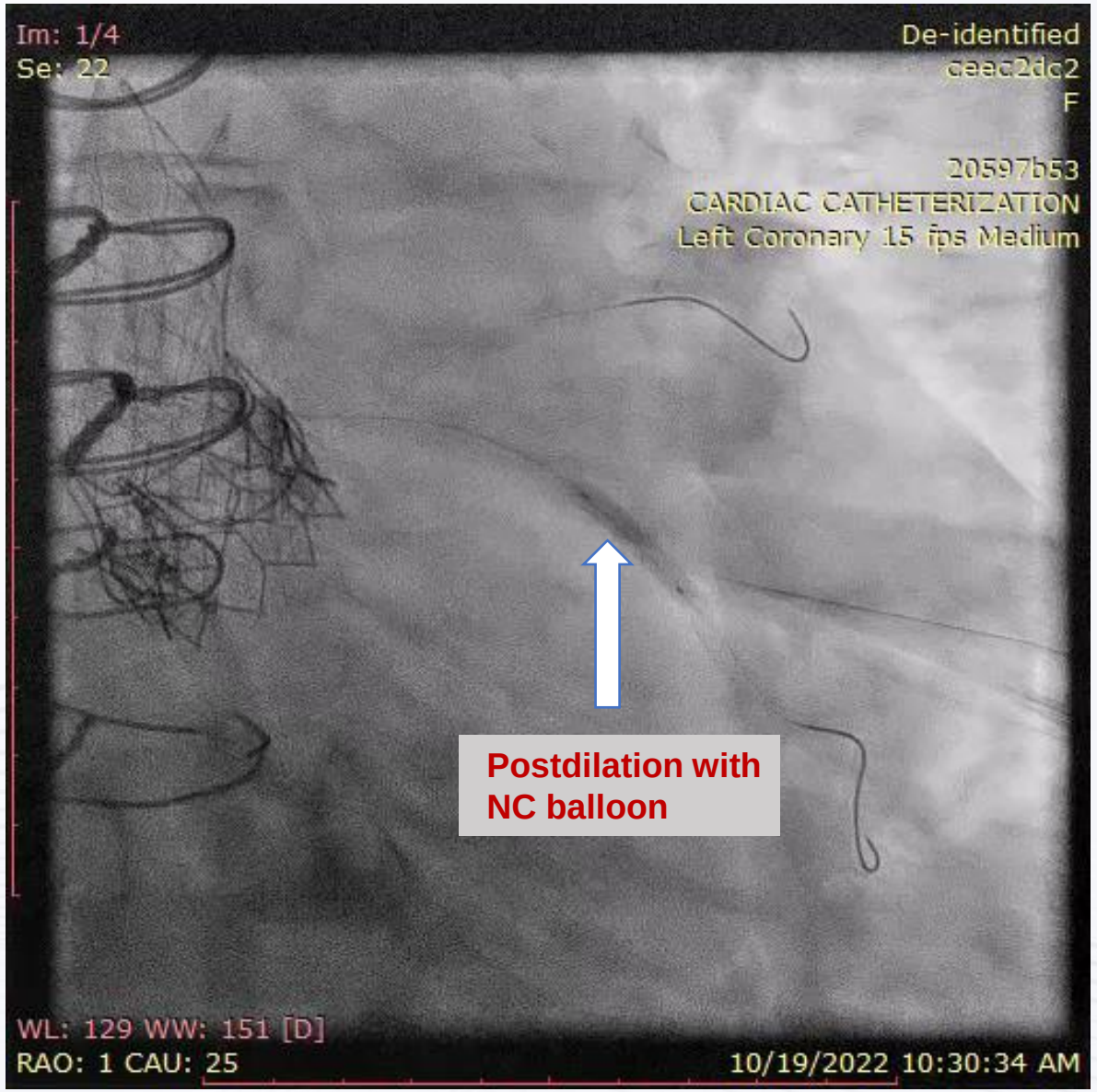
hydrophilic wire backed up by microcatheter to cross → des-escalate





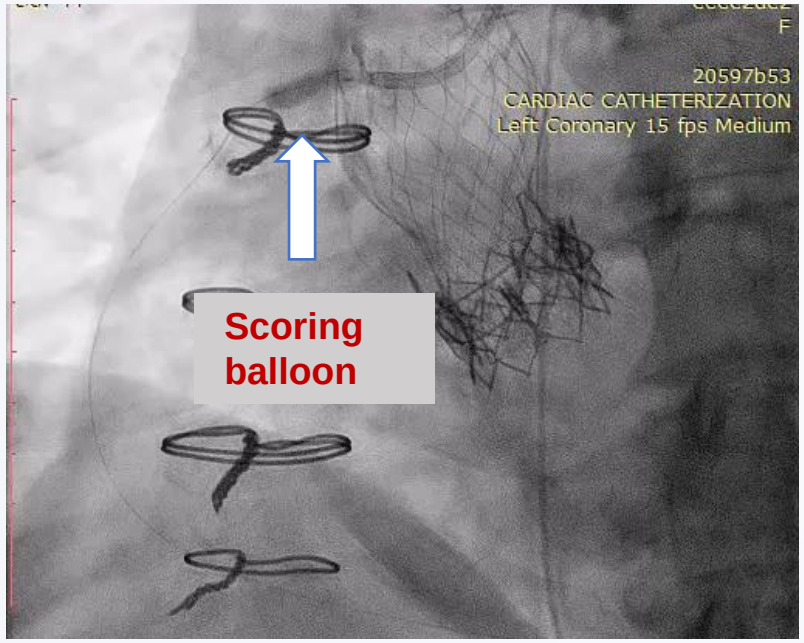
Stent and postdilate





PCI to LCx: result

- Semi-selective angiogram of SVG-RPDA
- Native RCA CTO (known)
- 90% ostium PDA ISR, eccentric, calcified
- Could not deliver intravascular imaging/filter wire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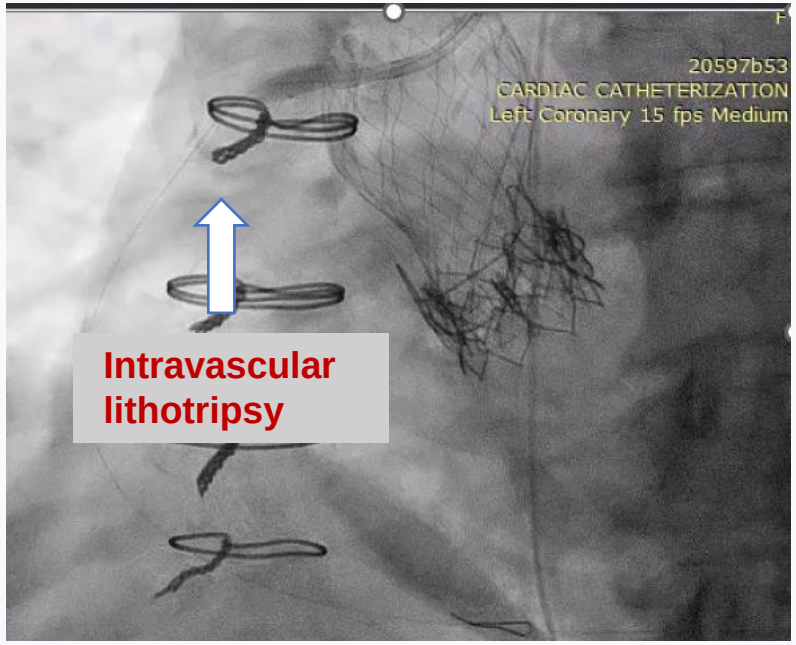
CARDIAC CATHETERIZATION
Left Coronary 15 fps Medium
Scoring balloon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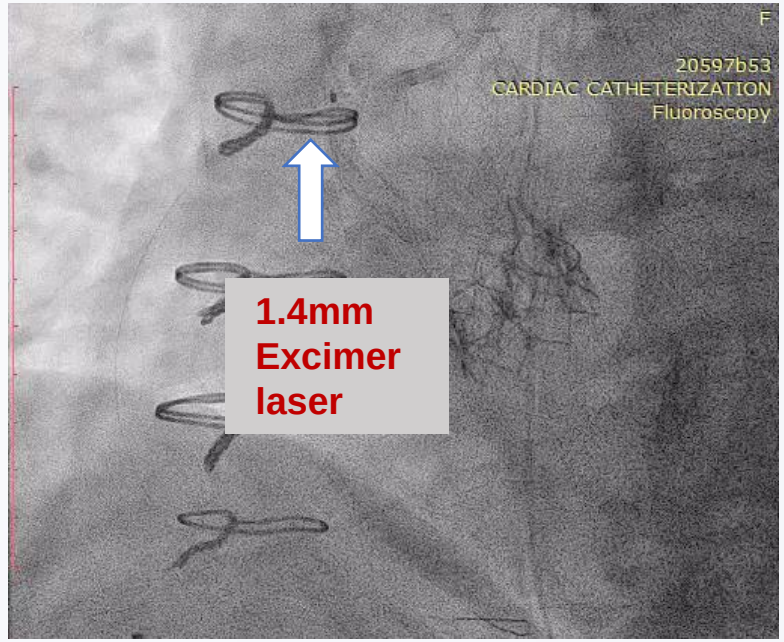
CARDIAC CATHETERIZATION
Left Coronary 15 fps Medium
Intravascular lithotripsy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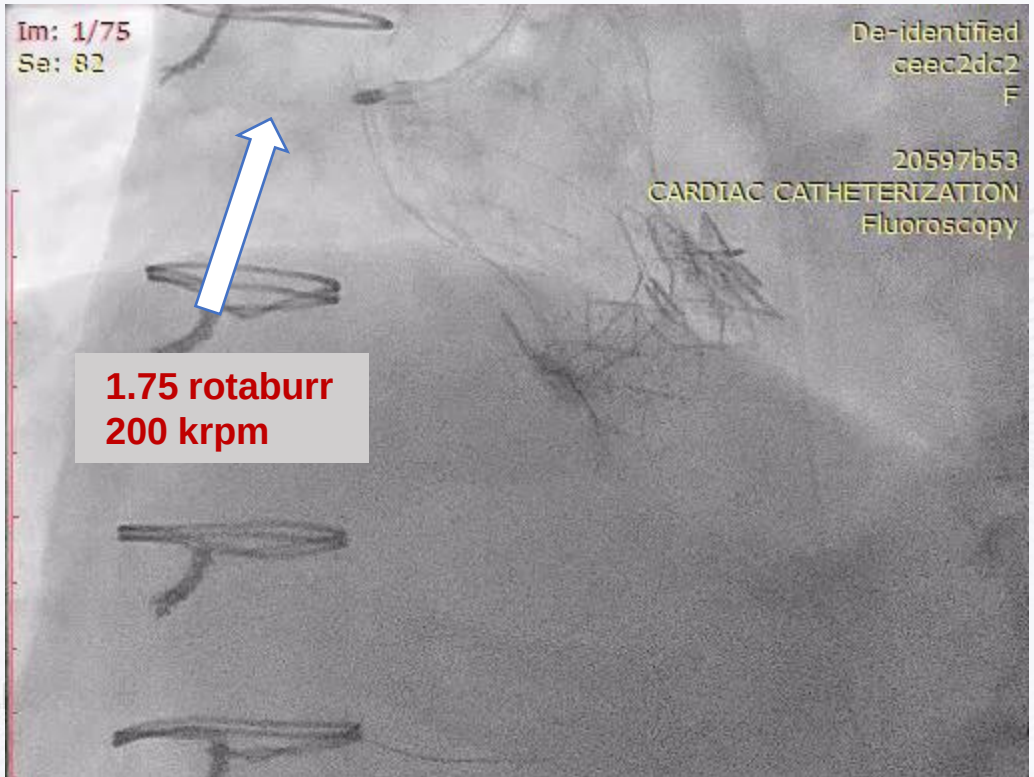
CARDIAC CATHETERIZATION
Fluoroscopy
1.4mm Excimer laser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Se: 82
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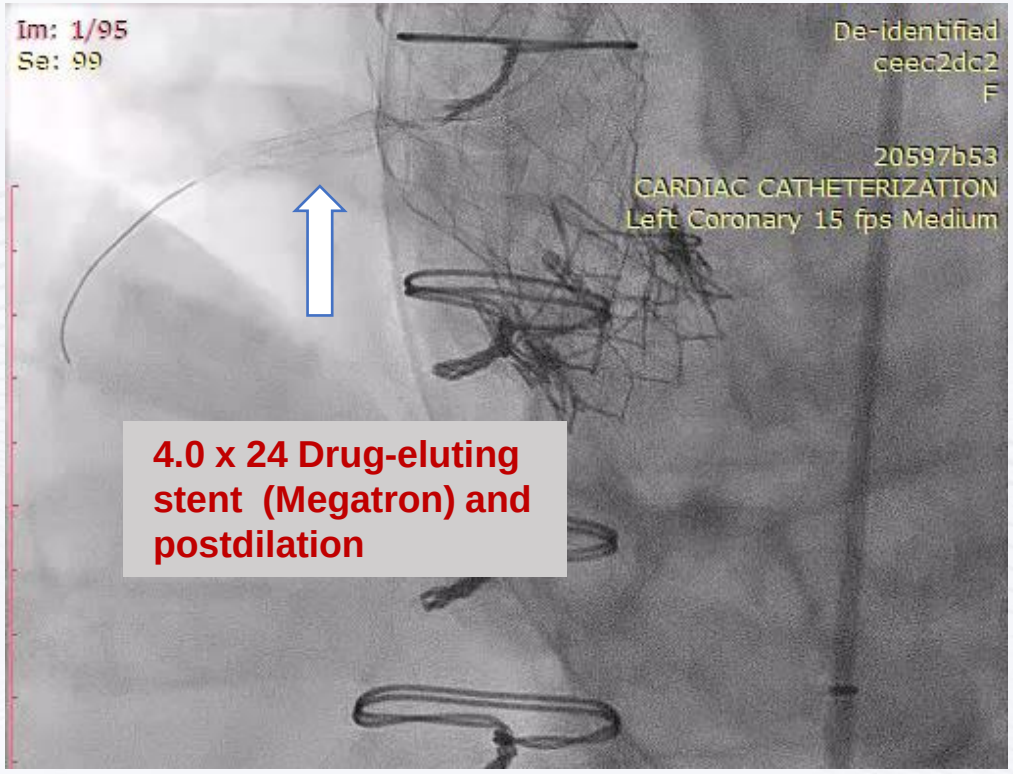
F
20597b53
CARDIAC CATHETERIZATION
Fluoroscopy
1.75 rotaburr
200 krpm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Se: 99
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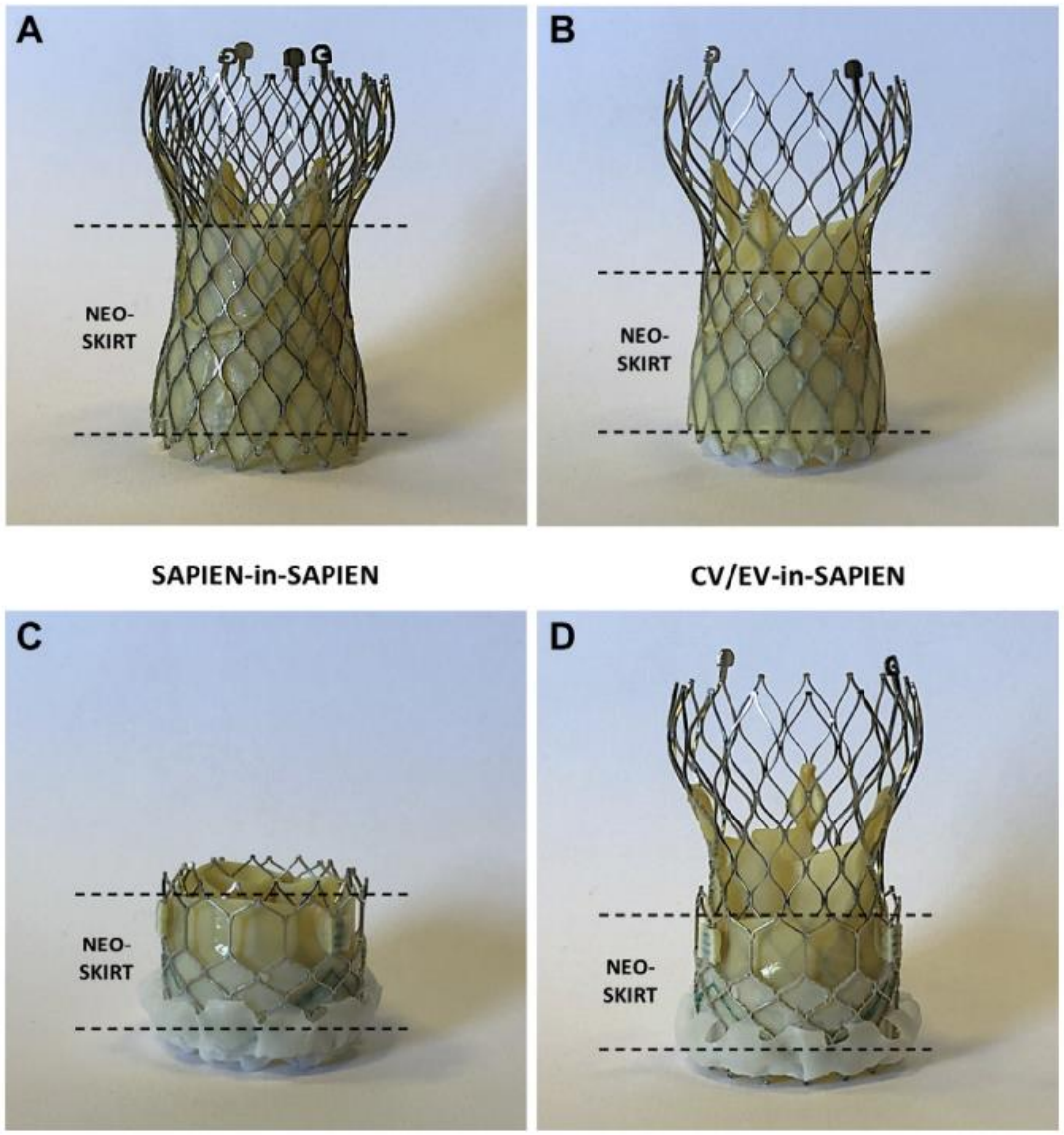
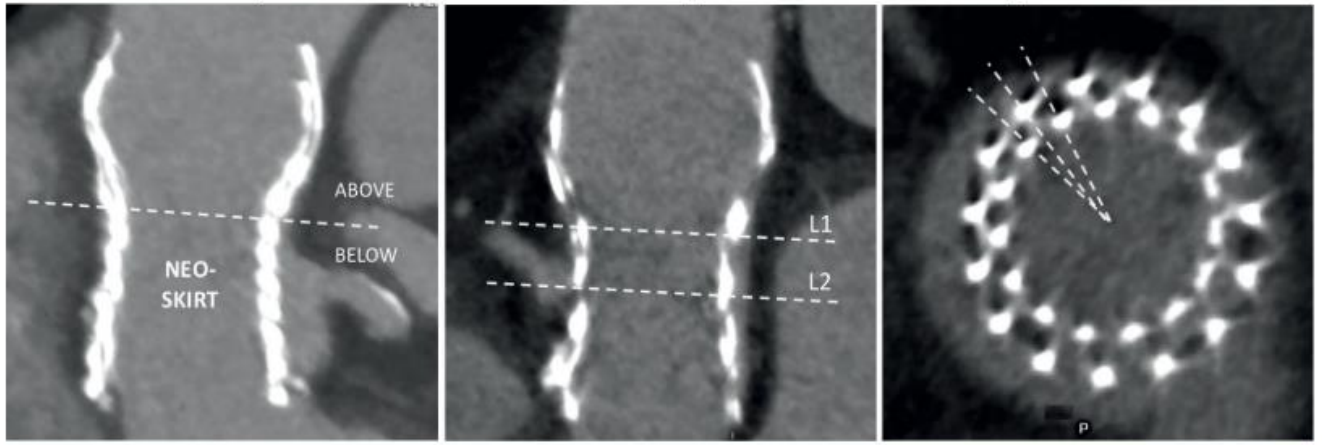
F
20597b53
CARDIAC CATHETERIZATION
Left Coronary 15 fps Medium
4.0 x 24 Drug-eluting stent (Megatron) and postdilation

8. TAV-in-TAV: know the neoskirt and the valve-to-aorta distance



ASSESSMENT OF POSSIBLE TRANSCATHETER HEART VALVE INTERFERENCE WITH CORONARY ACCESS AFTER TAVR-IN-TAVR



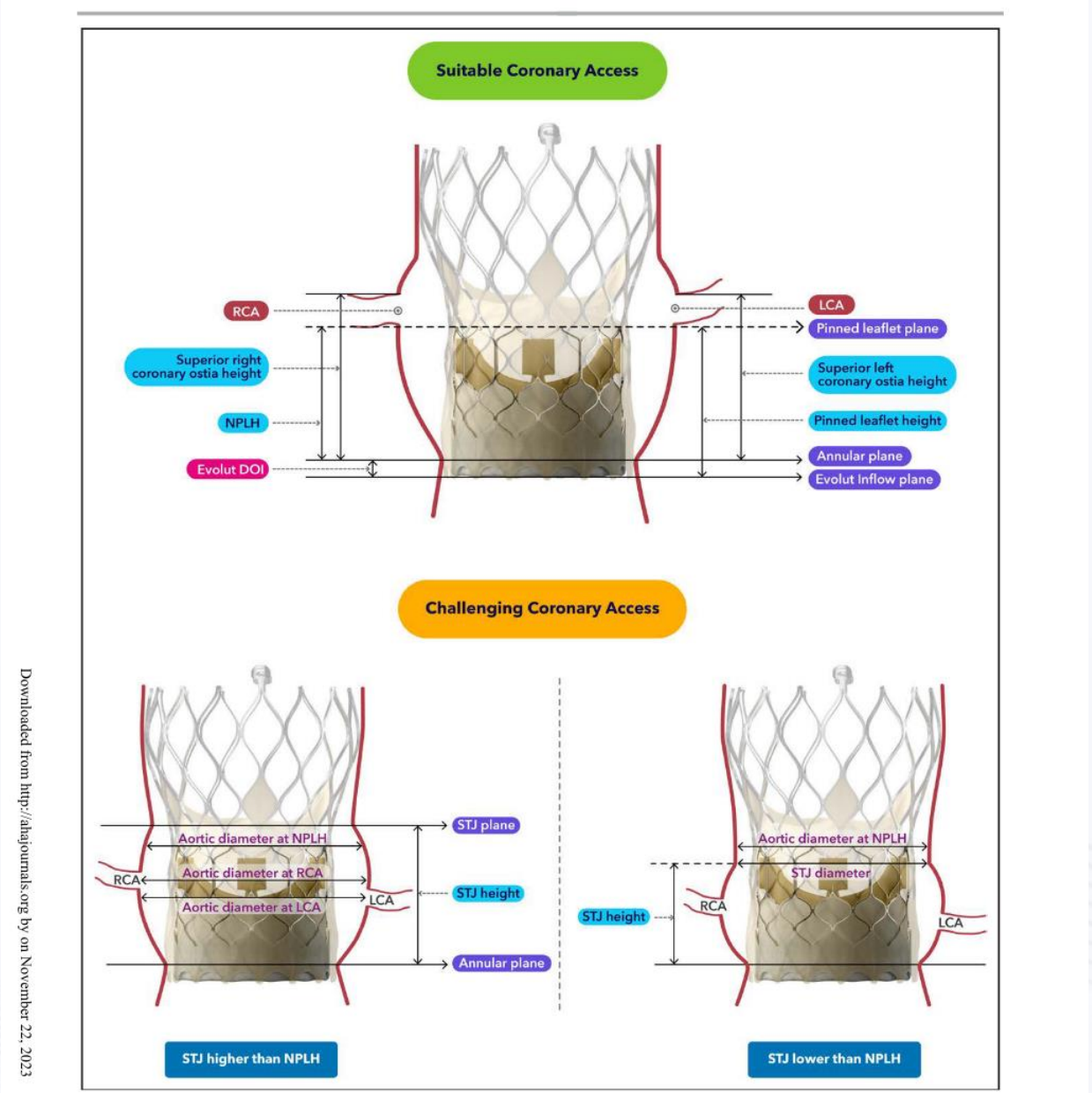
Above the top of neo-skirt	≥3 mm	≥3 mm
Below the top of neo-skirt	<3 mm	<3 mm
-	<2 mm*	<2 mm*

INCIDENCE OF DIFFERENT DEGREES OF UNFAVORABLE CORONARY ACCESS AFTER TAVR-IN-TAVR

	First transcatheter heart valve		
	CoreValve/Evolut (n = 60)	SAPIEN (n = 30)	p Value
No anticipated interference	5 (8%)	10 (33%)	0.003
At least 2 interfering factors	39 (65%)	5 (17%)	< 0.001
Impossible coronary access (<2 mm)*	16 (27%)	3 (10%)	0.069

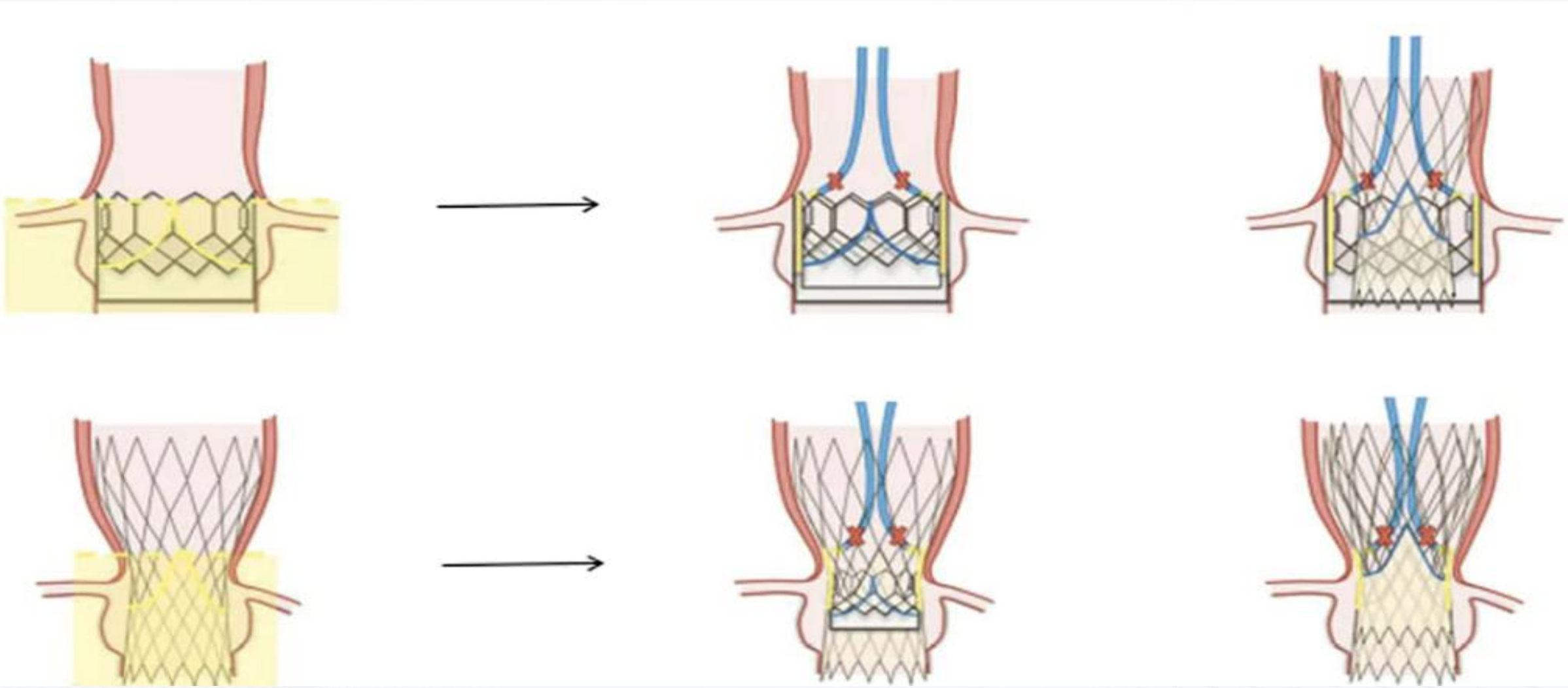
De Backer O, Landes U, Fuchs A, Yoon S-H, Mathiassen ON, Sedaghat A, et al. Coronary Access After TAVR-in-TAVR as Evaluated by Multidetector Computed Tomography. JACC: Cardiovascular Interventions. 2020;13(21):2528-38.

NPLH-net pinned leaflet height



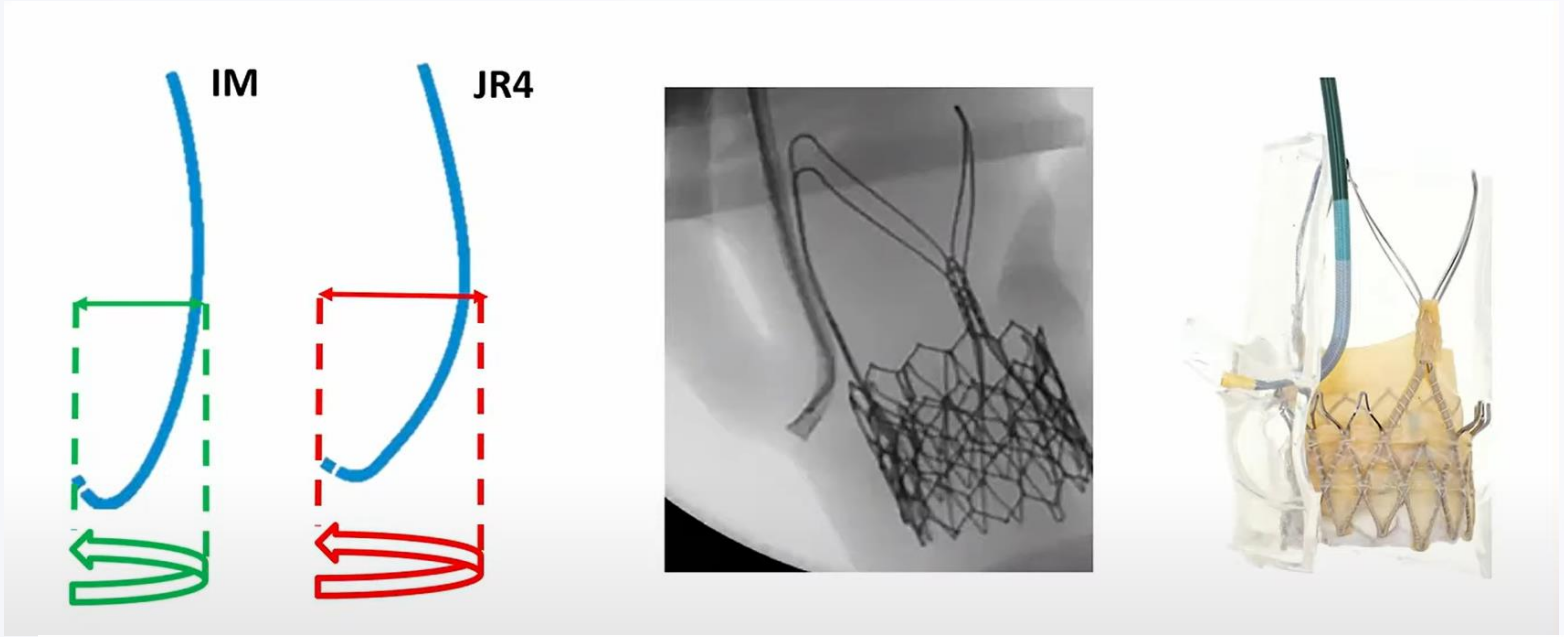
Tang GHL, Spencer J, Rogers T, Grubb KJ, Gleason P, Gada H, et al. Feasibility of Coronary Access Following Redo-TAVR for Evolut Failure: A Computed Tomography Simulation Study. Circulation: Cardiovascular Interventions. 2023;16(11):e013238.

Coronary ostia below neoskirt; narrow Sinotubular junction

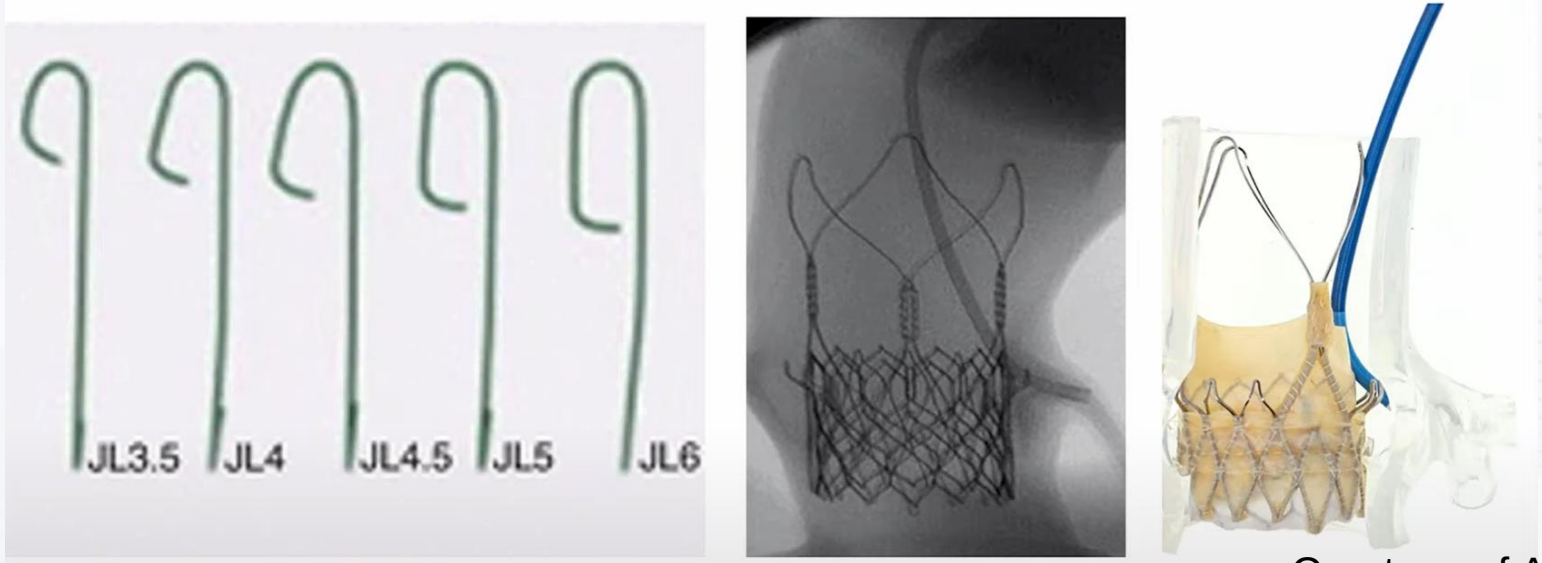


Giuseppe T, Gilbert T, Luca Nai F, Daniel B, Nicolas MVM, Won-Keun K, et al. Management of coronary artery disease in patients undergoing transcatheter aortic valve implantation. A clinical consensus statement from the European Association of Percutaneous Cardiovascular Interventions in collaboration with the ESC Working Group on Cardiovascular Surgery. EuroIntervention. 2023.

Consider dropping down from above if the Sinotubular junction and aorta is wide enough



Drop down from **outer curvature of Aorta for RCA** with **IM** catheter and then clockwise torque



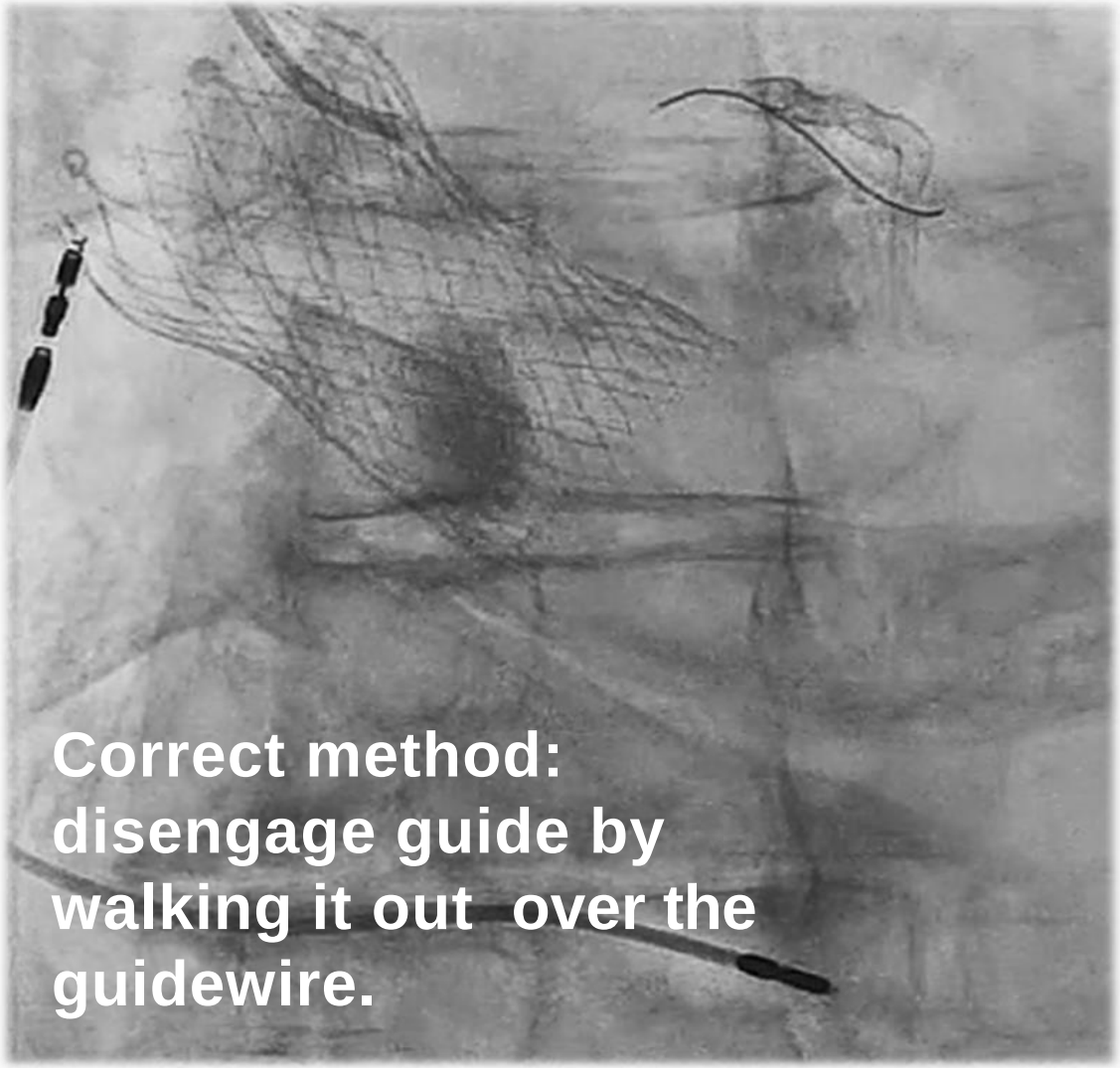
Drop down **inner curvature of Aorta for LMCA** with **JL6**

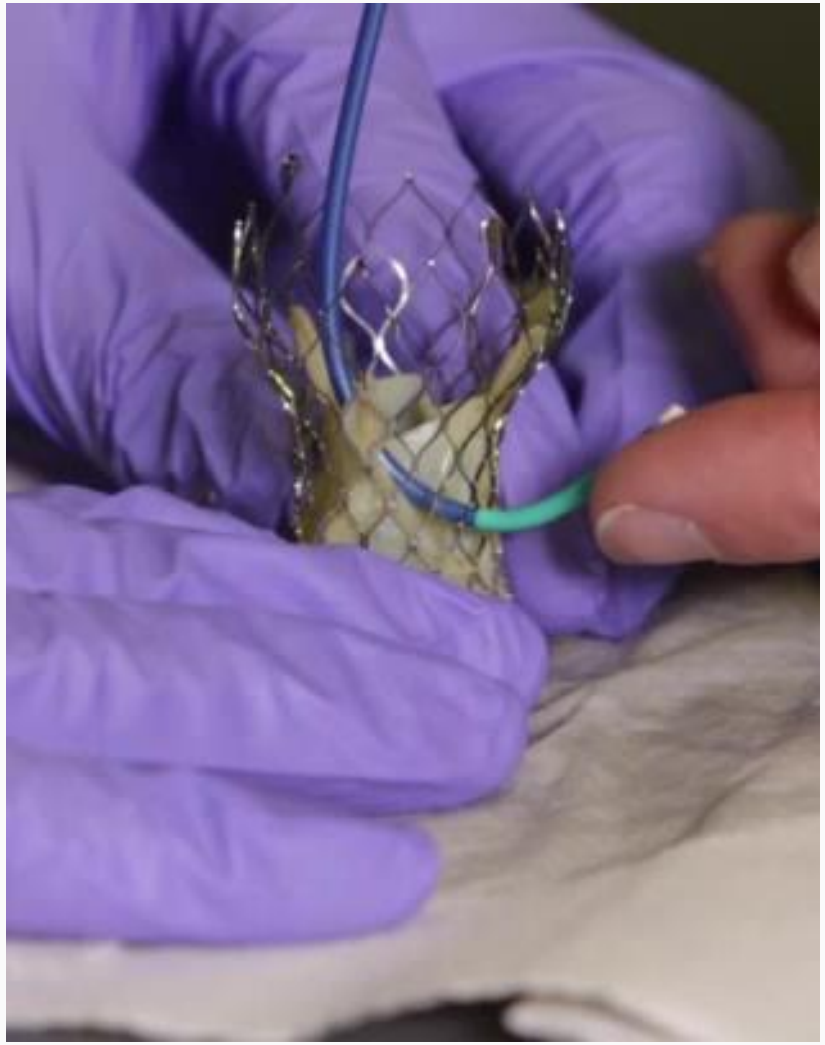
Courtesy of Arif Khokhar, BCh BM. Imperial College London

Twitter: @DrArifK | taviaccess@gmail.com

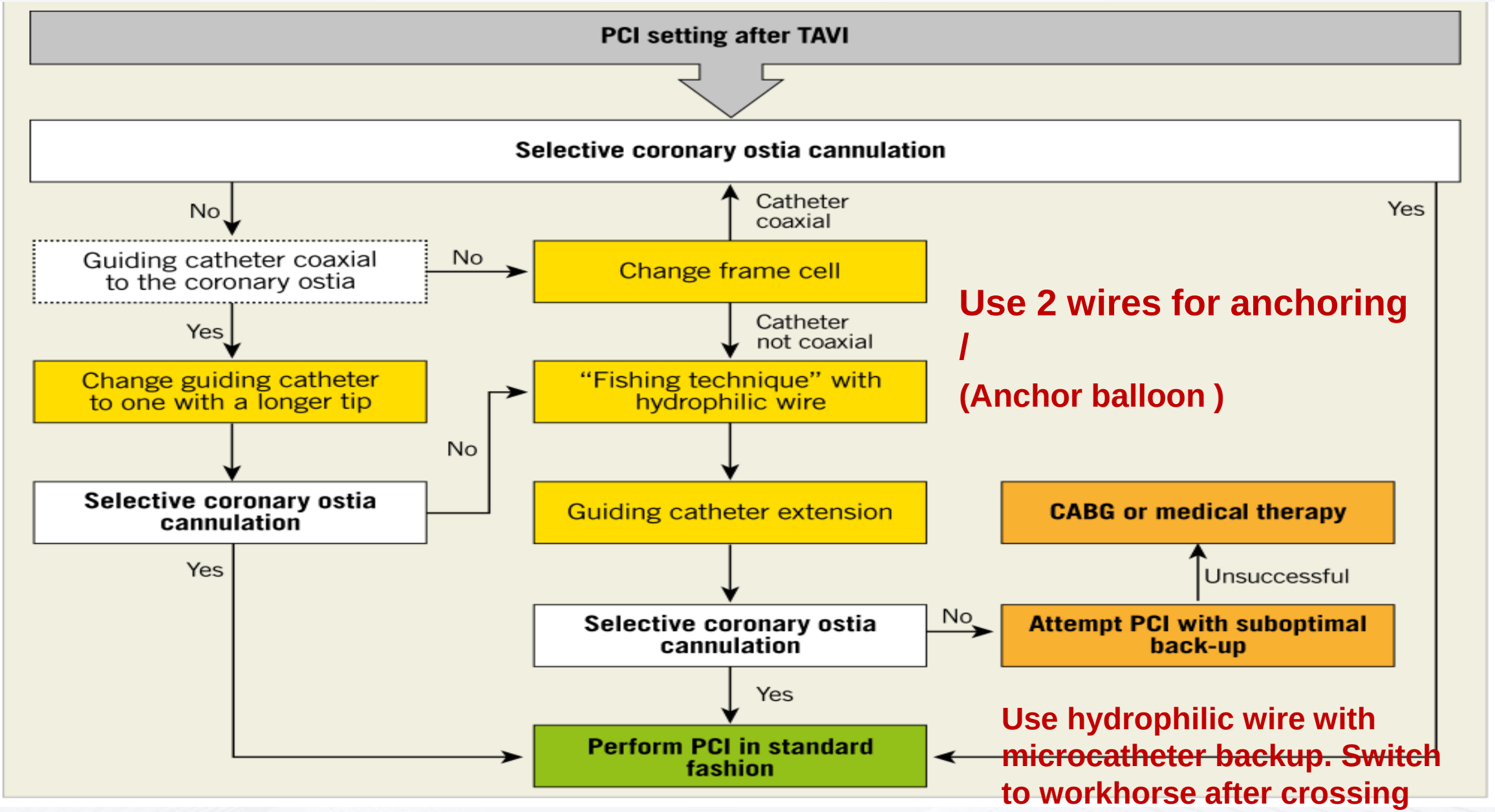
8. Disengage safely by unsheathing the guide over the wire.

Guide can kink and become stuck if valve if pulled too hard





Harhash A, Ansari J, Mandel L, Kipperman R. STEMI After TAVR: Procedural Challenge and Catastrophic Outcome. JACC: Cardiovascular Interventions. 2016;9(13):1412-3.



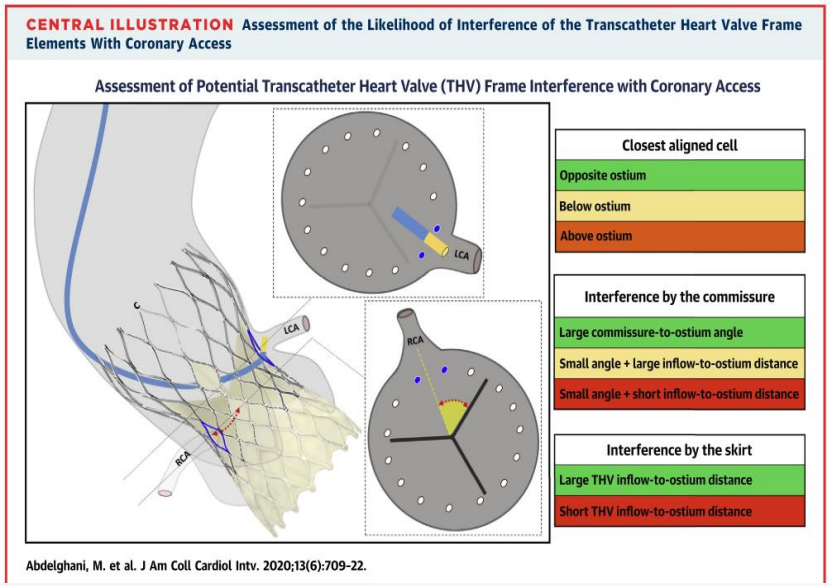
Roberto V, Giuliano C, Corrado T, Marco B. Coronary artery cannulation after transcatheter aortic valve implantation. EuroIntervention. 2021;17(10):835-47.

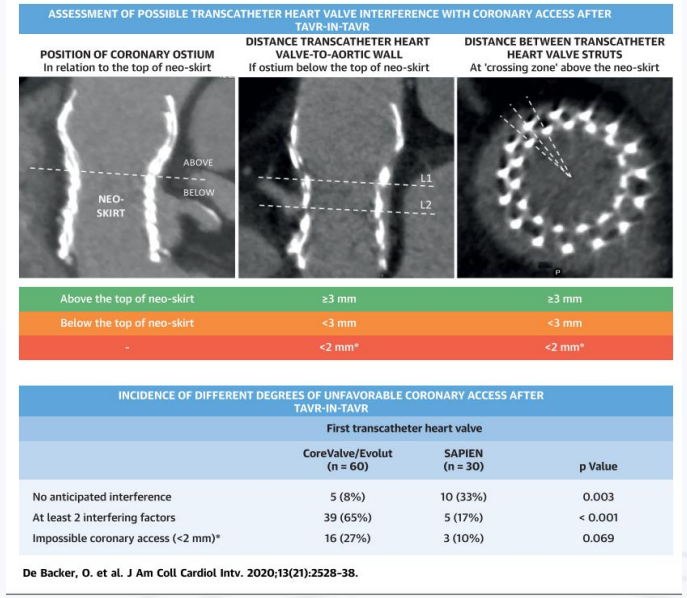
Conclusion

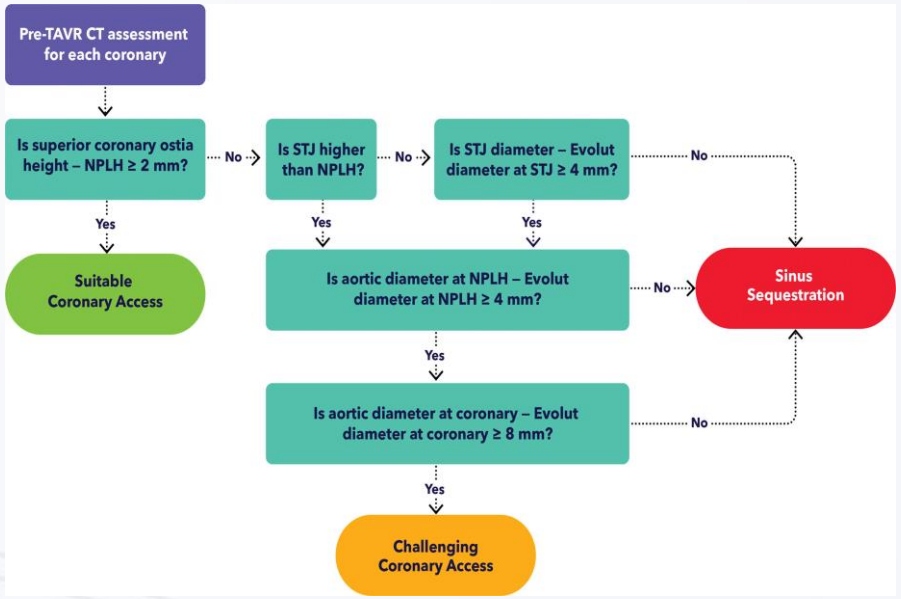
- Post TAVR coronary access is required in 15% of patients in 5 years, ACS 10% of patients in 2 years. PCI can be challenging.
- 1. Go femoral/left radial
- 2. Use aortogram
- 3. Know your valve
- 4. Select the right guide
- 5. Use guideliner and hydrophilic wires
- 6. Know the commissural alignment
- 7. Wire from afar and perform PCI when impossible to engage

With good planning, the correct tools and approach. Complex PCI can be performed successfully in post TAVR patients

Bonus: CT is your friend







De Backer O, Landes U, Fuchs A, Yoon S-H, Mathiassen ON, Sedaghat A, et al. Coronary Access After TAVR-in-TAVR as Evaluated by Multidetector Computed Tomography. JACC: Cardiovascular Interventions. 2020;13(21):2528-38.

Abdelghani, M, Landt, M, Traboulsi, H. et al. Coronary Access After TAVR With a Self-Expanding Bioprosthesis: Insights From Computed Tomography. J Am Coll Cardiol Intv. 2020 Mar, 13 (6) 709–722.

Tang GHL, Spencer J, Rogers T, Grubb KJ, Gleason P, Gada H, et al. Feasibility of Coronary Access Following Redo-TAVR for Evolut Failure: A Computed Tomography Simulation Study. Circulation: Cardiovascular Interventions. 2023;16(11):e013238.