SAPPORO LIVE DEMONSTRATION COURSE 2011

1-3,September

Practical Use of MSCT in CTO PCI

Yasumi Igarashi

Hokkaido Social Insurance Hospital

Clinical significance of recanalized CTO

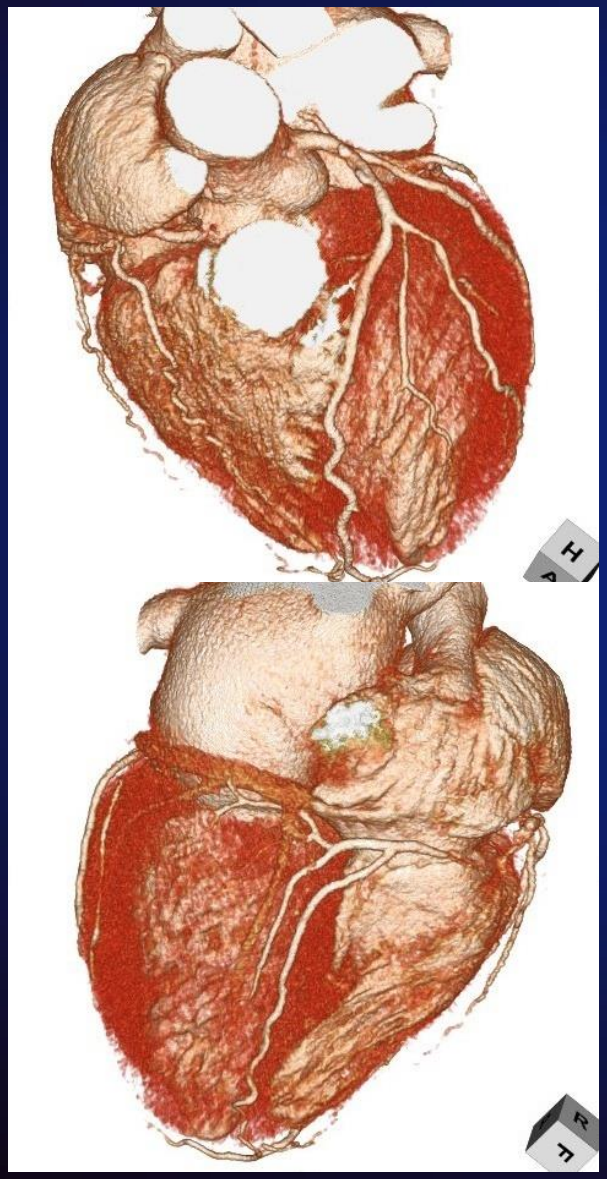
- **Acute phase**

1. Relief of symptom
2. Safety margin in PCI of other vessel
3. Escape from bypass surgery

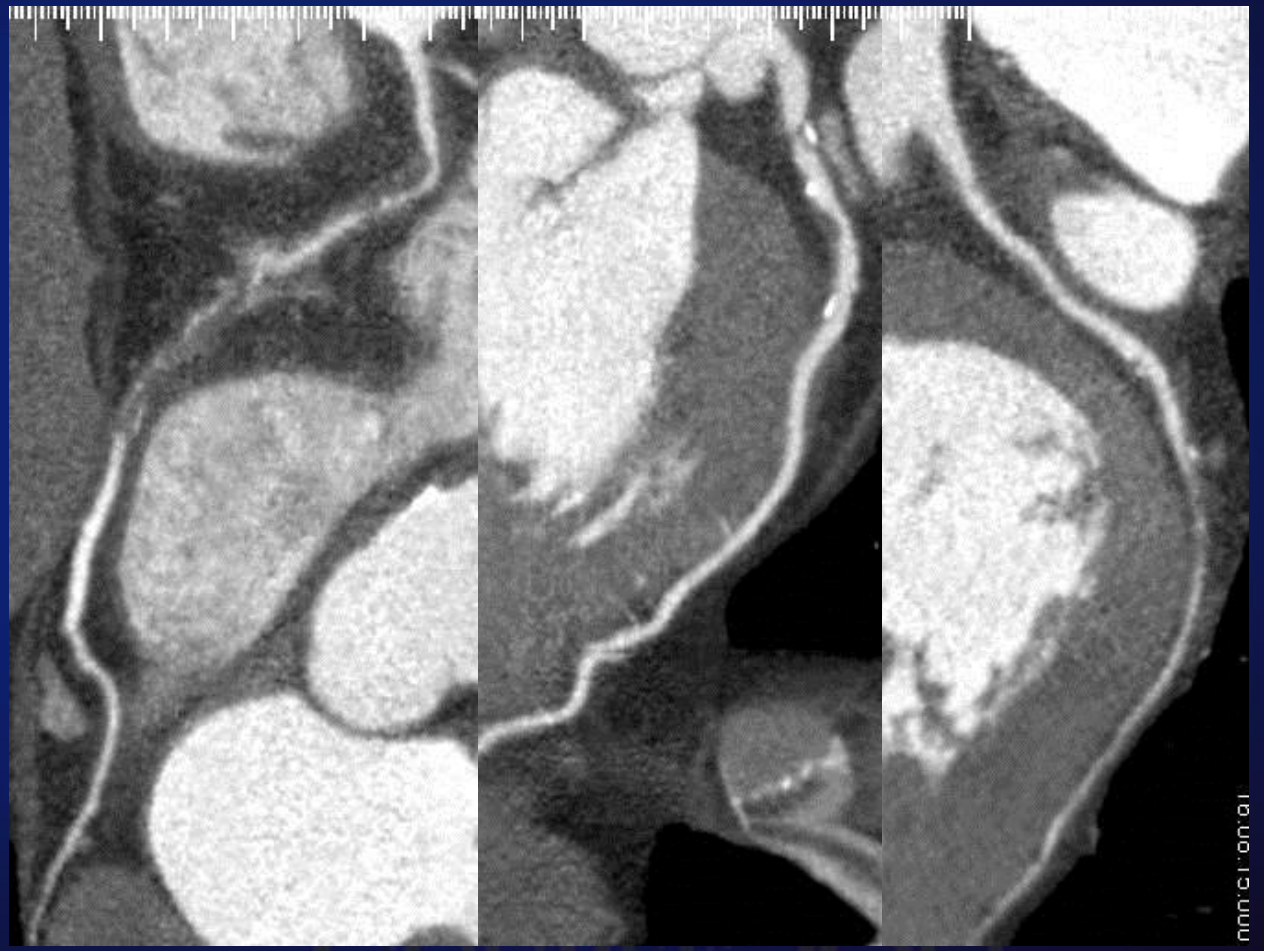
- **Chronic phase**

4. Improvement of LV function
5. Collateral for the future diseased vessel
6. Improvement of long-term prognosis

Screening CCTA



RCA LAD LCX



Conventional CAG vs Coronary CTA

Extractive information

< Catheter angiogram >

- Shape of open vessels
- Distribution of calcium
- Collateral circulation

< CT angiogram >

- Shape of open vessels
- Distribution of calcium
- Collateral circulation
- Distribution of soft plaque
- Shape of closed vessels

CCTA predictors of procedural failure of CTO PCI

TABLE 3 Angiographic and MSCT Coronary Angiographic Multivariate Predictors of Procedural Failure for Chronic Total Occlusion

Variable	Coefficient	Wald's Chi-square	DF	p Value	OR (95% CI)	−2 Log Likelihood	Hosmer-Lemeshow Test DF	Hosmer-Lemeshow Test p Value	C Index
Clinical/angiographic predictors						50.0	2	0.66	0.80
Occlusion duration >9 mo	1.27	3.30	1	0.07	3.56 (0.90–14.02)				
Tapered stump	−1.93	7.46	1	<0.01	0.15 (0.04–0.58)				
Constant	0.24	0.13	1	0.7					
MSCT coronary angiography predictors						44.2	6	0.99	0.84
Occlusion length >15 mm	1.86	5.21	1	0.02	6.39 (1.30–31.41)				
Severe calcification	2.49	6.51	1	0.01	12.01 (1.78–81.1)				
Stump morphology	—	5.63	2	0.06	—				
Blunt	1 (reference)	—	—	—	—				
Tapered	−2.19	5.23	1	0.02	0.11 (0.02–0.73)				
Not determinable	−2.65	3.46	1	0.06	0.07 (0.00–1.15)				
Constant	−0.45	0.26	1	0.6	—				
Clinical/angiographic + MSCT coronary angiographic predictors						41.0	5	0.60	0.85
Tapered stump*	−2.43	7.98	1	<0.01	0.09 (0.02–0.48)				
Occlusion length >15 mm	2.17	6.16	1	0.01	8.77 (1.58–48.76)				
Severe calcification	2.03	5.18	1	0.02	7.62 (1.33–43.74)				
Constant	−0.67	0.74	1	0.4	—				

*A −2 log-likelihood change in the global model if 1 variable is removed: tapered stump −10.7 (p <0.01 for change), occlusion length −8.2 (p <0.01), and calcification −6.6 (p = 0.01 for change).
DF = degrees of freedom; other abbreviations as in Table 2.

Mollet NR et al, Value of Preprocedure Multislice Computed Tomographic Coronary Angiography to Predict the Outcome of Percutaneous Recanalization of Chronic Total Occlusions. Am J Cardiol 2005;95:240-243

Multivariate predictors of procedure failure in PCI for CTO

	Odds Ratio	p-Value	95% CI	Likelihood Ratio Test p-Value
Vessel bending, n	20.62	< 0.0001	4.72–90.09	< 0.0001
Vessel shrinkage, n	10.76	0.0078	1.87–62.05	0.0057
Severe calcification, n	4.54	0.0342	1.12–18.38	0.0307

CI = confidence interval. The likelihood ratio test for the whole model was < 0.0001.

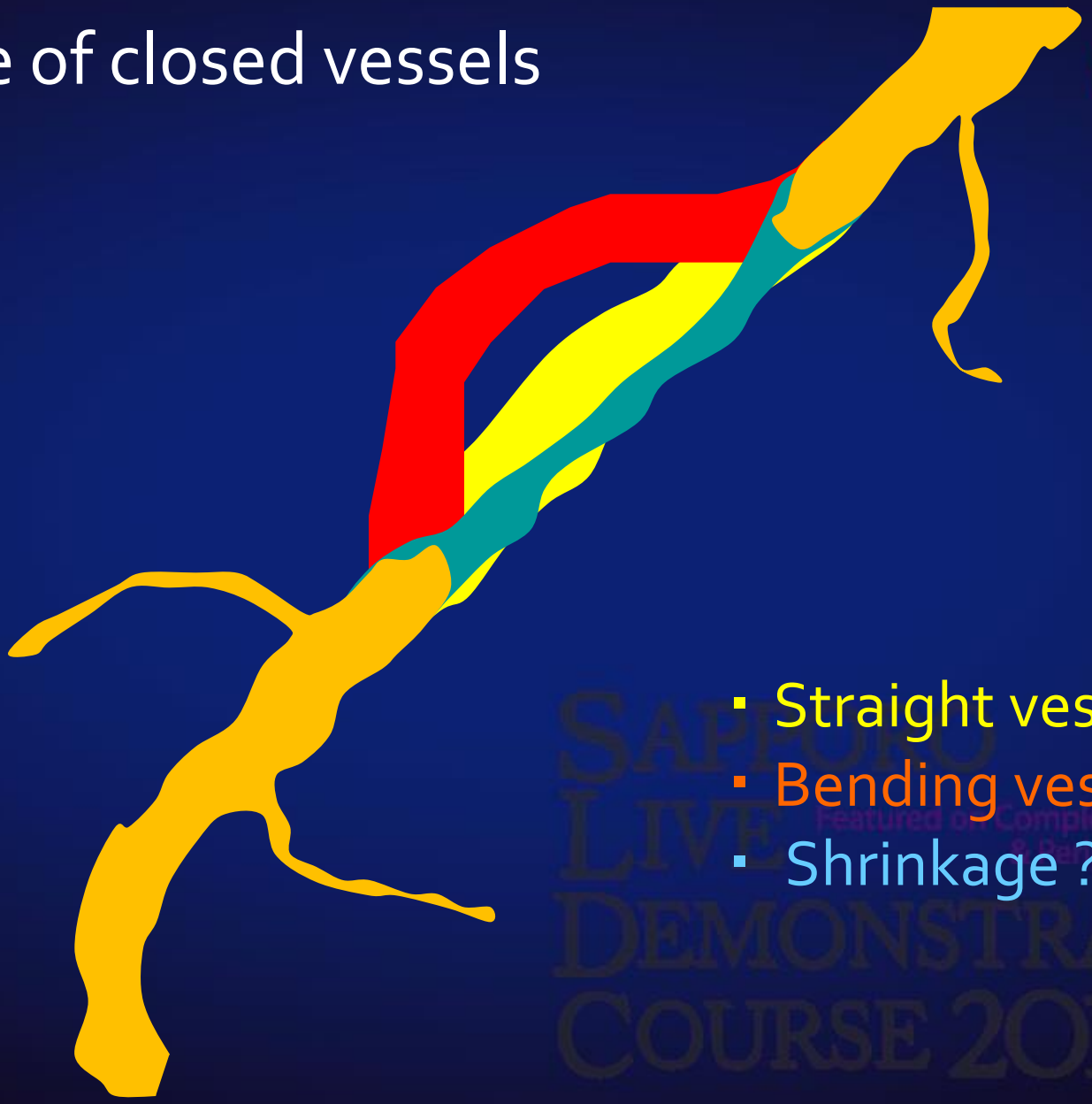
Mariko Ehara, Osamu Katoh, Takahiko Suzuki et al. Impact of Multislice Computed Tomography to Estimate Difficulty in Wire Crossing in Percutaneous Coronary Intervention for Chronic Total Occlusion. J Invasive Cardiol. 2009 Nov;21(11):575-82.

Table 4. Impact of morphological features on wiring success as observed by CTCA.

Findings on CTCA	Detected Group		Nondetected Group		*p*-Value
	Total	No. of Successes	Total	No. of Successes	
Vessel bending	30	17 (57%)	80	76 (95%)	< 0.0001
Vessel shrinkage, *n*	9	4 (44%)	101	89 (88%)	0.0005
Severe calcification, *n*	24	17 (71%)	86	76 (88%)	0.0356
Tapered stump, *n*	56	46 (82%)	54	47 (87%)	0.5542
Significant side branch, *n*	62	50 (81%)	48	43 (90%)	0.1984
In-stent occlusion, *n*	18	16 (89%)	92	77 (84%)	0.5772
Occlusion length ≥ 20 mm, *n*	51	41 (80%)	59	52 (88%)	0.2625
Occlusion length ≥ 30 mm, *n*	25	19 (76%)	85	74 (87%)	0.1787

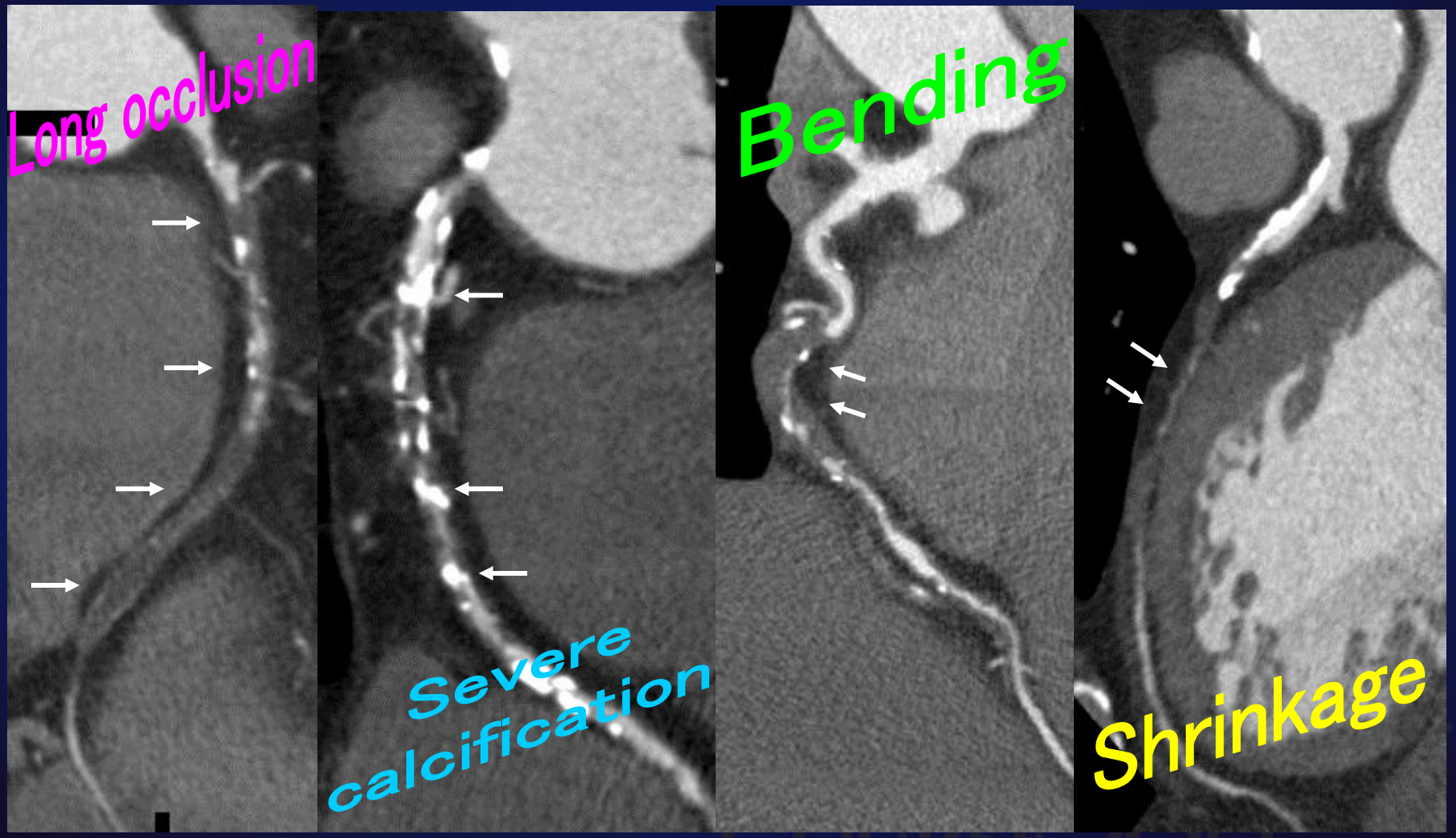
CTCA = *multislice computed tomographic coronary angiography*

Shape of closed vessels

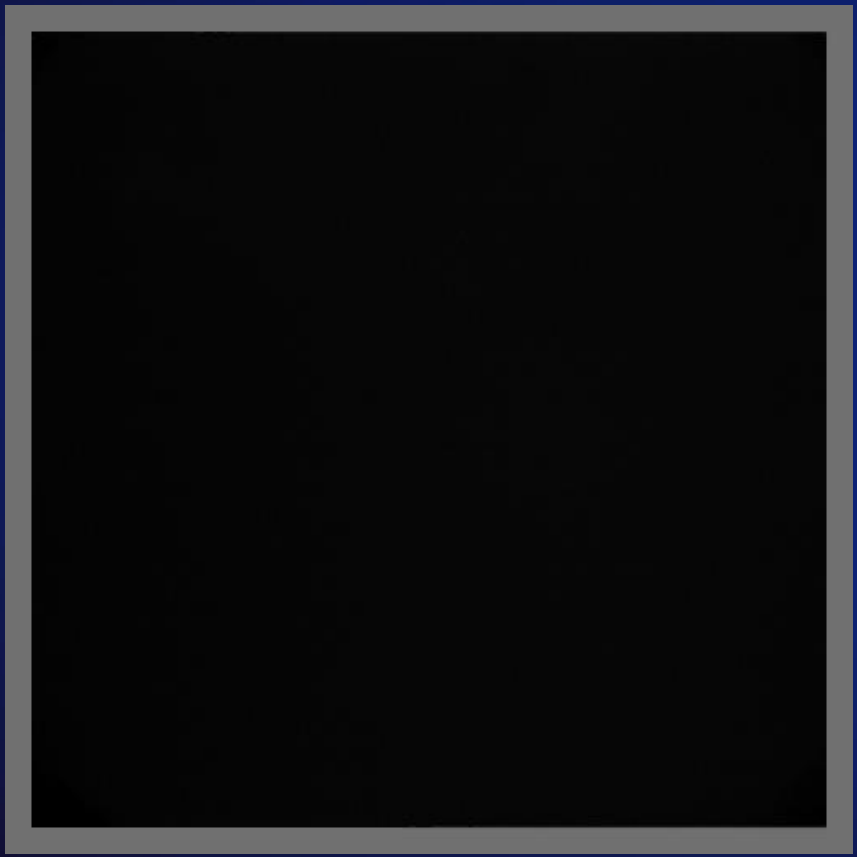


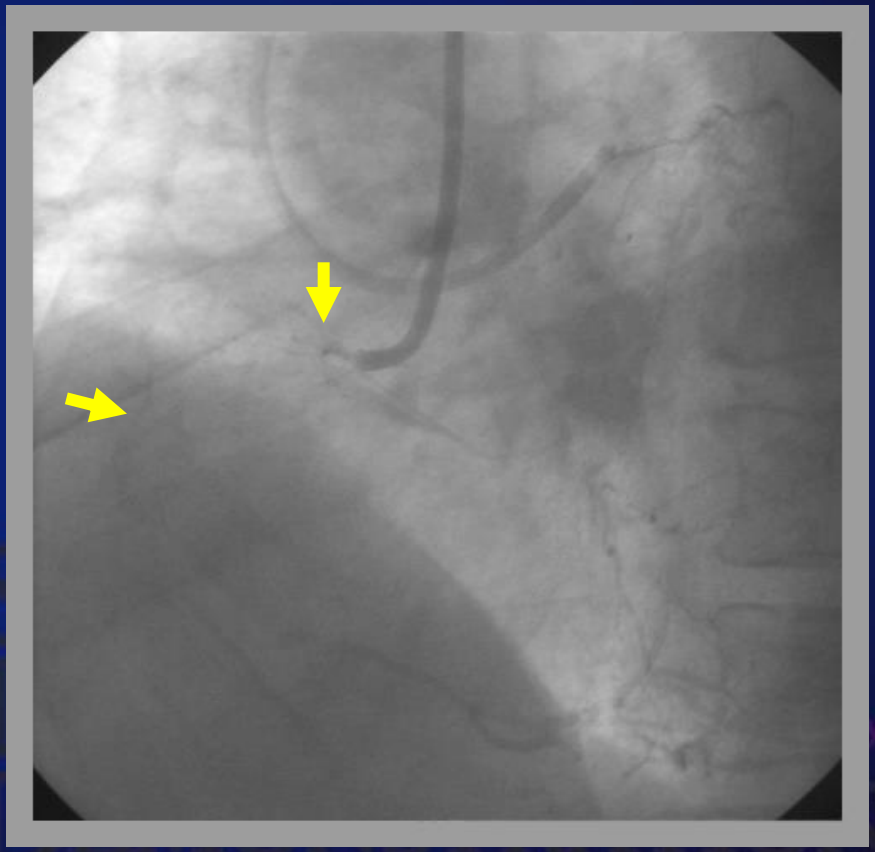
- Straight vessel ?
- Bending vessel ?
- Shrinkage ?

CCTA predictors of procedural failure for CTO

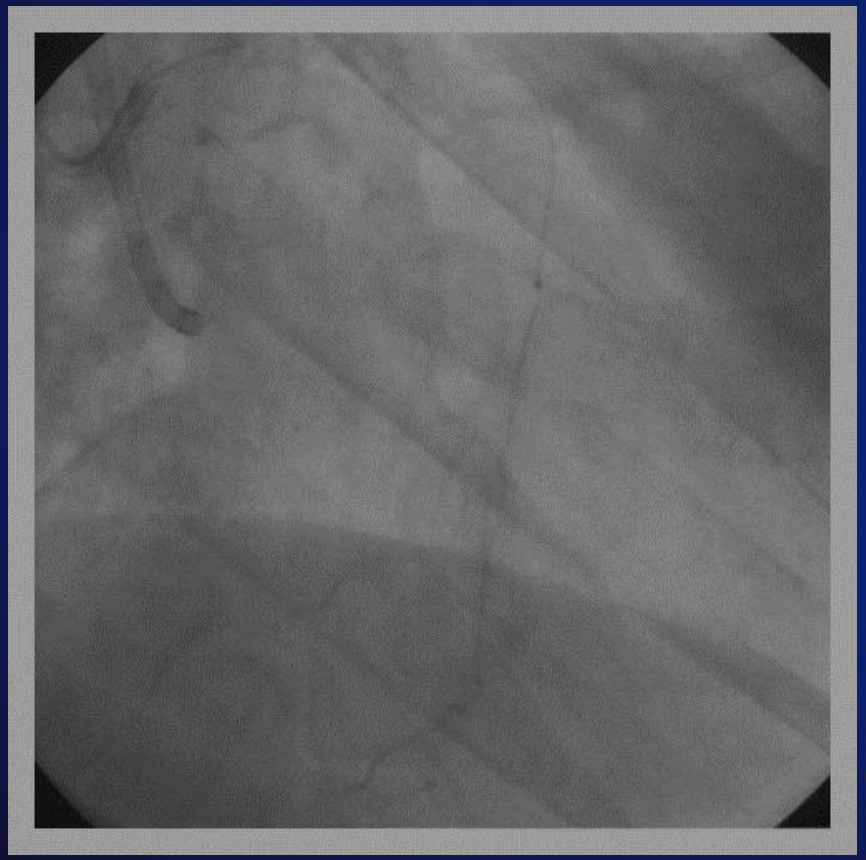


CASE 2 (OCT/06)
his 70's Male
RCA ostial CTO case

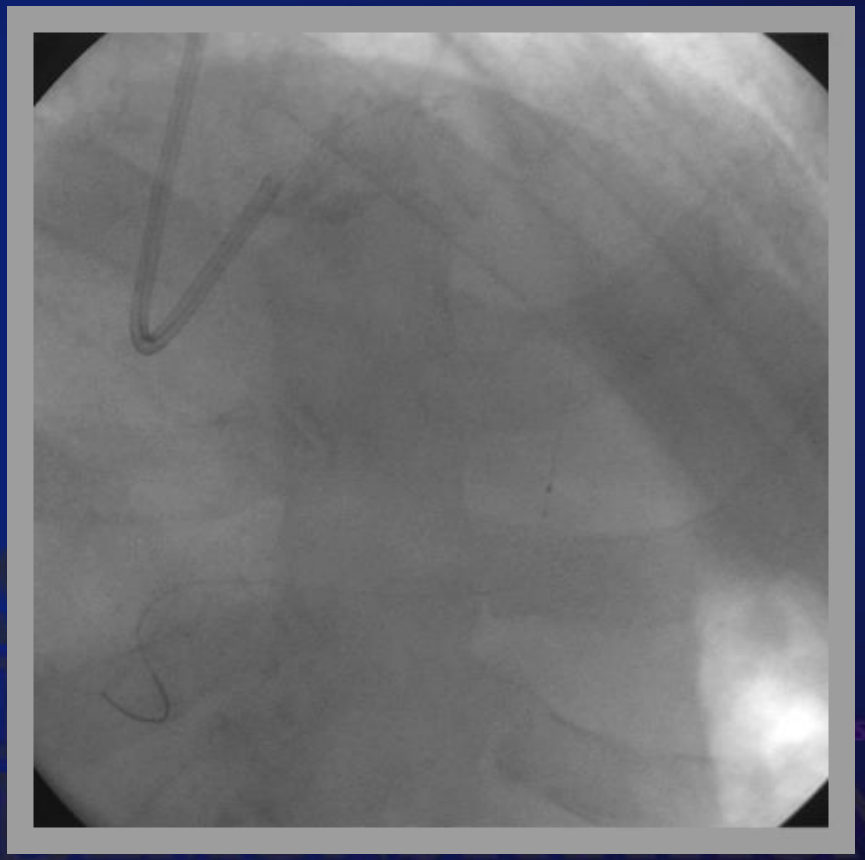




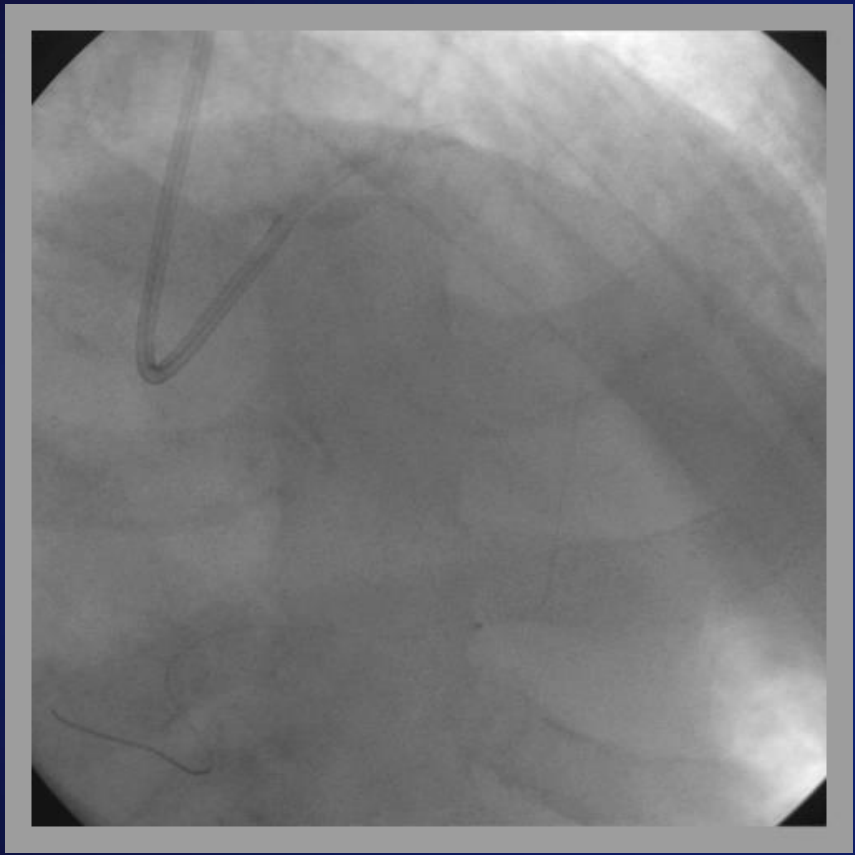
angiogram

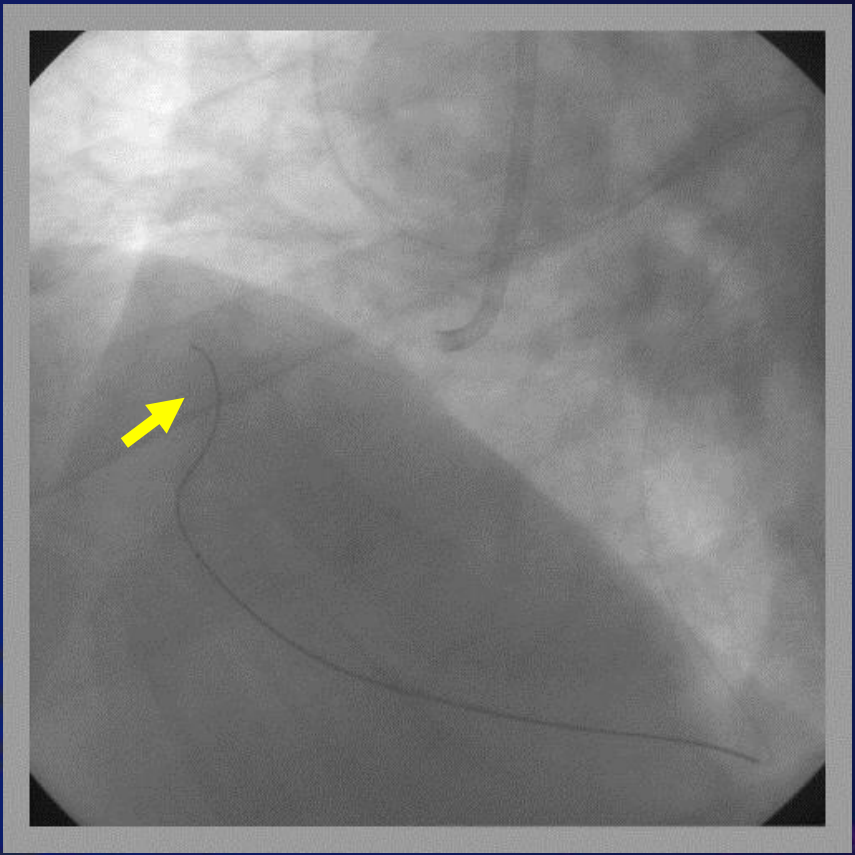


super selective tip injection
septal branch angiography

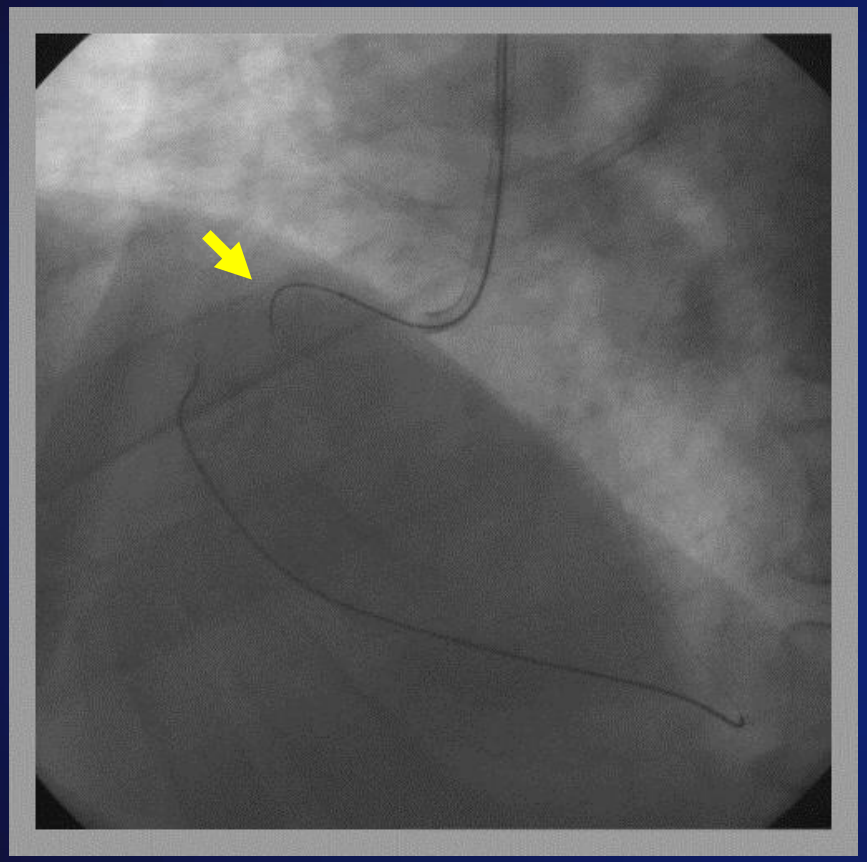


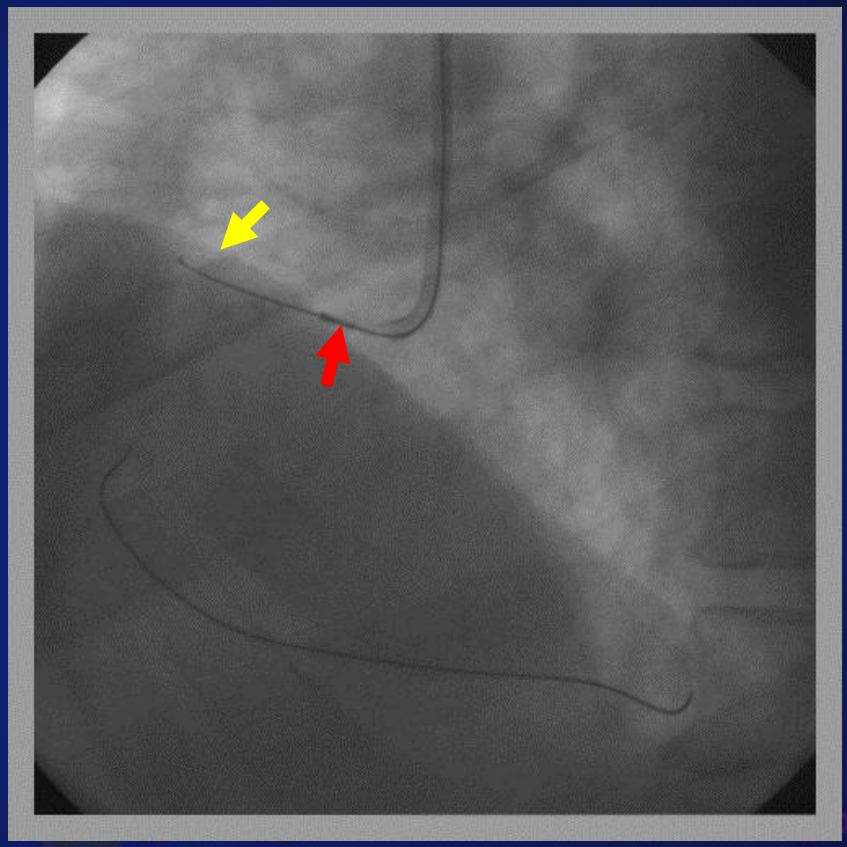
wire passed septal junction



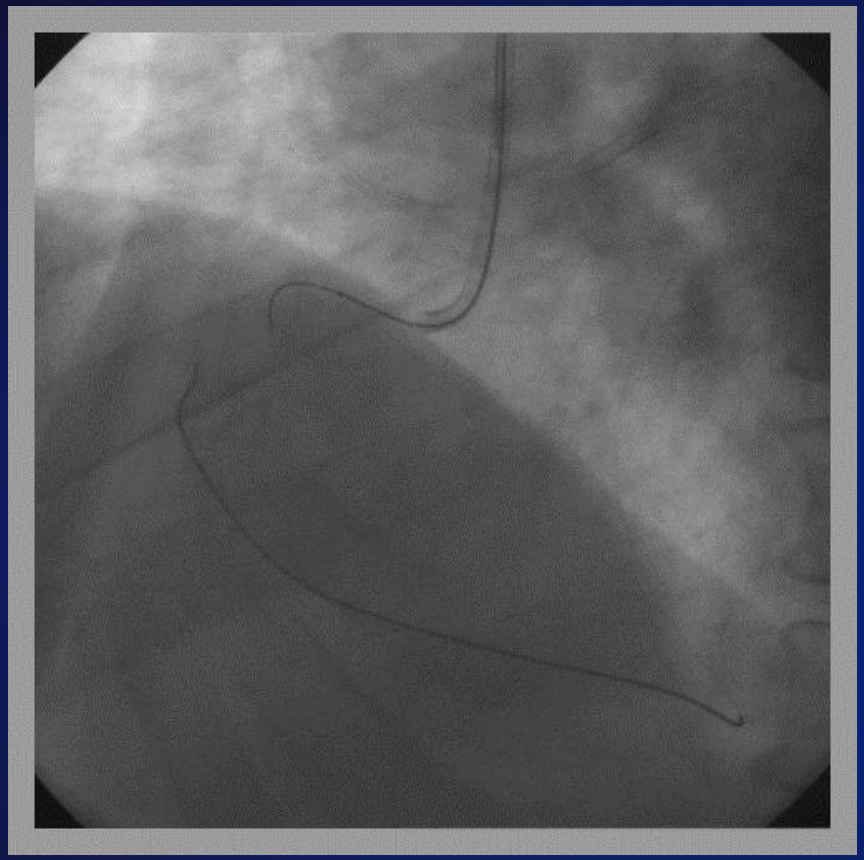


1.25mm OTW balloon dilatation

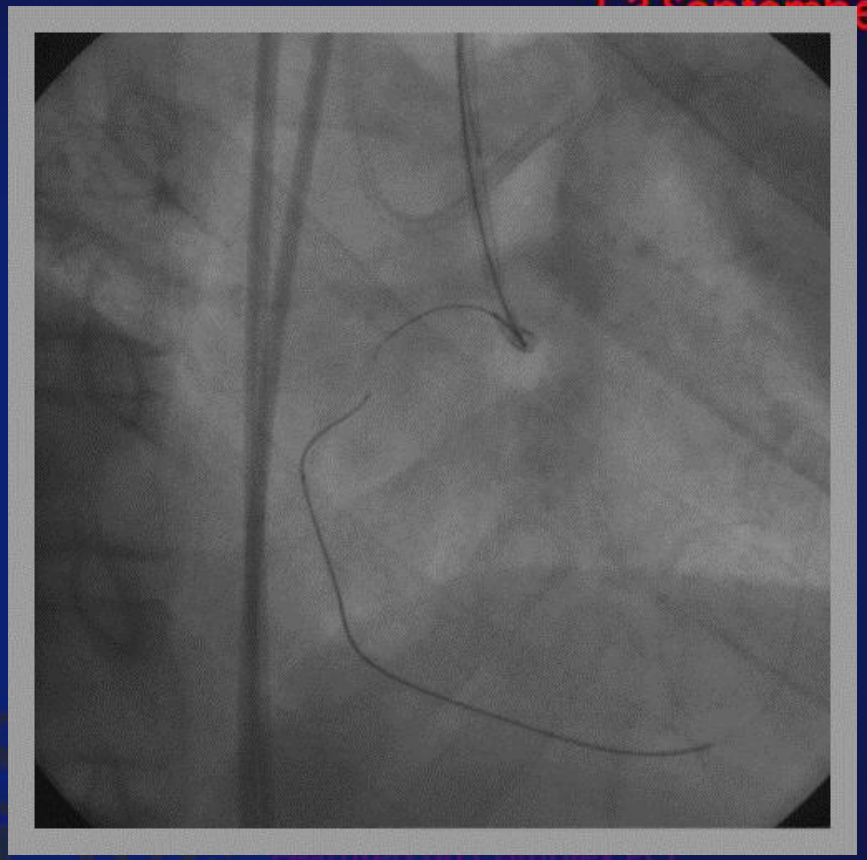




antegrade approach with Tornus backup



LAO



RAO

antegrade approach with Tornus backup

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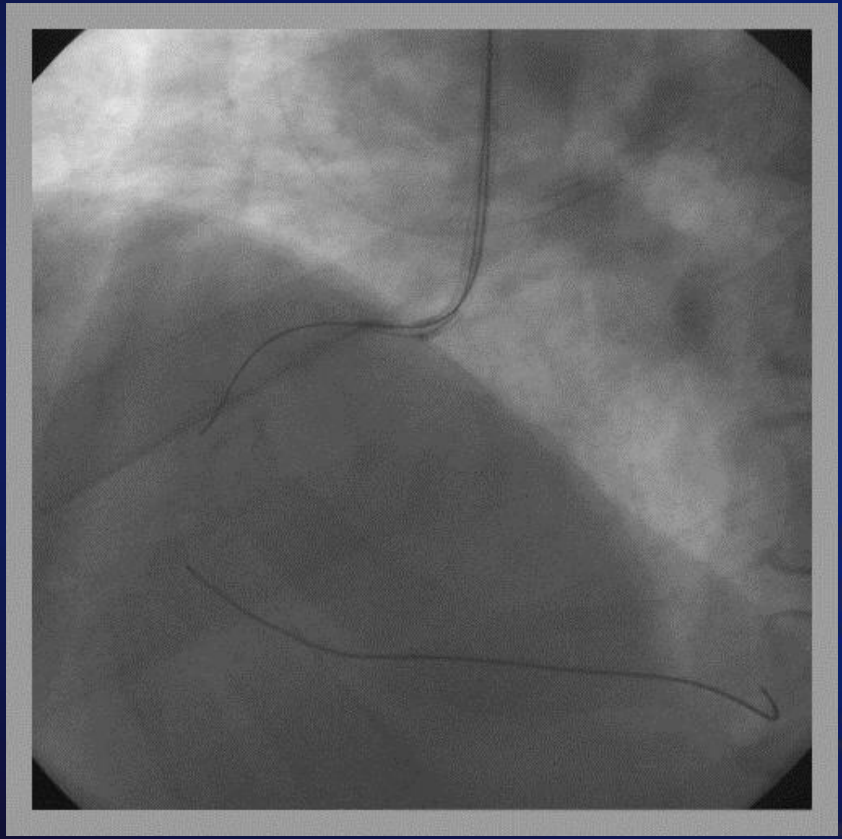

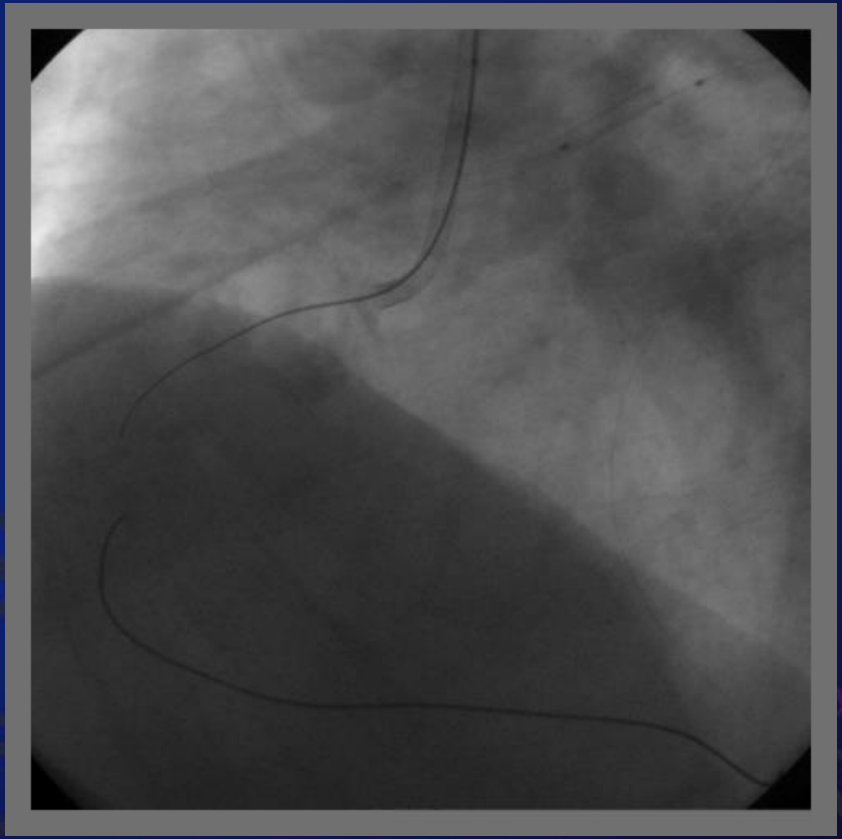

COURSE 2011

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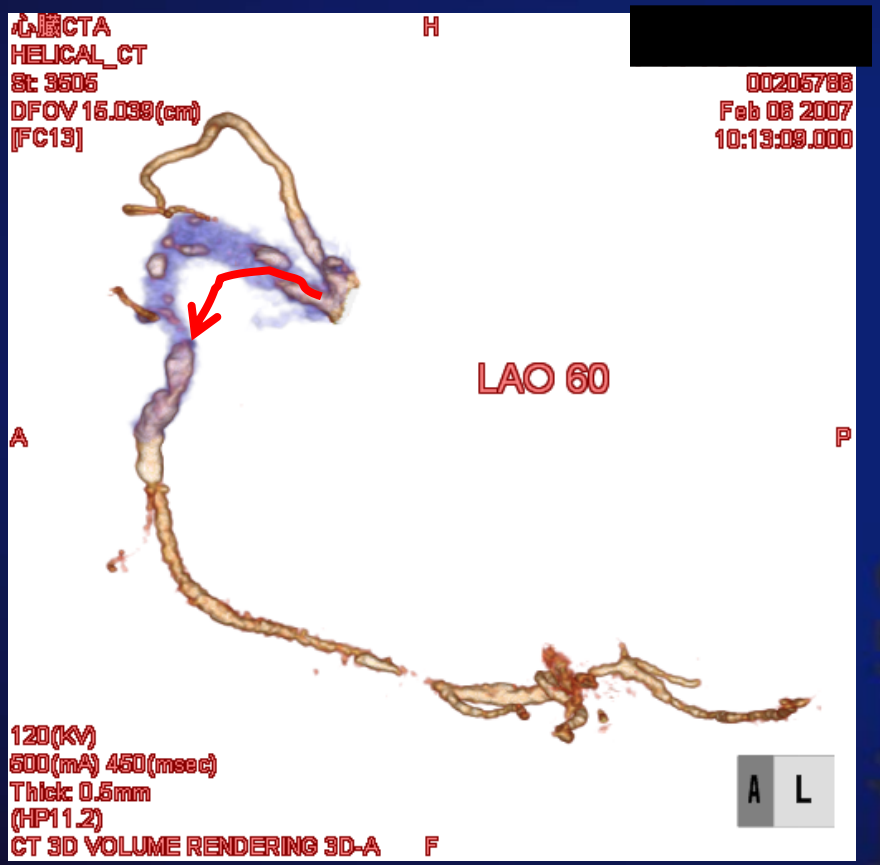
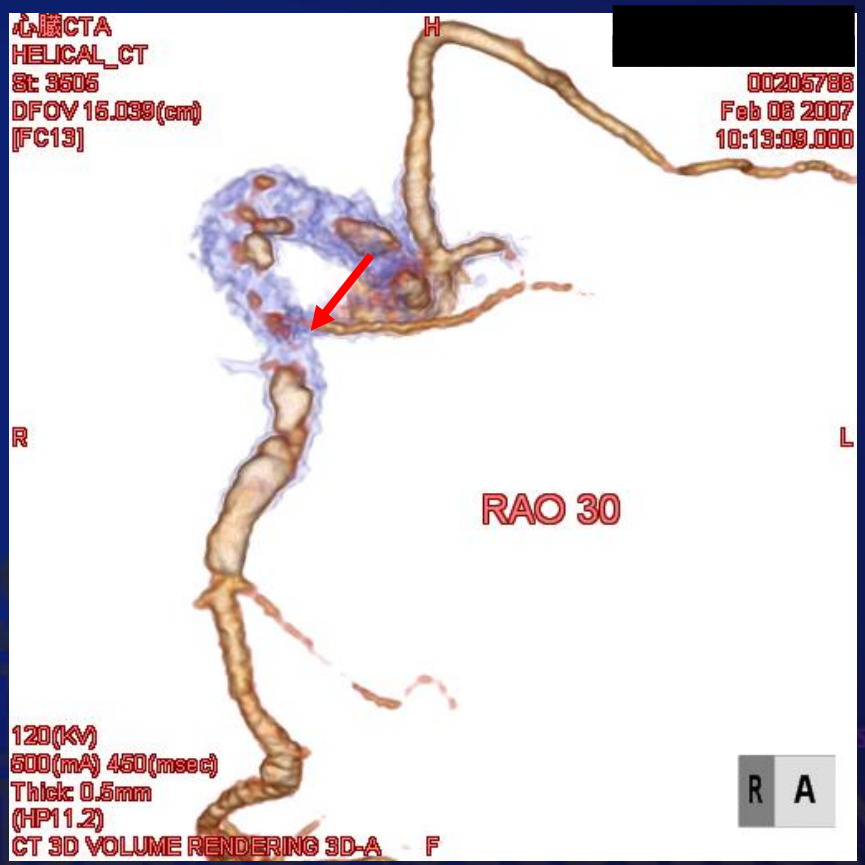
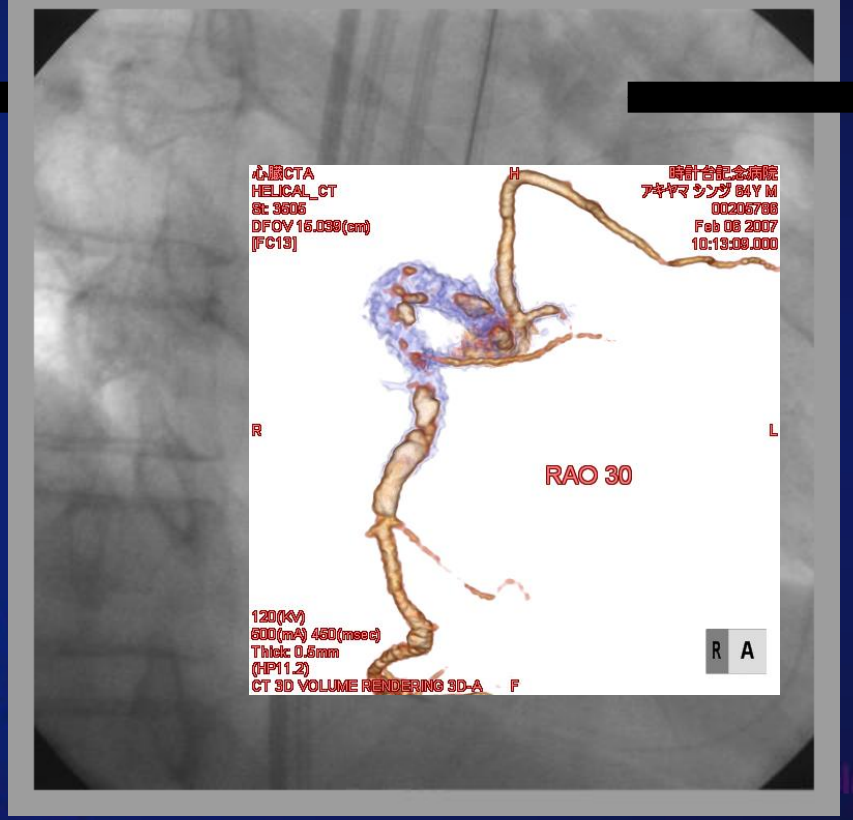
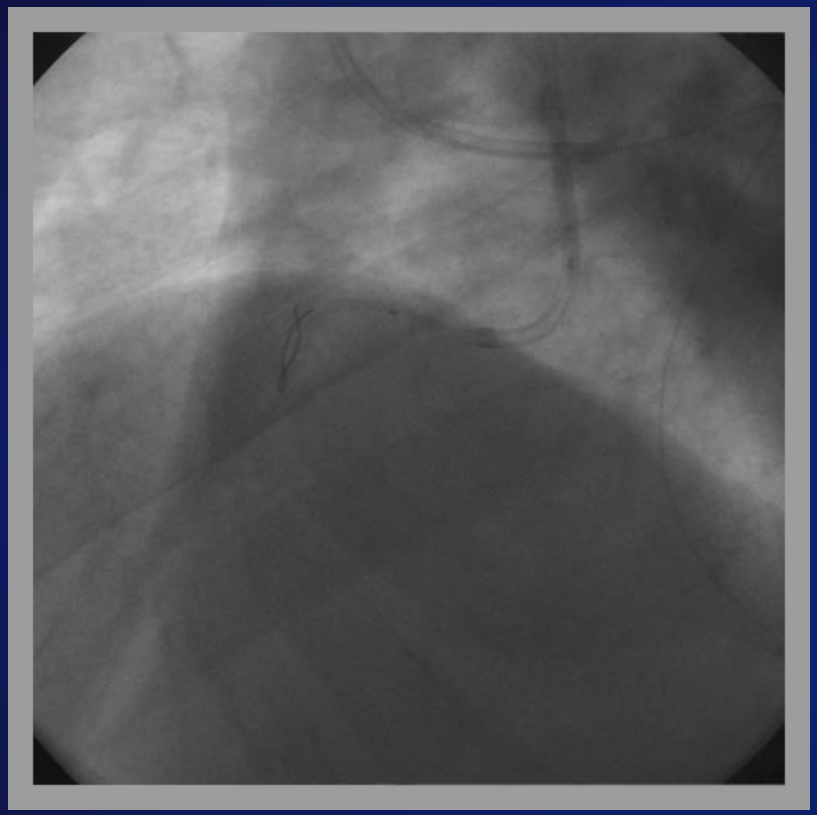




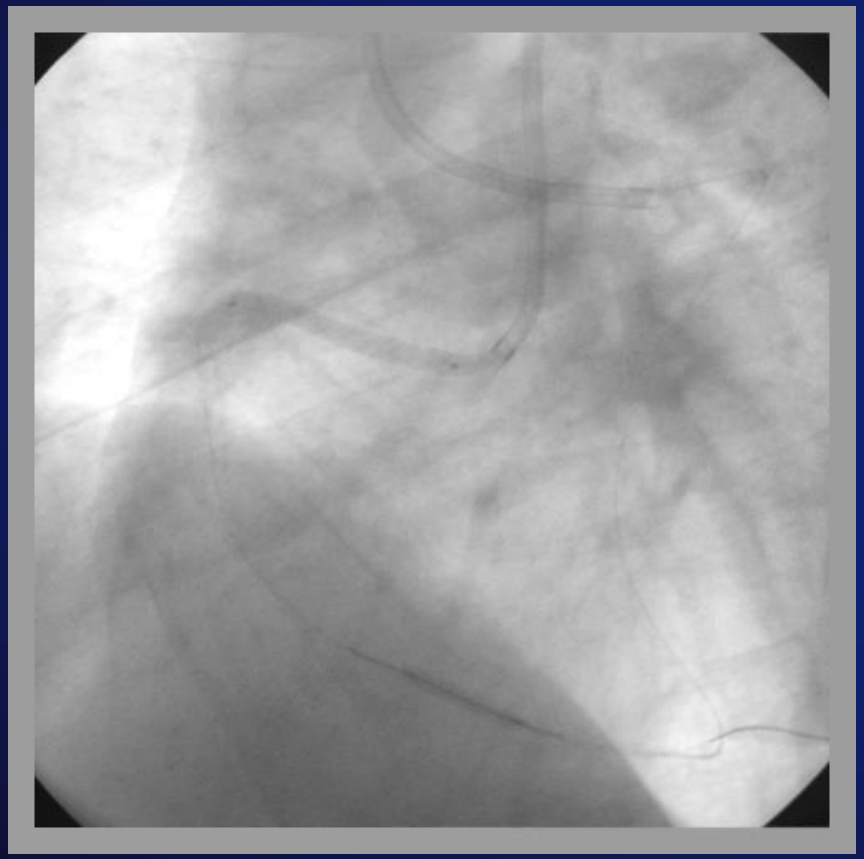
2nd PCI


心臓CTA
HELICAL_CT
St: 3505
DFOV 15.039(cm)
[FC13]
H
時計台記念病院
アキヤマ シンゾ 64Y M
00205786
Feb 08 2007
10:13:09.000
LAO 60
A
P
120(kV)
500(mA) 450(msec)
Thick: 0.5mm
(HP11.2)
CT 3D VOLUME RENDERING 3D-A
F
A L

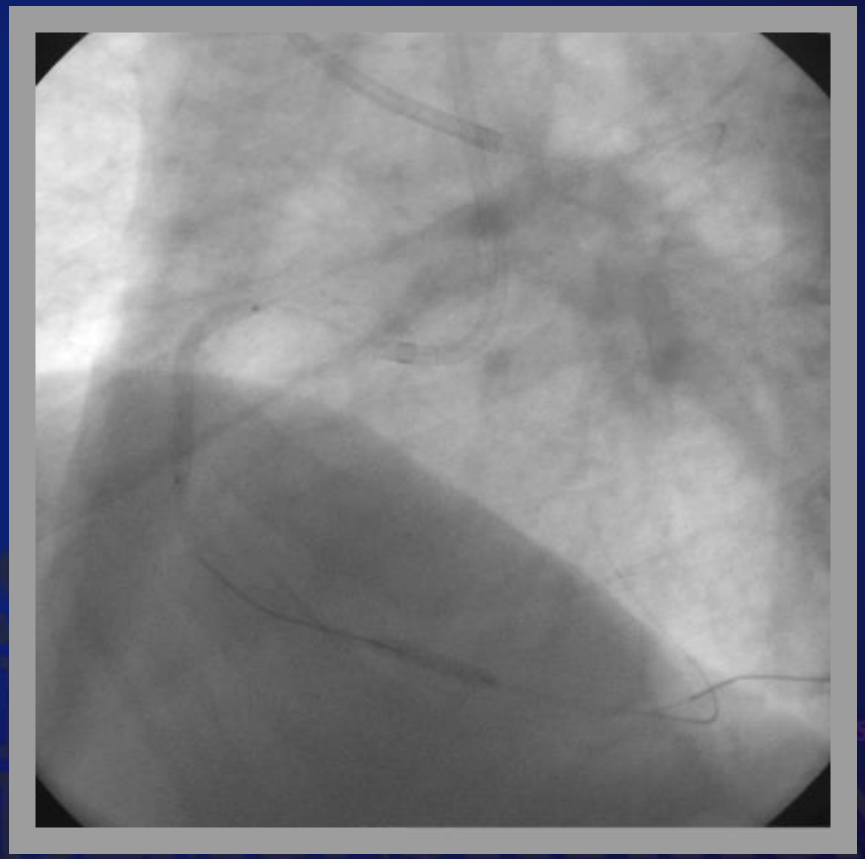

心臓CTA
HELICAL_CT
St: 3505
DFOV 15.039(cm)
[FC13]
H
時計台記念病院
アキヤマ シンゾ 64Y M
00205786
Feb 08 2007
10:13:09.000
R
L
RAO 30
120(kV)
500(mA) 450(msec)
Thick: 0.5mm
(HP11.2)
CT 3D VOLUME RENDERING 3D-A
F
R A



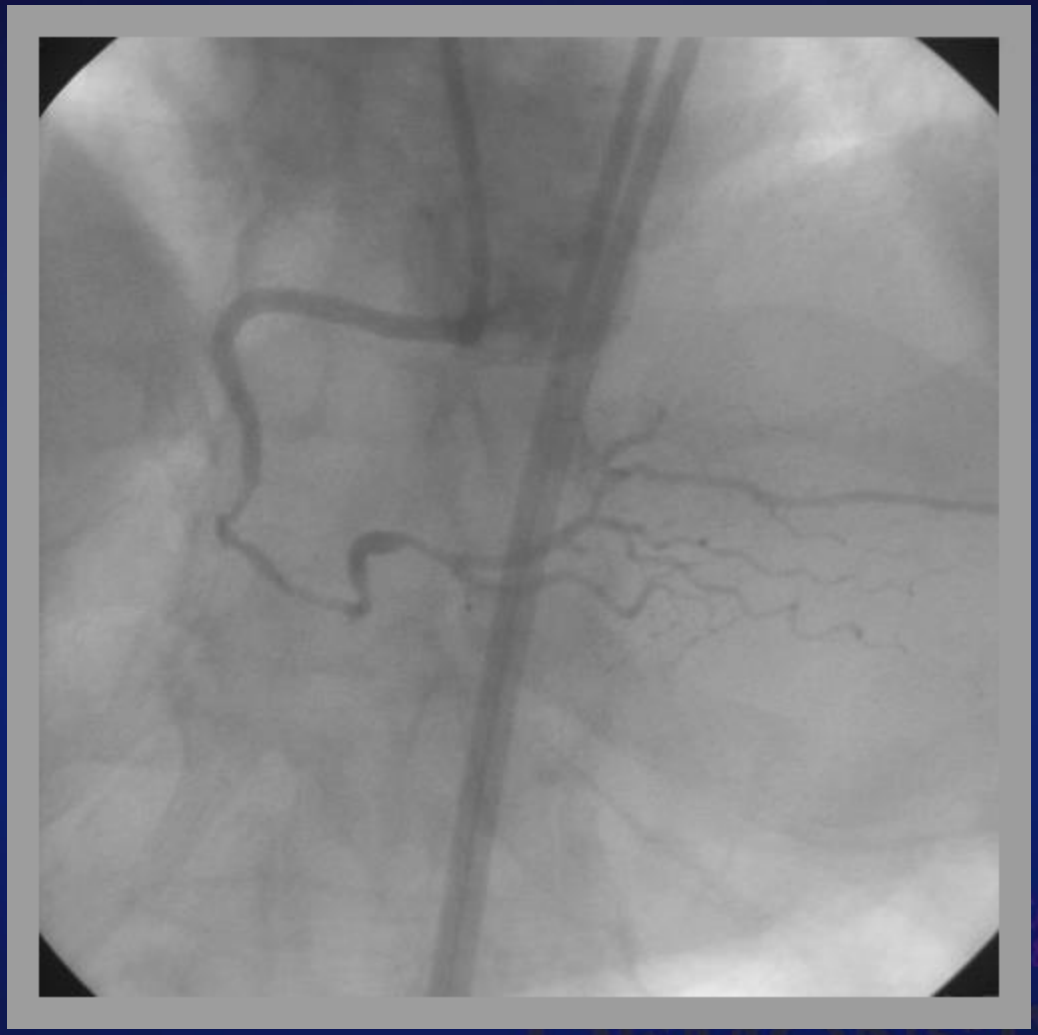
Reverse CART technique



DES to RCA#1



DES to #2



Final angiogram

Conventional CAG vs Coronary CTA

Extractive information

< Catheter angiogram >

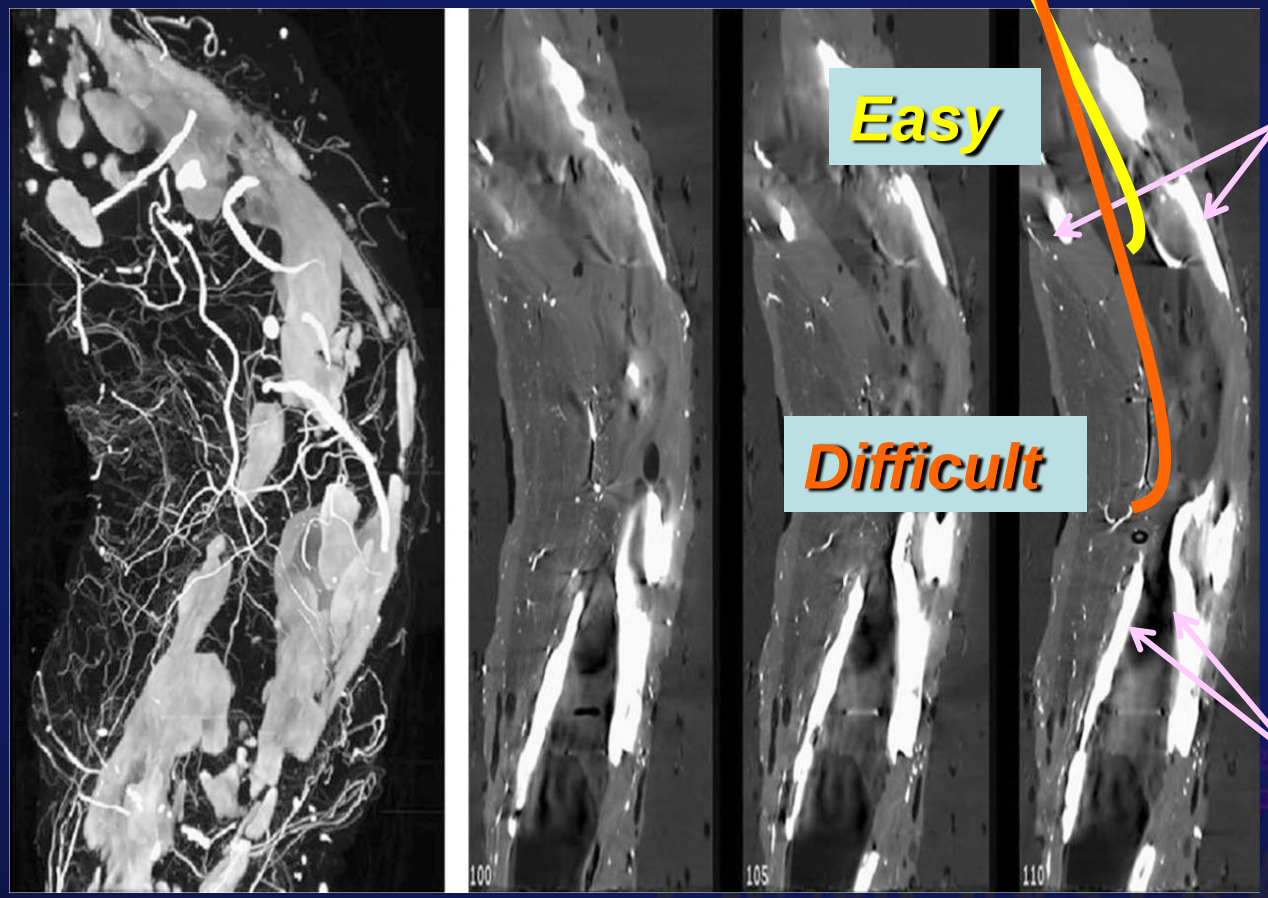
- Shape of open vessels
- Distribution of calcium
- Collateral circulation

< CT angiogram >

- Shape of open vessels
- Distribution of calcium
- Collateral circulation
- Distribution of soft plaque
- Shape of closed vessels

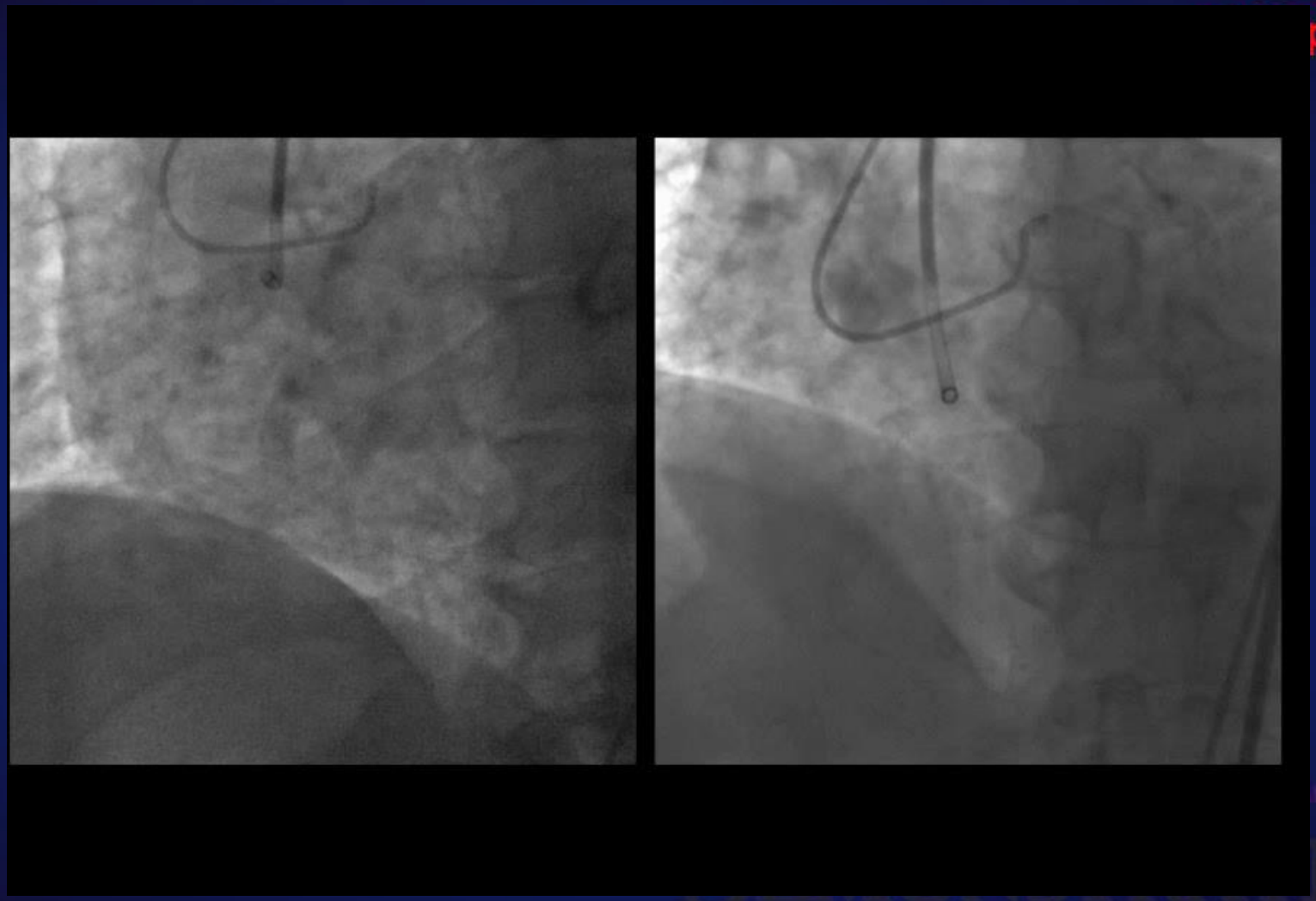
Distribution of calcium

Microscopic CT images of CTO



Gregg W. Stone, David E. Kandzari, Roxana M, et al : Percutaneous recanalization of chronically occluded coronary arteries : A consensus document : Part 1 , Circulation. 2005; 112: 2364-2372

Bi-lateral injection



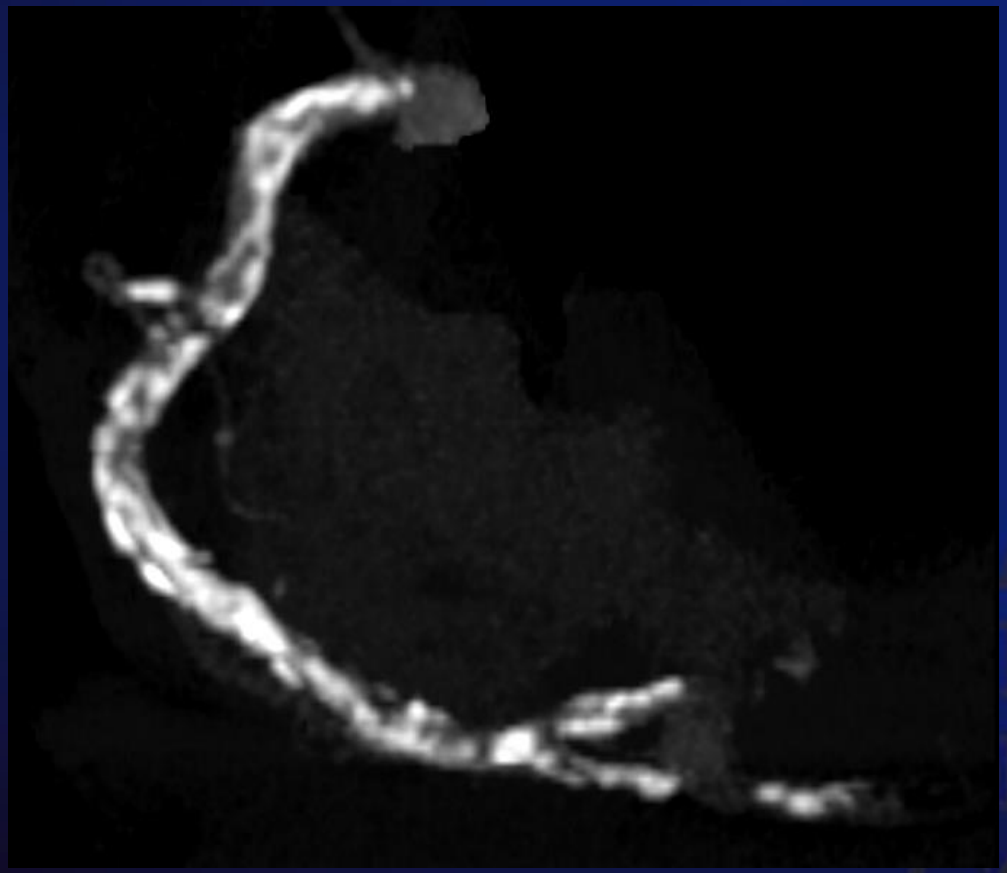
Rt femoral A 8Fr sheath

G/C : mach 1 FR 4.0 SH 8Fr

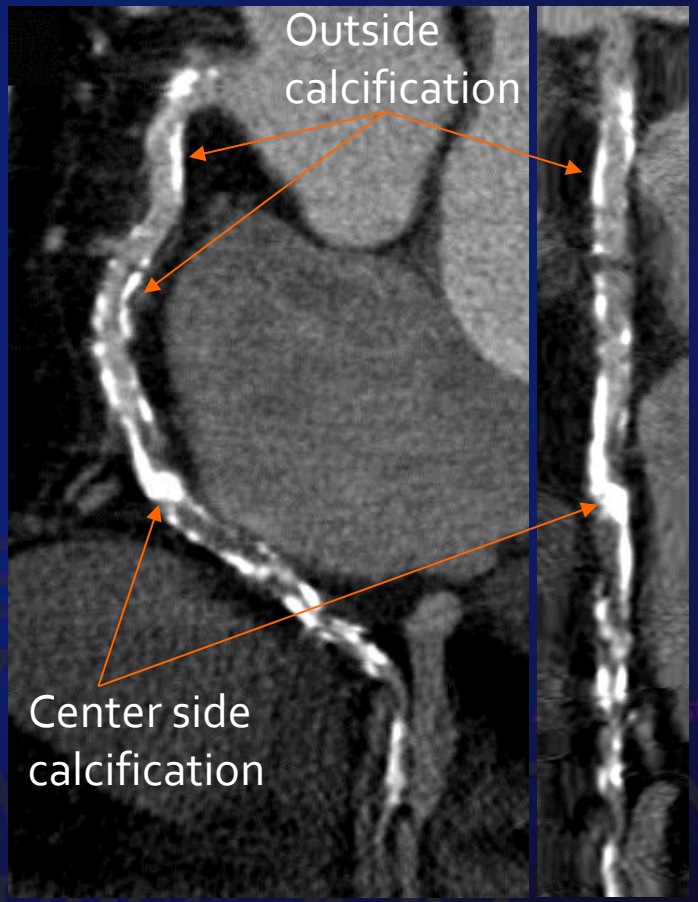
Lt femoral A 8Fr sheath

Distribution of calcium

3D MIP (LAO 45°)

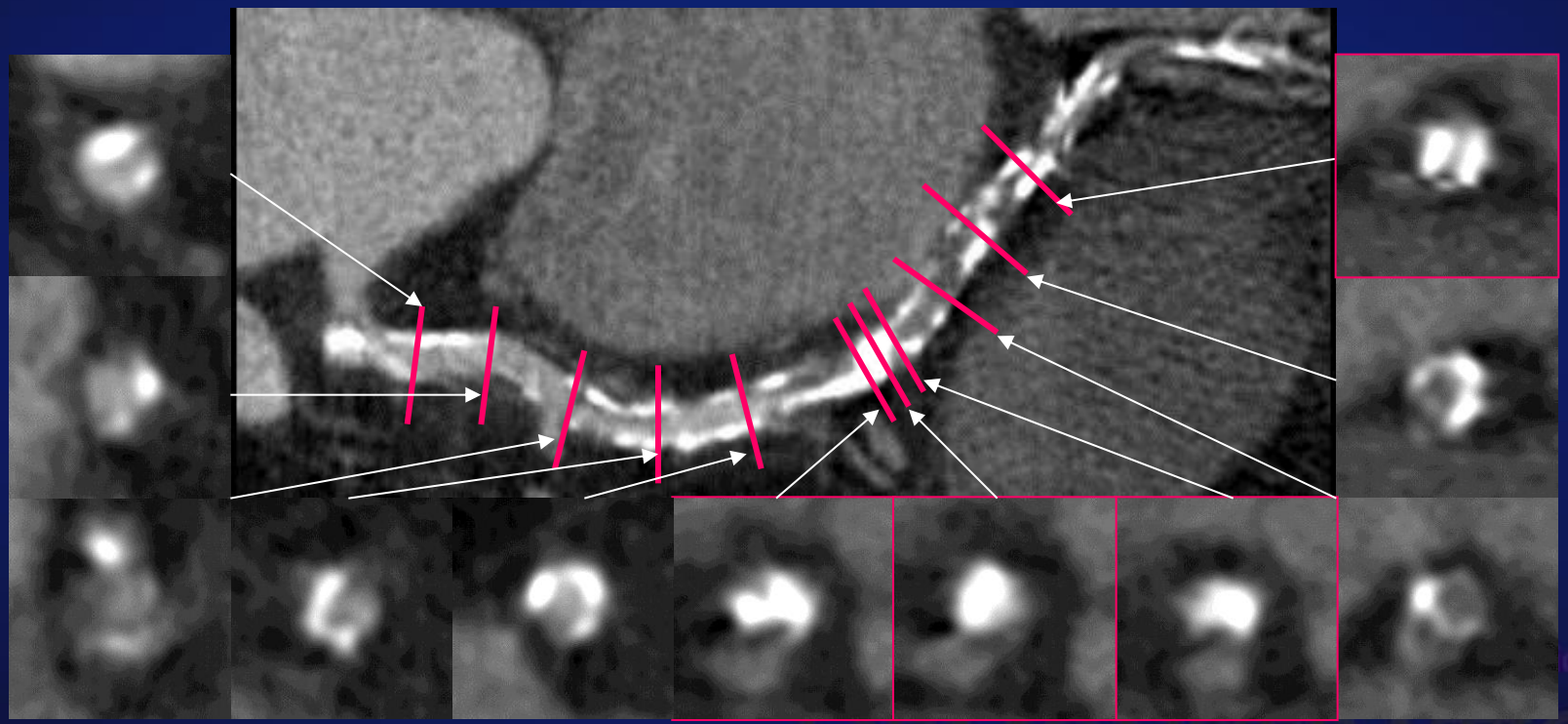


Curved MPR



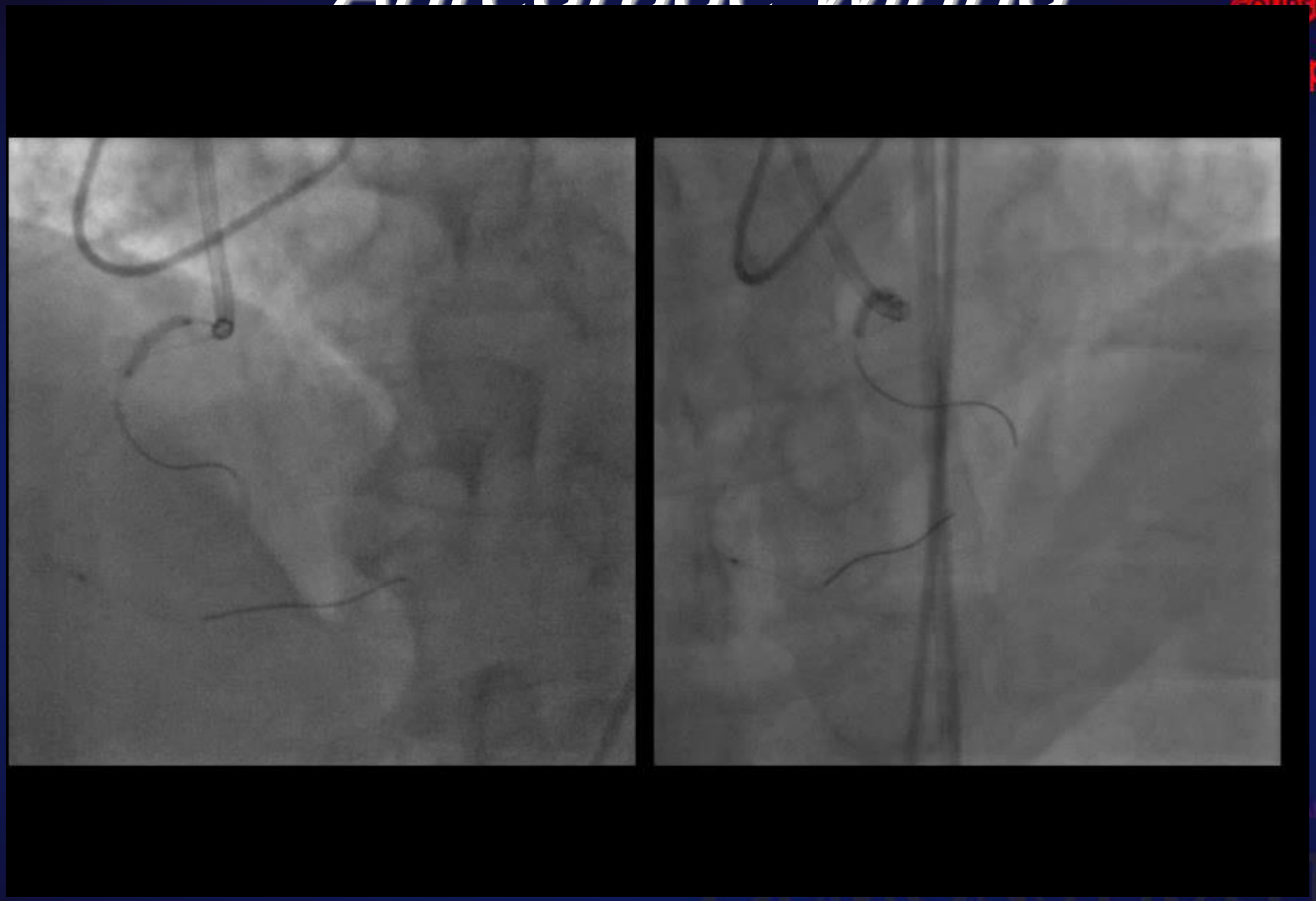
Distribution of calcium

Curved MPR



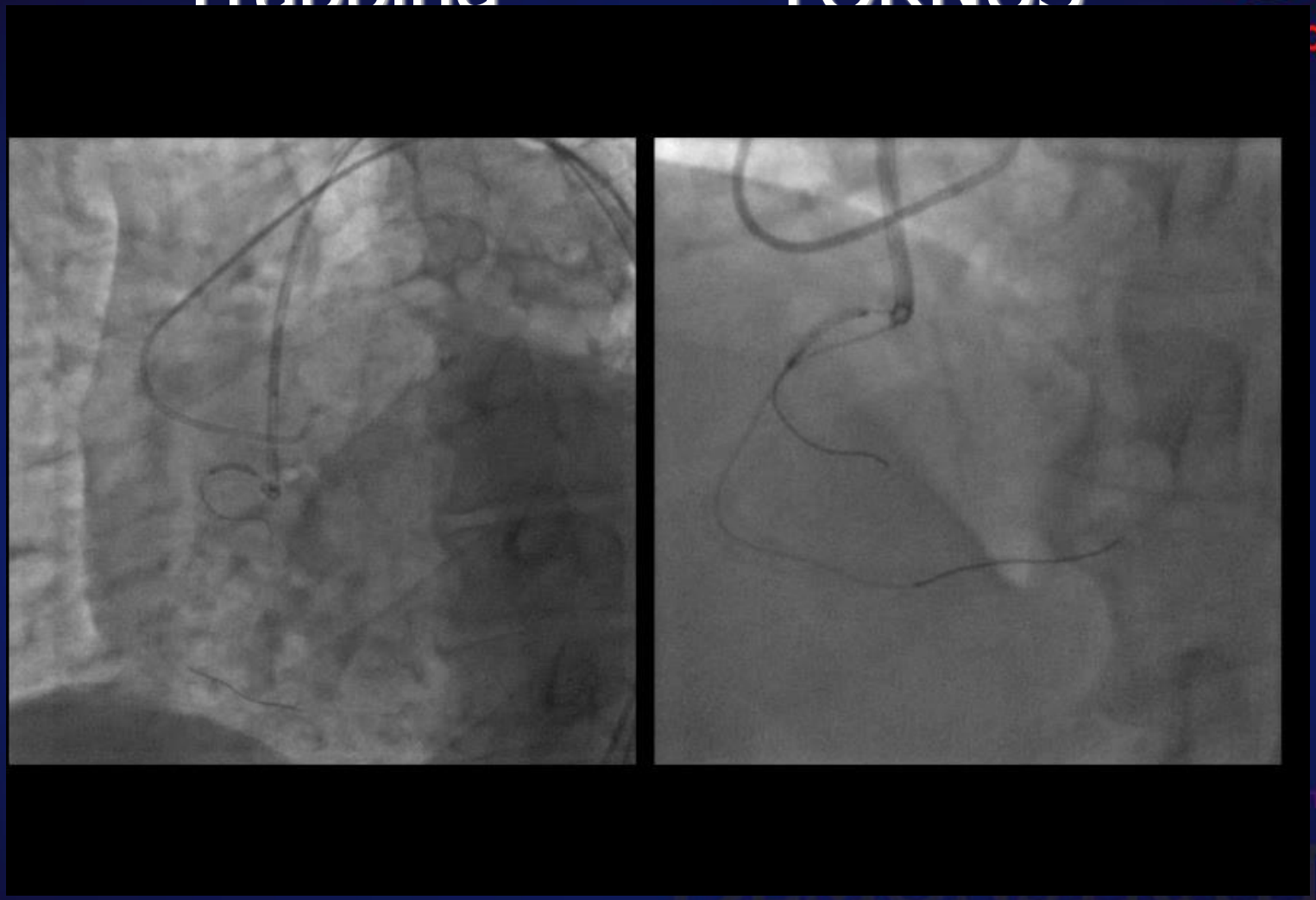
Cross sectional view

Antegrade wiring



Anchor balloon:φ2.0x15 Voyager
OTW: φ1.25x10 Ryujin G/W: Fielder FC

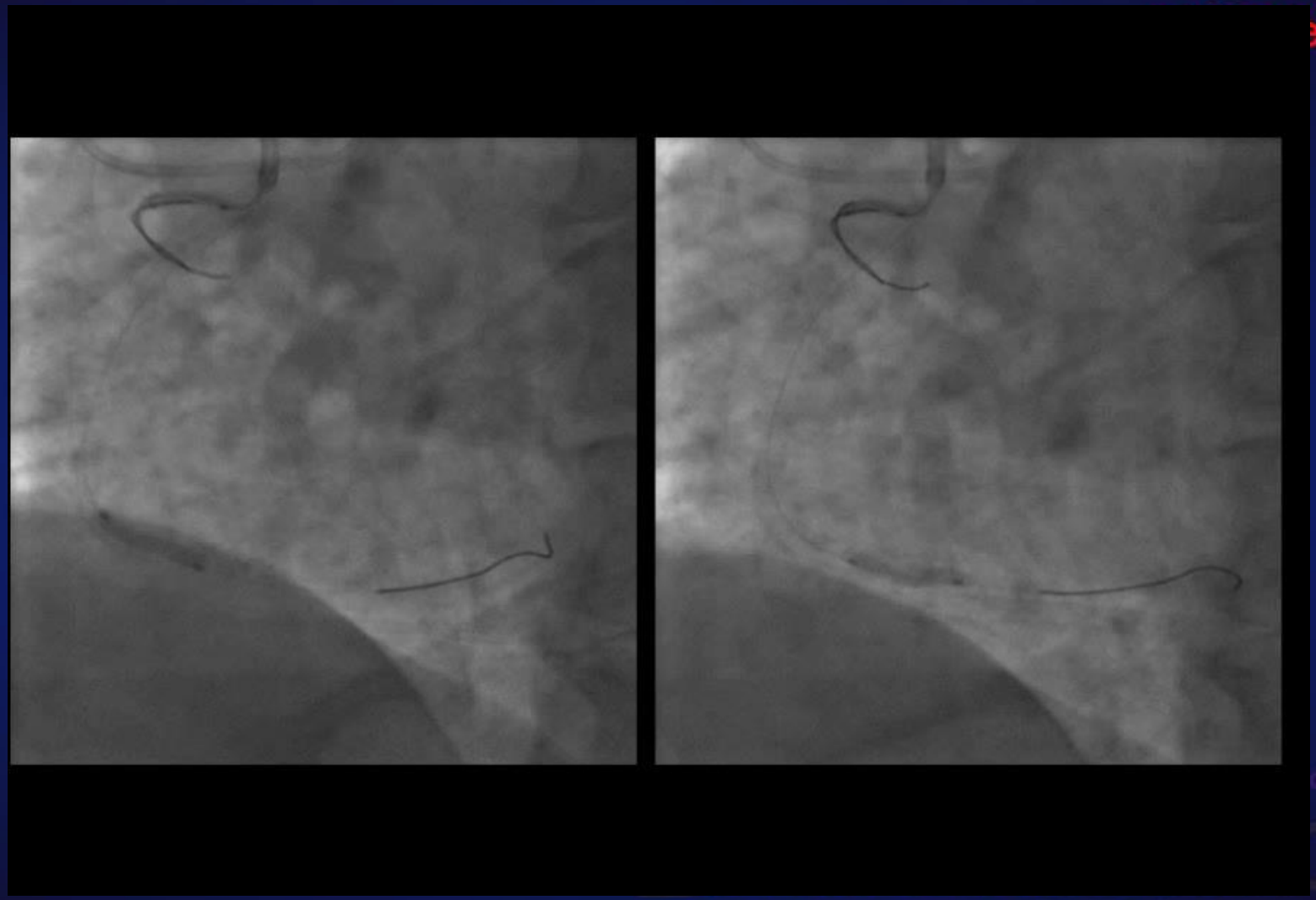
Trapping TORNUS



OTW exchange to TORNUS

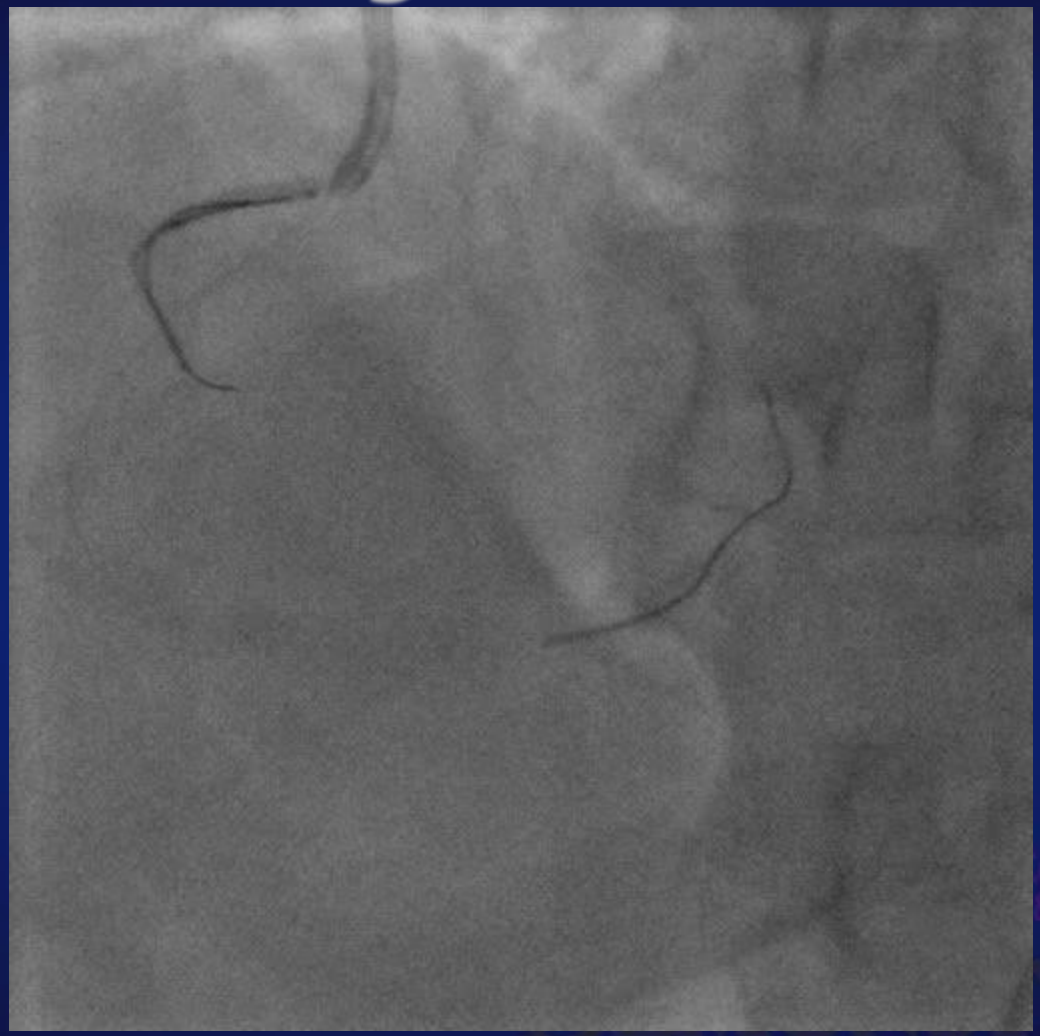
G/W: Fielder FC

Predilatation-2



BC: φ2.5x15Voyager

Antegrade CAG

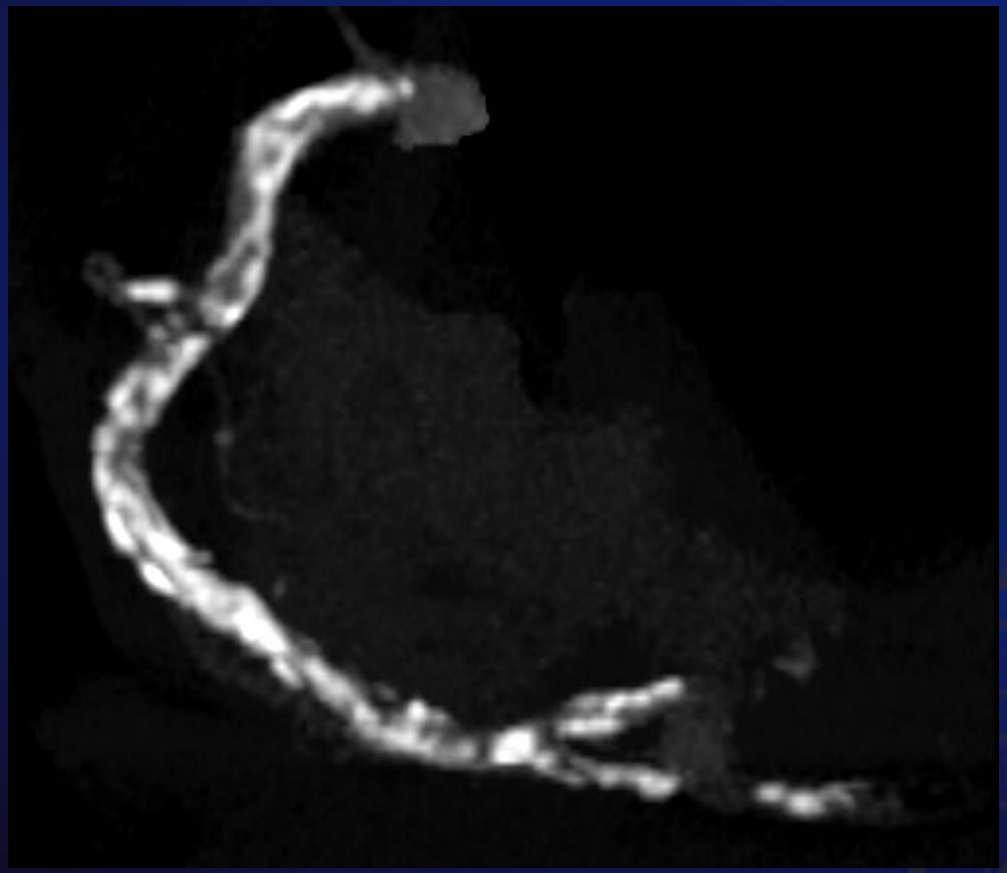


#4PD antegrade wiring

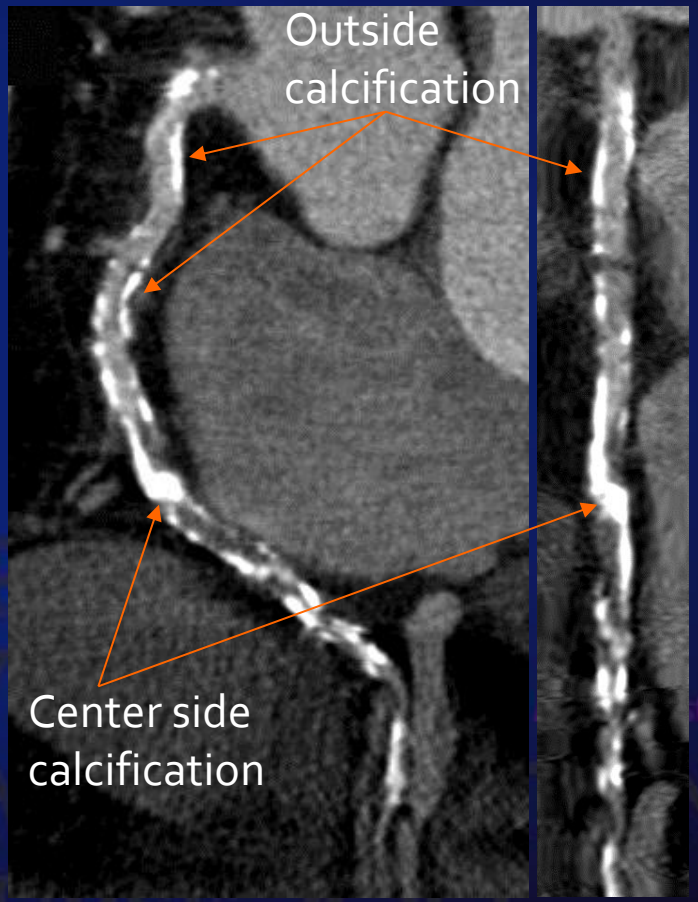
M/C: Crusade G/W: Miracle 3g→Miracle12g→Conquest pro 12g

Distribution of calcium

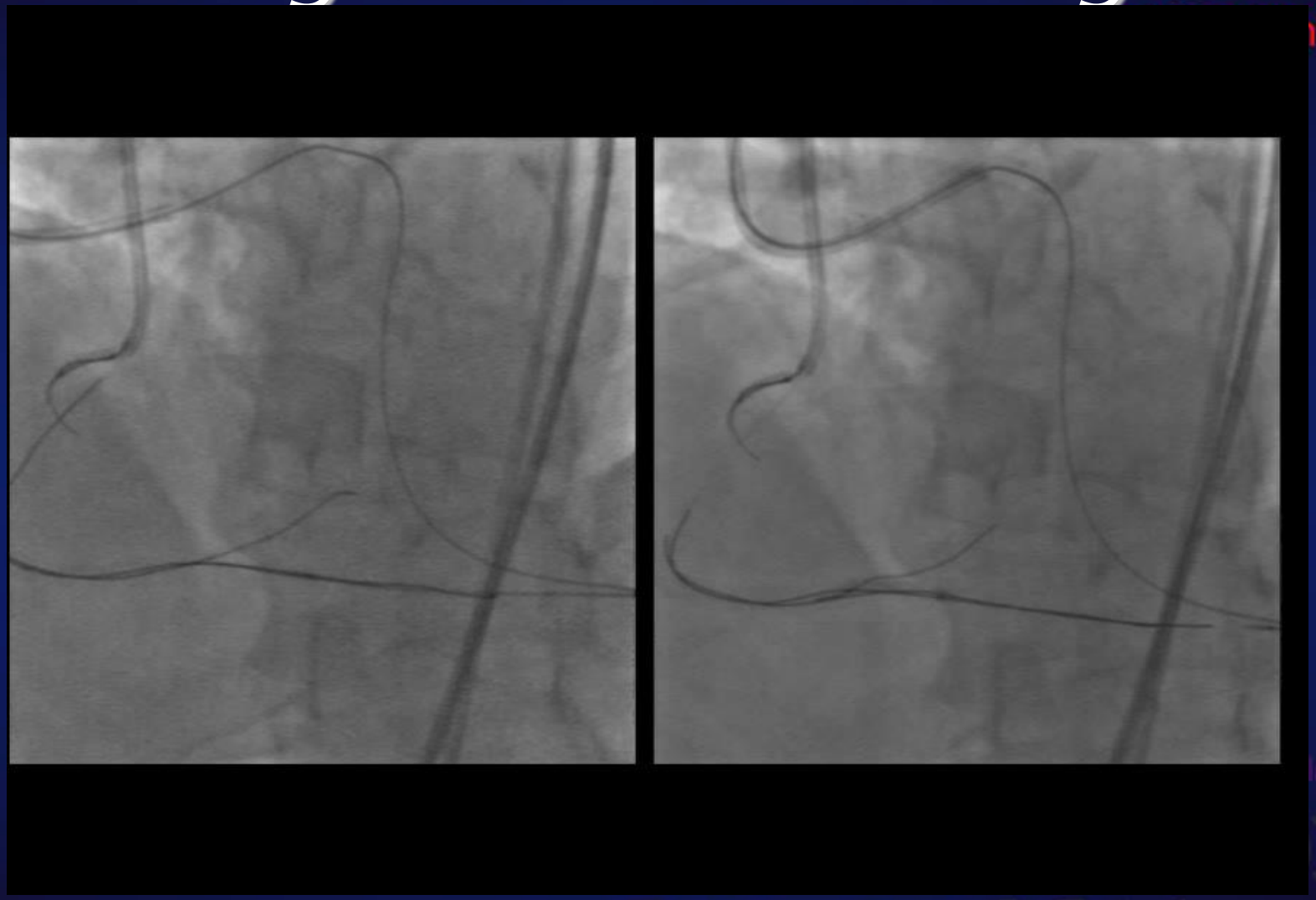
3D MIP (LAO 45°)



Curved MPR



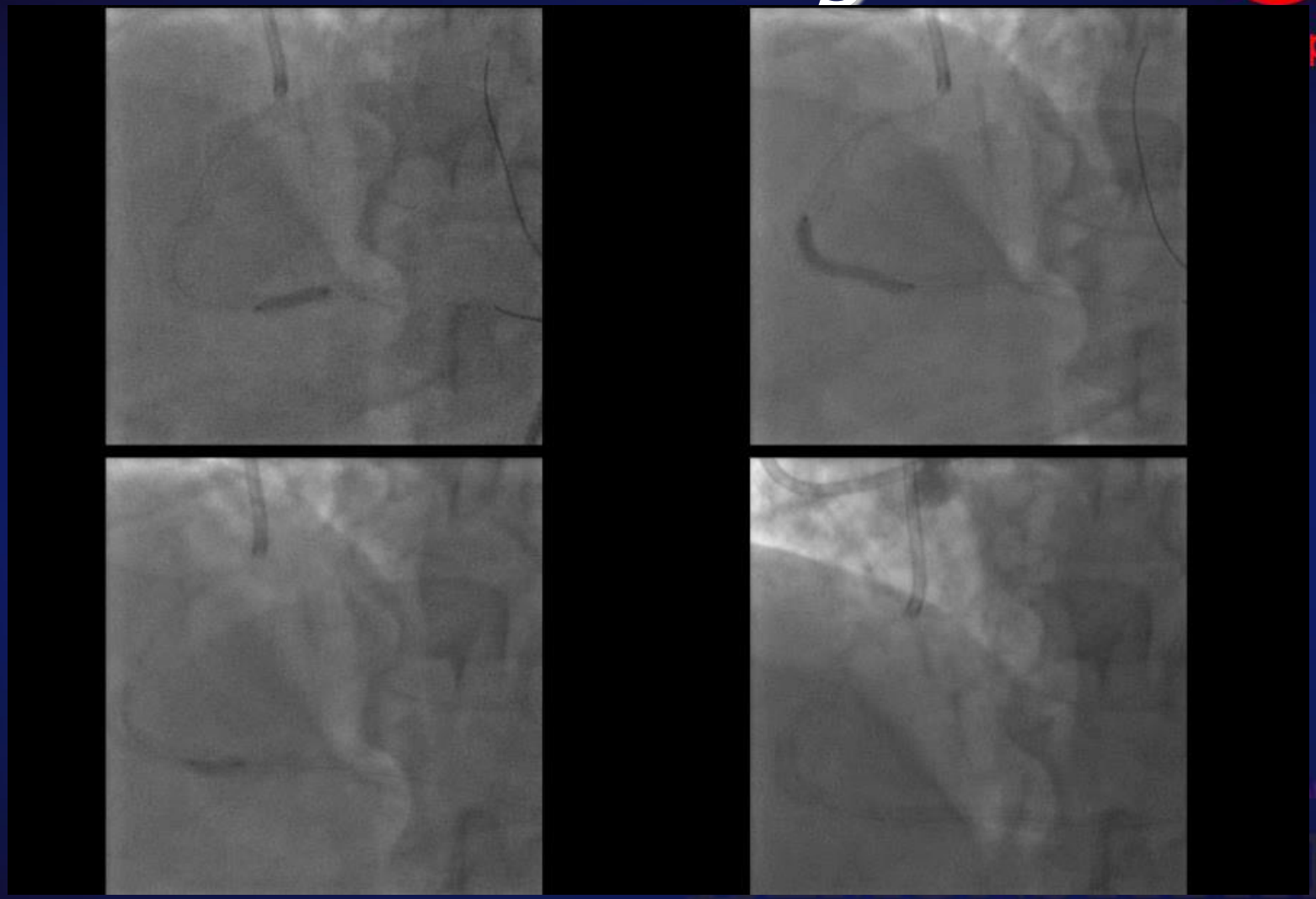
Antegrade wire crossing



Ante. G/W: Miracle 12g

Ante. BC: φ2.5x15 Voyager

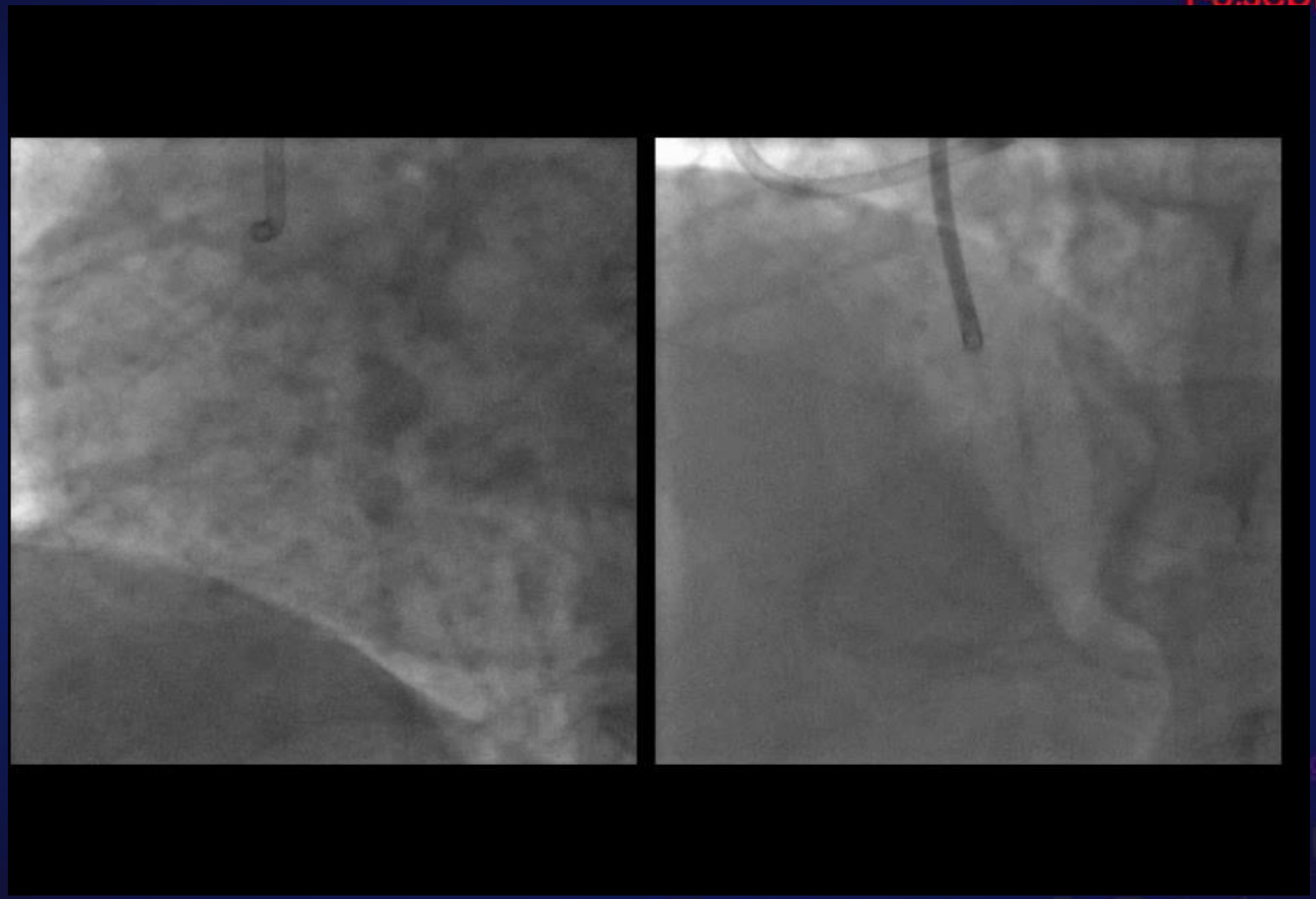
Stenting



#3 dis : φ2.5x16 TAXUS Express [2]　　#2 dis ～#3 prox : φ2.75x32 TAXUS Express [2]

#3 prox : φ3.0x8 TAXUS Express [2]

Final CAG

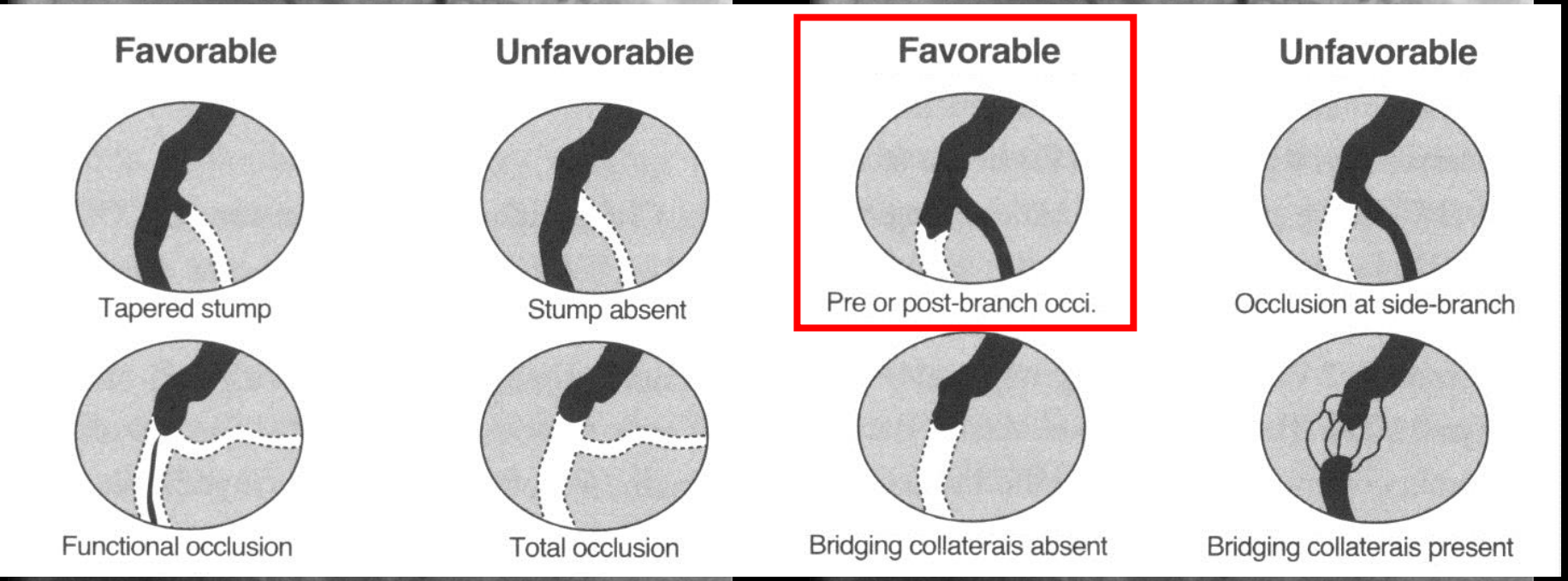


LAO 45

RAO Cranial

RCA CTO

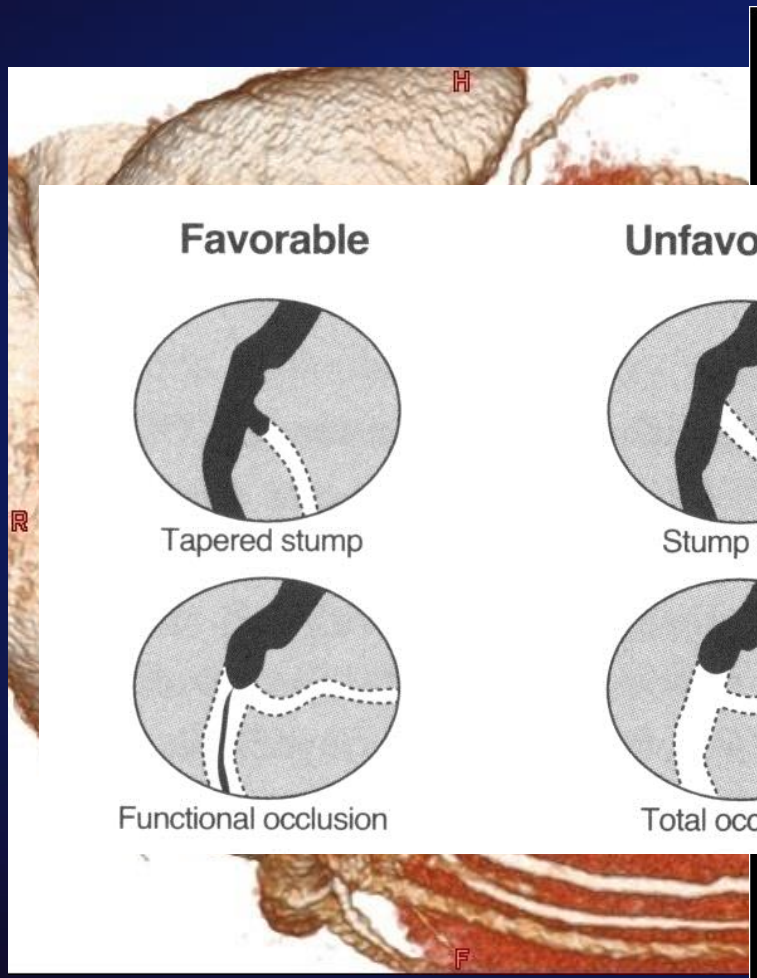
Case 1

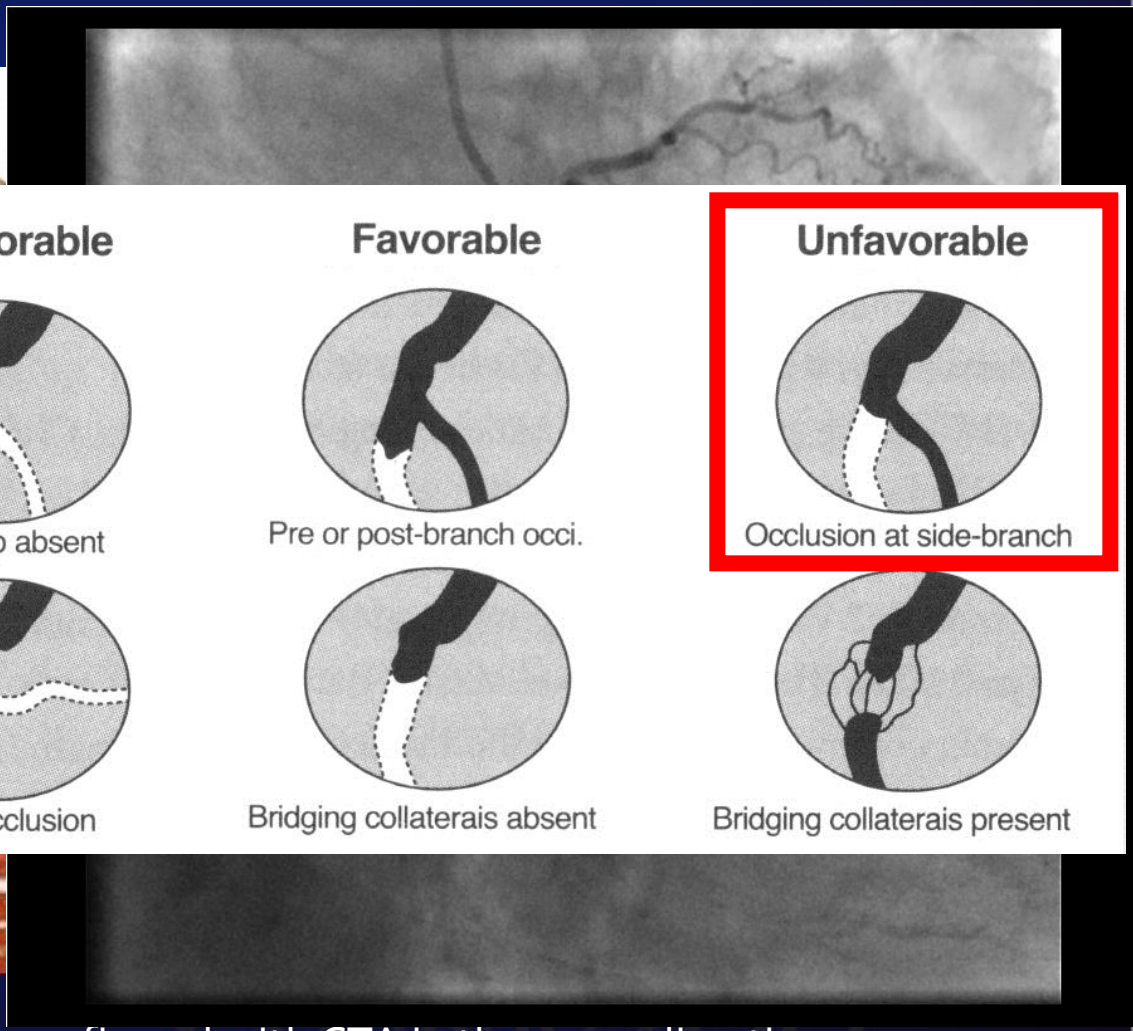


RAO 30° Cd 30°

The form of the vessel is guessed.

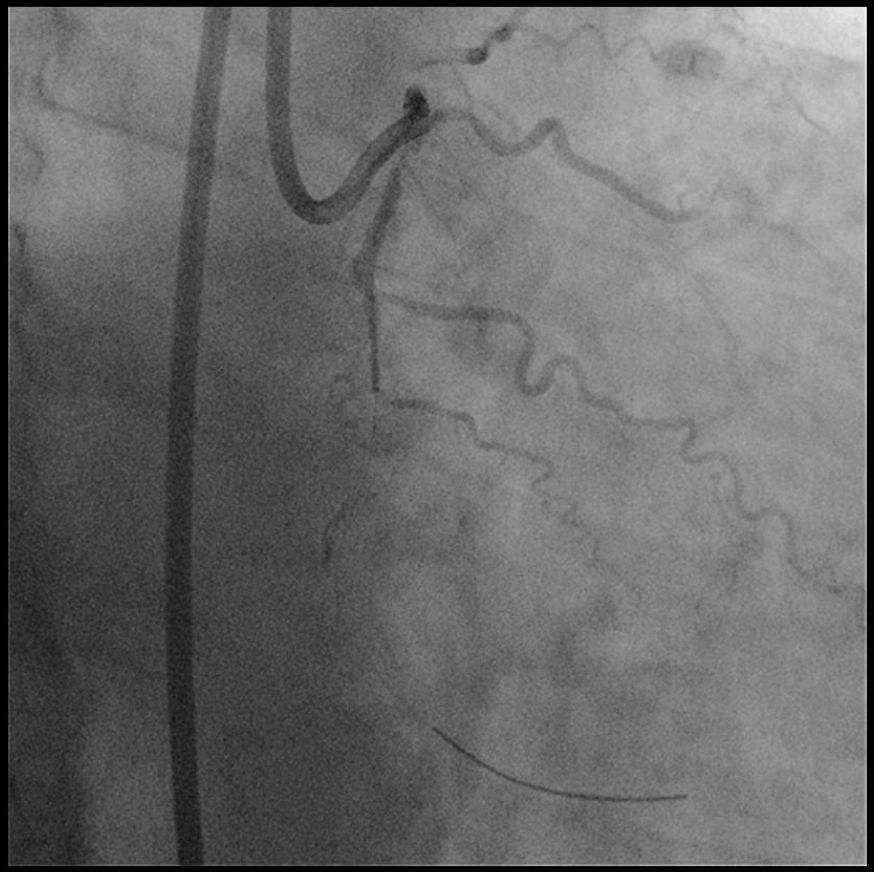
3DMAP assists PCI

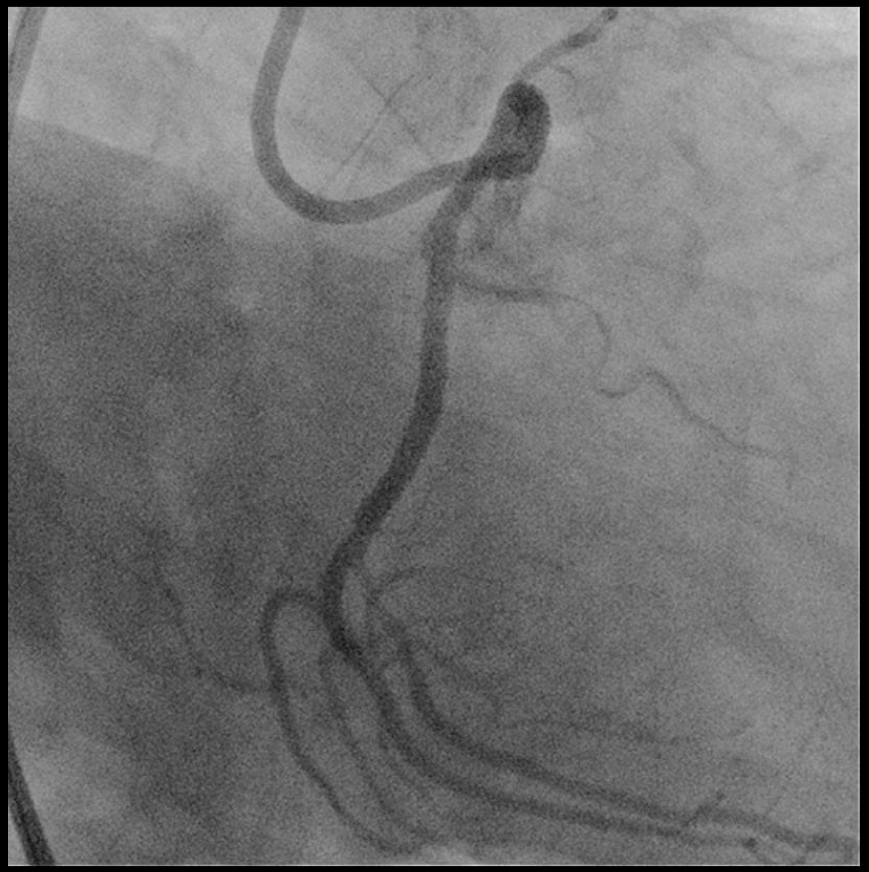




The form of the vessel is confirmed with CTA in the same direction.

3DMAP assists PCI





MSCT for CTOs

- Volume-rendered MSCT image provides a 3-demensional overview of the coronary segment, and a collateral filling on MSCT can be more clearly visible than on coronary angiography.

- Maximum intensity projection (MIP) allows evaluation of the morphology of the CTO lesion.

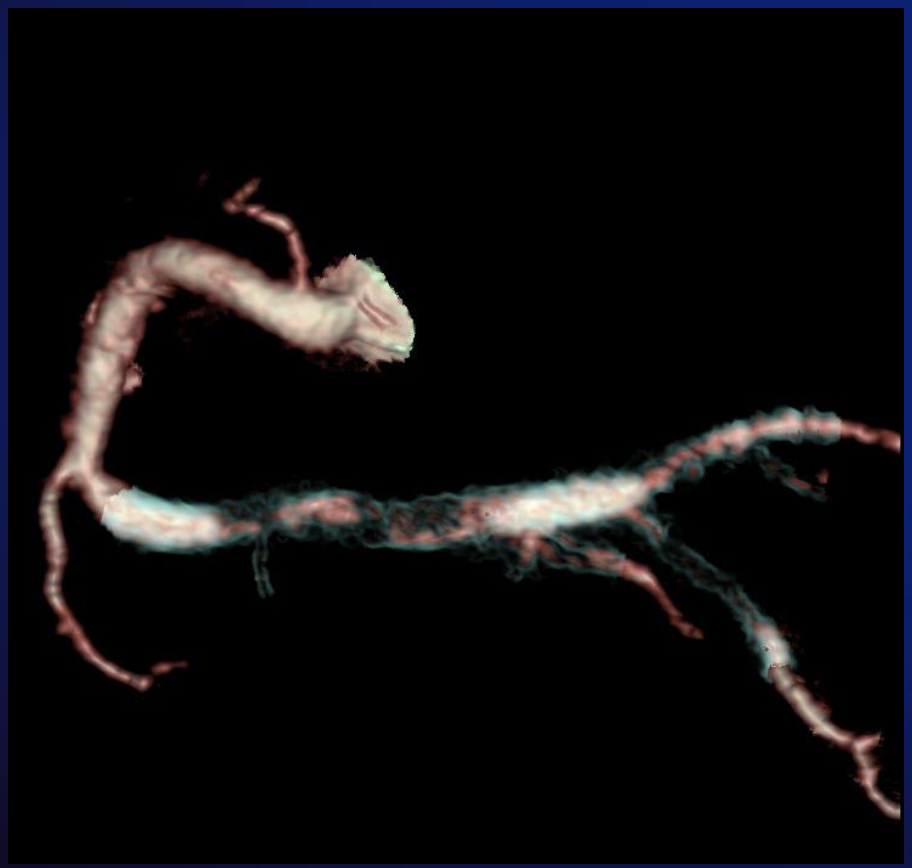
<u>We can know in advance</u>

- the tortuosity of the occluded artery.
- the relation between side branch and target lesion.
- the reliable length measurement of occluded segment.
- the localization of calcification within occluded artery.
- the adequate fluoroscopic angle for PCI procedure.

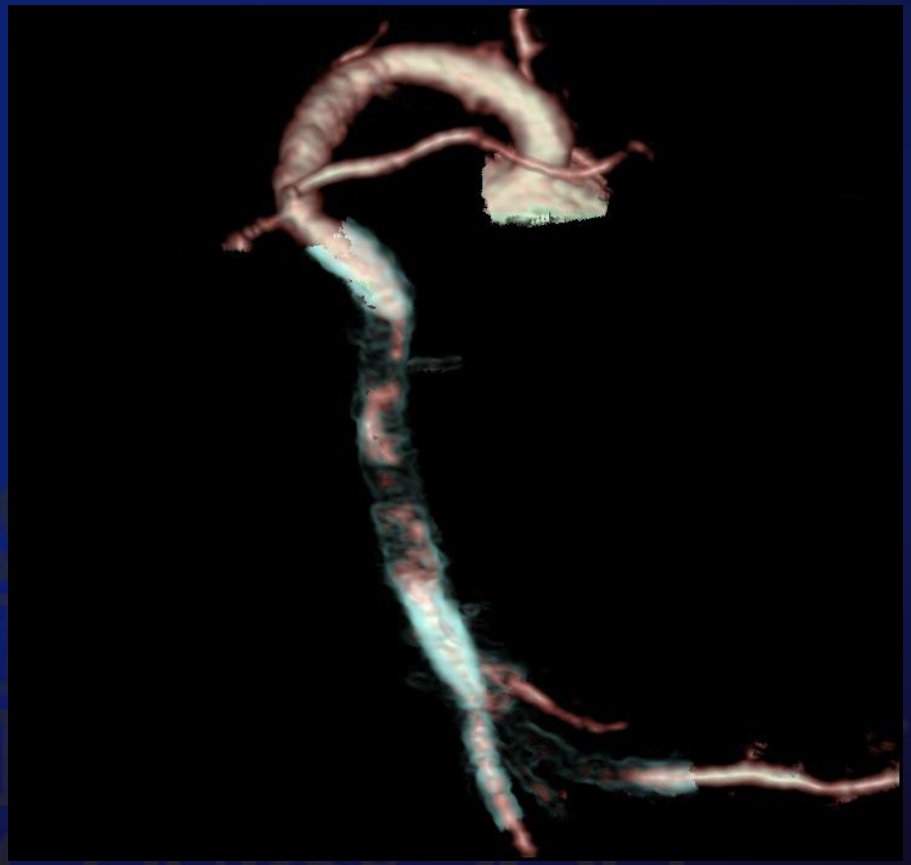
3DMAP Coronary artery

3D MAP-CT can present the adequate fluoroscopic angle for PCI .

LAO 35° Cr 35°

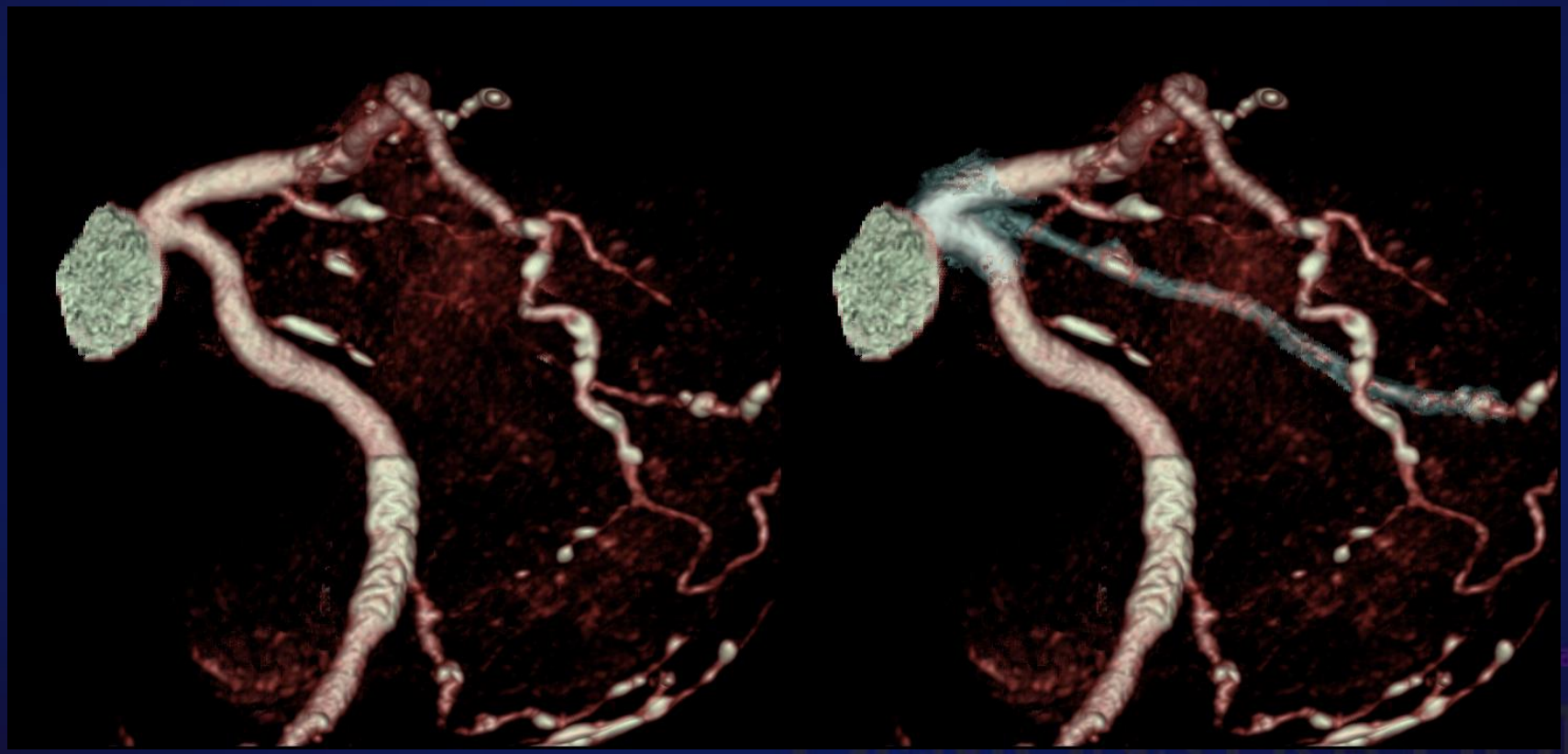


RAO 30° Cd 45°

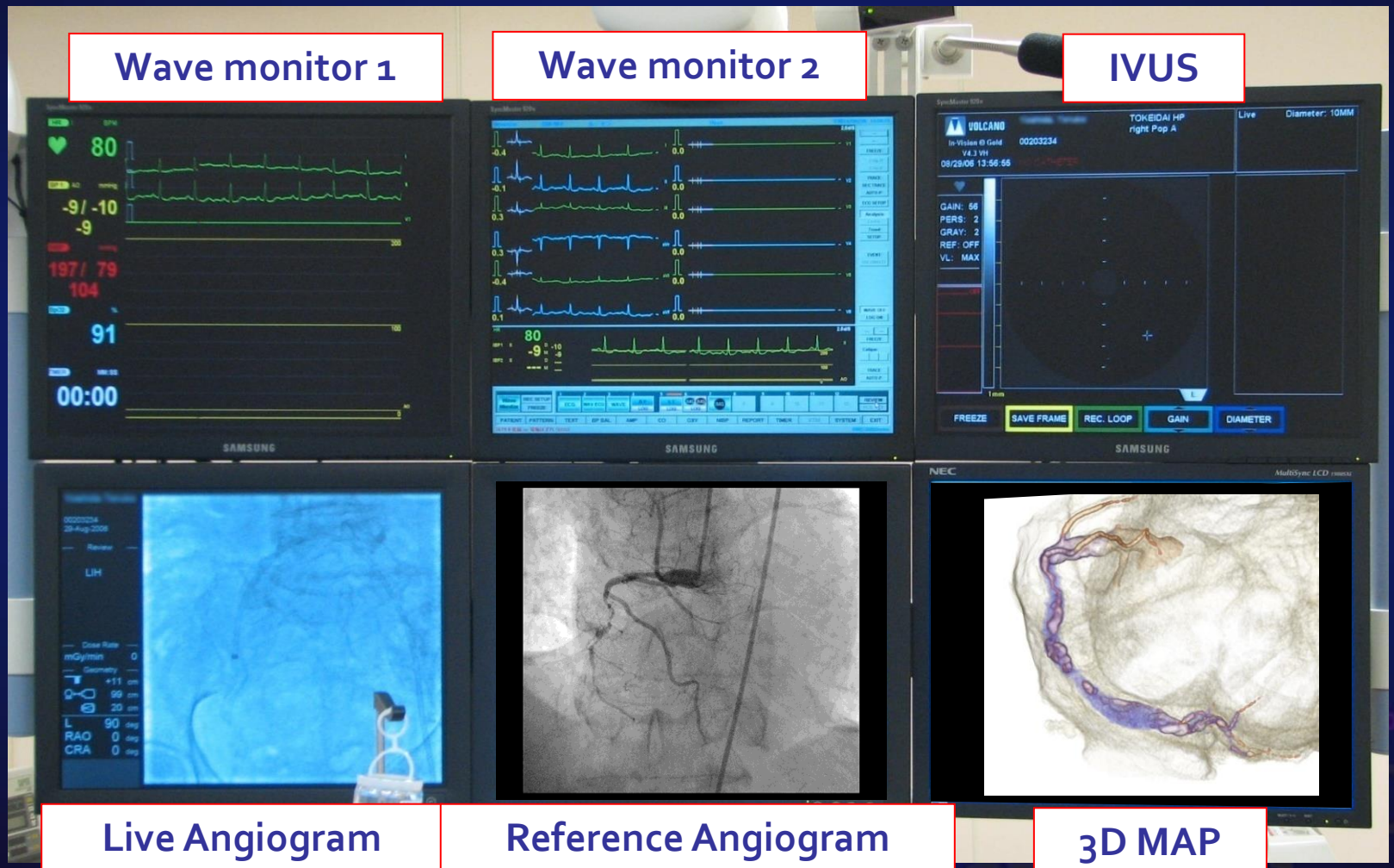


Work Station : Advantage Windows XT

CTO : 3D MAP



Display of 3D MAP in Catheterization laboratory



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1-3,September

Display of 3D MAP in Catheterization laboratory at the future