ACIC
Advanced Cardiac Intervention Course

Friday, March 25, 2022

Anomalous origin of right coronary artery: Angiography and PCI

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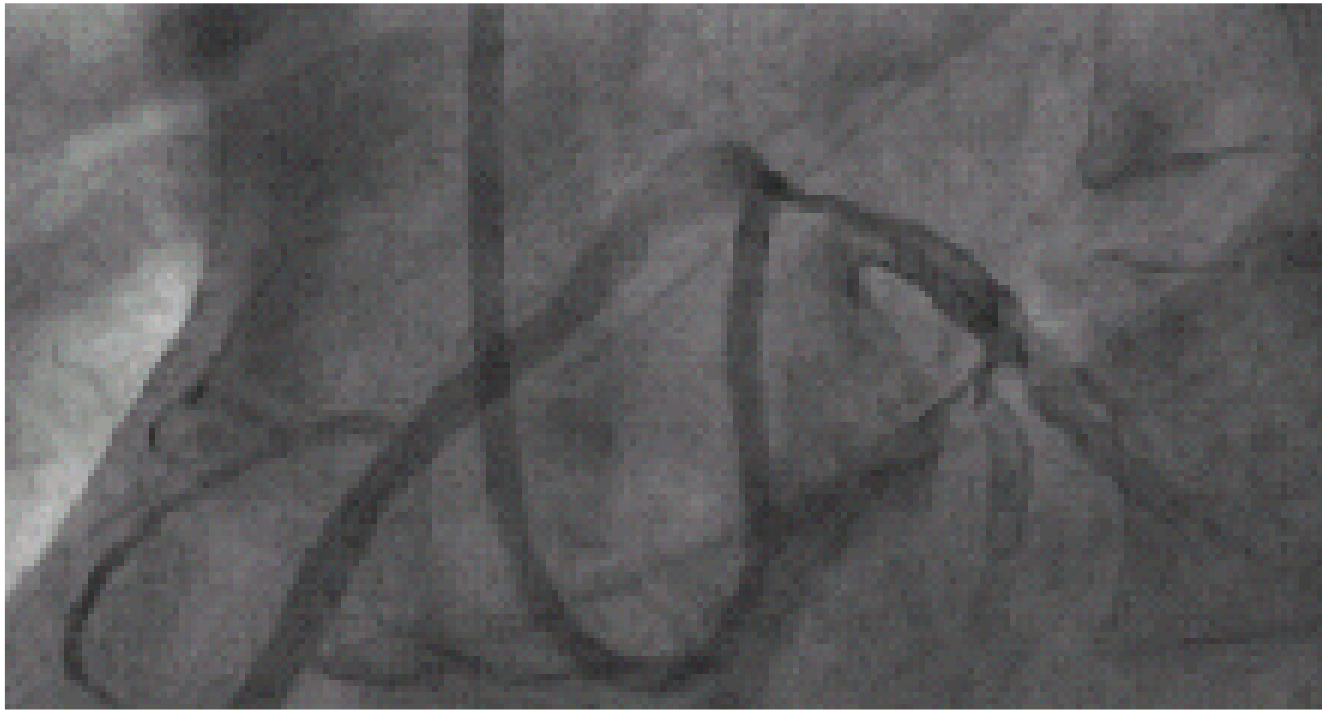
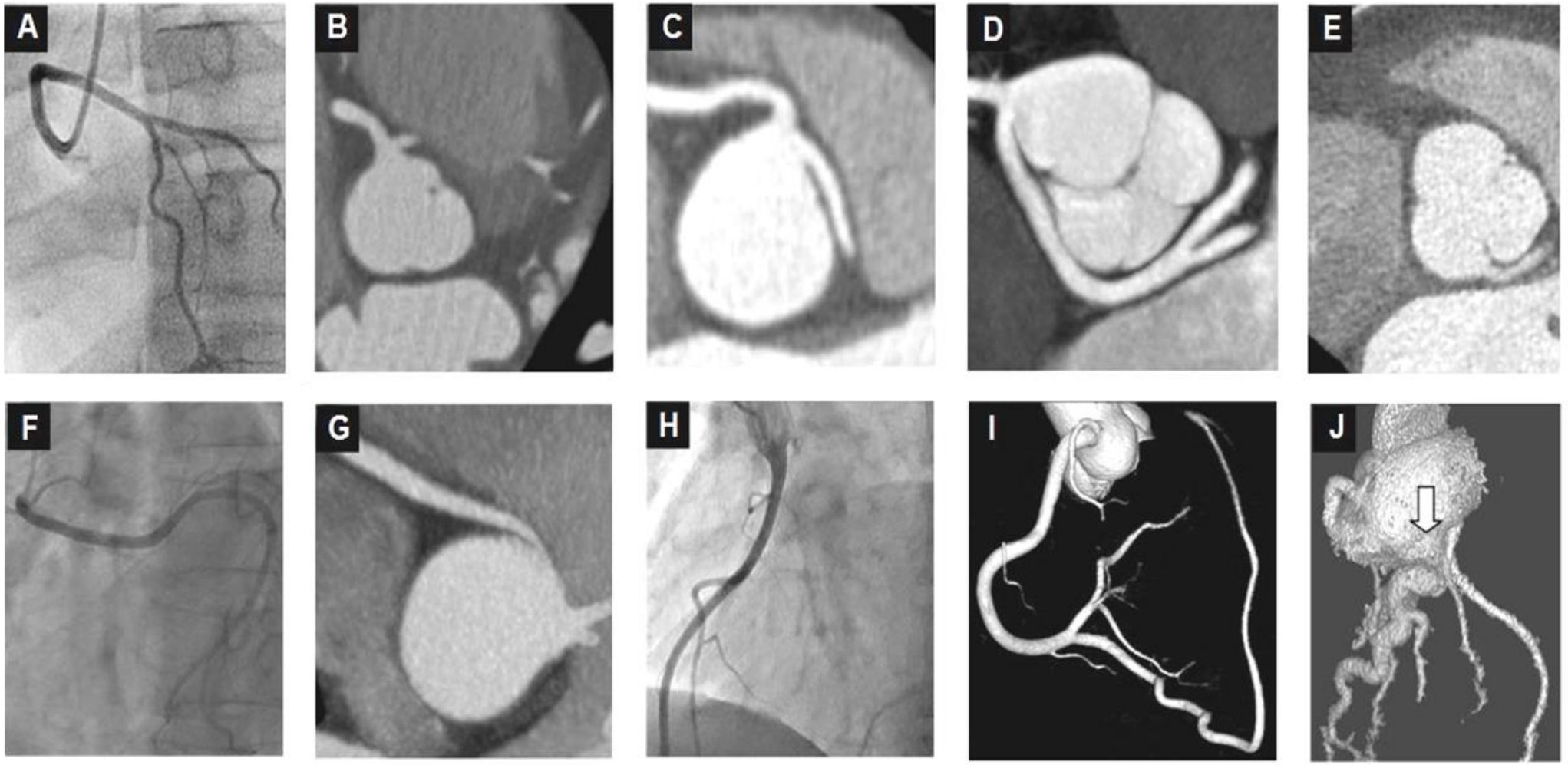
anoCor

Anomalous origin of RCA



Anomalous origin of coronary arteries (AOCA)

Angiographic prevalence ≈ 1% in adults



Anomalous origin of coronary arteries (AOCA)

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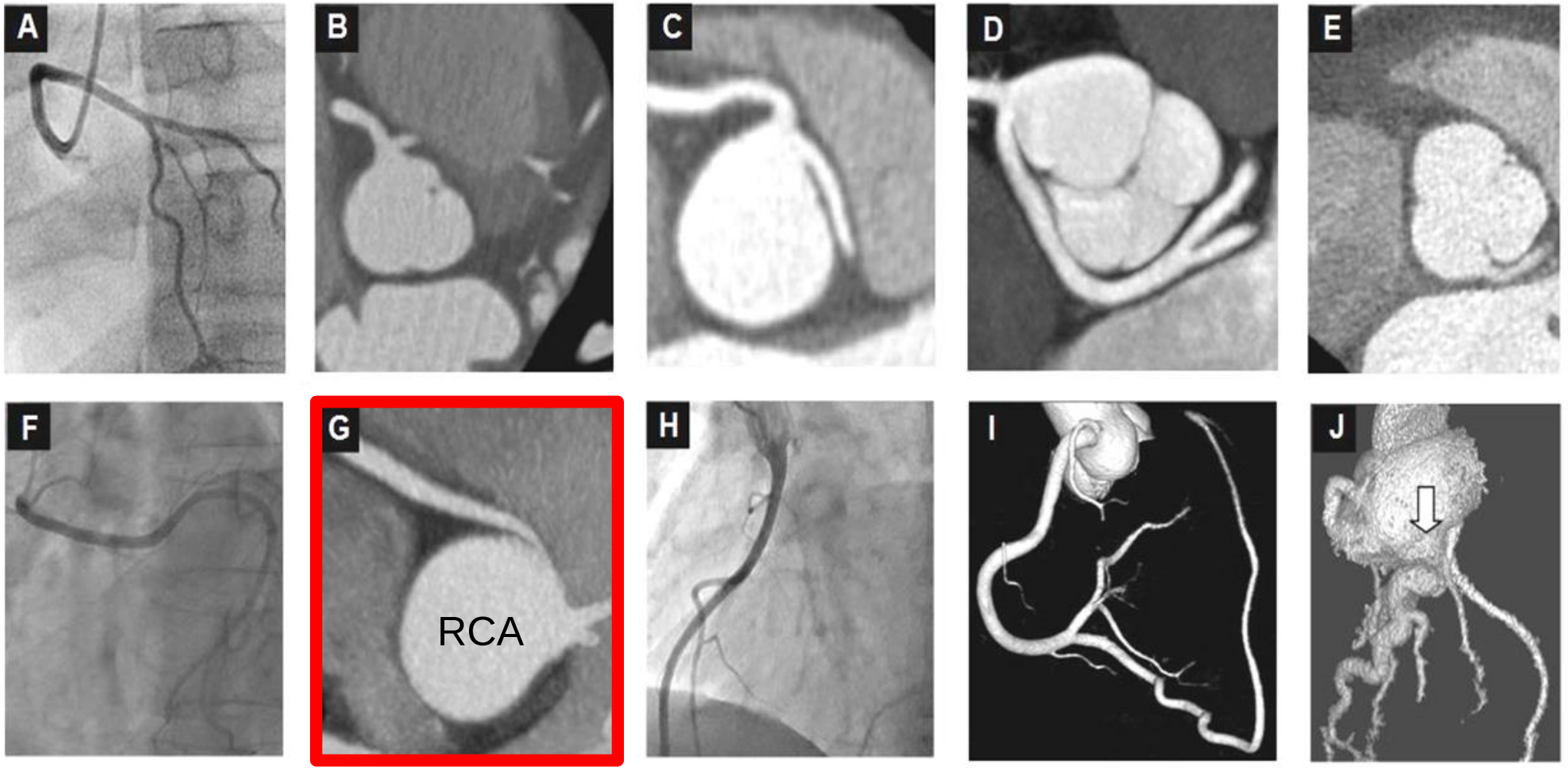
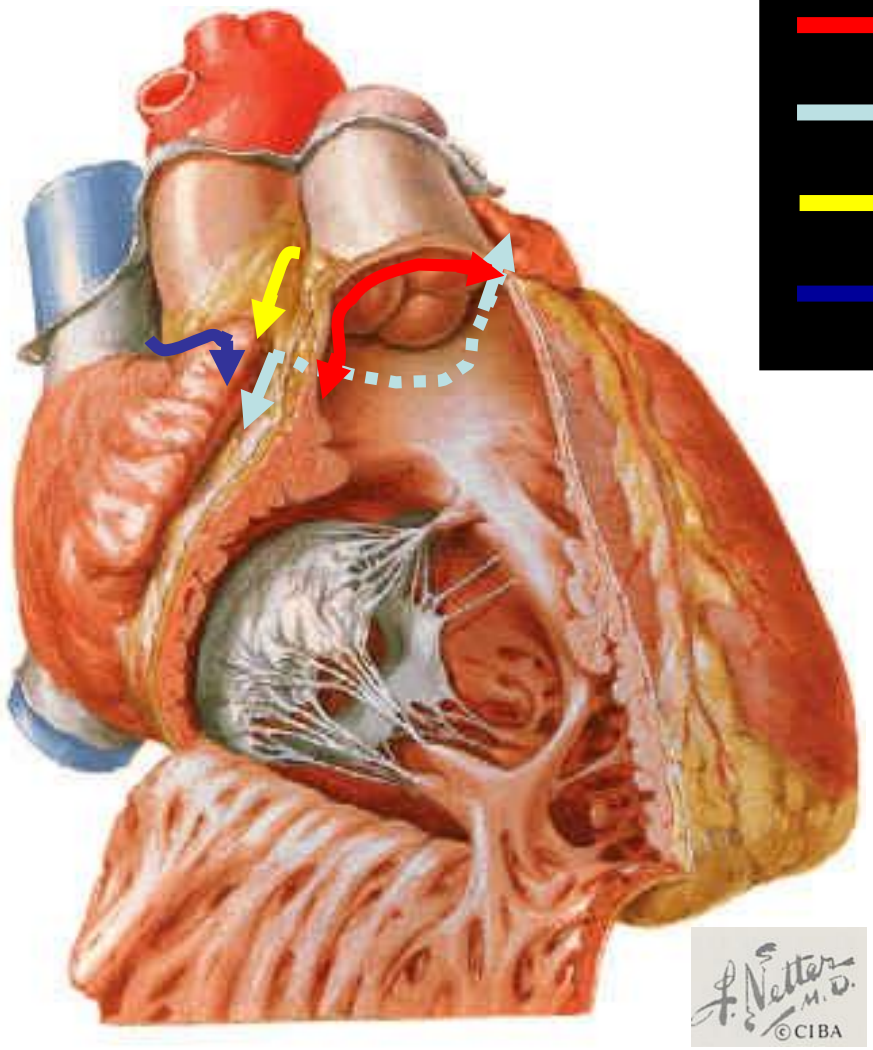
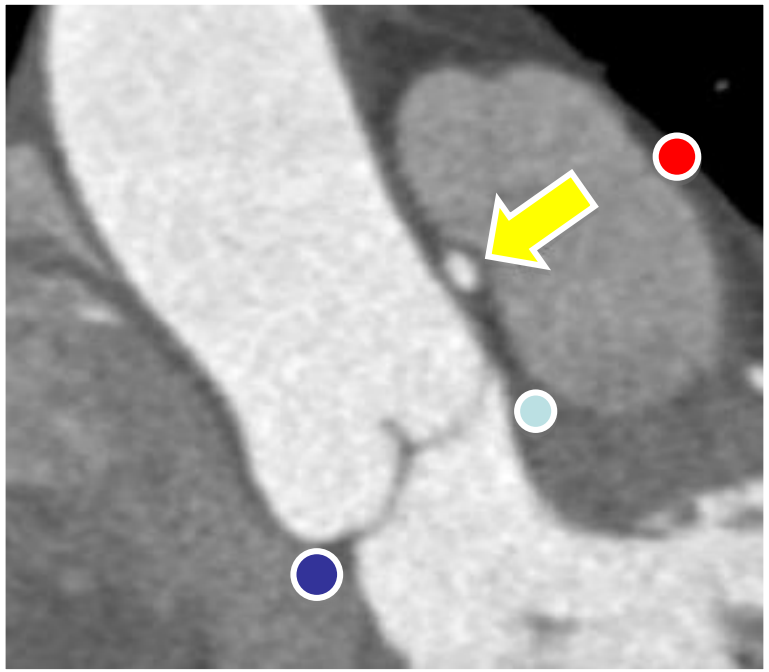


30% of AOCA

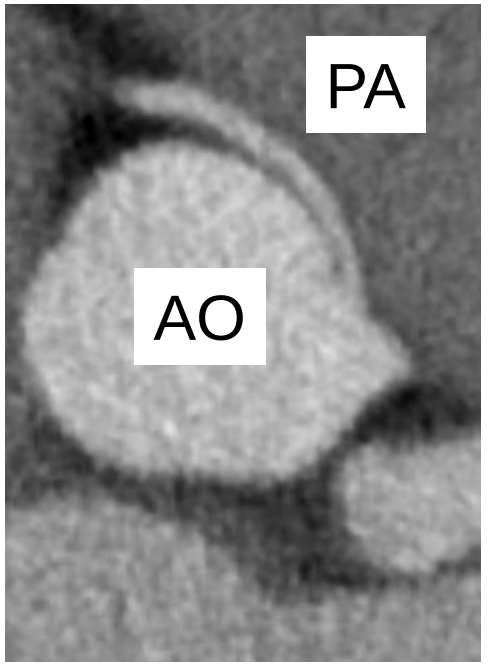
Ectopic courses of anomalous coronary arteries



Prepulmonic
Retropulmonic
Interarterial
Retroaortic



Right AOCA



Interarterial course
95% of the cases

What are the expected difficulties?

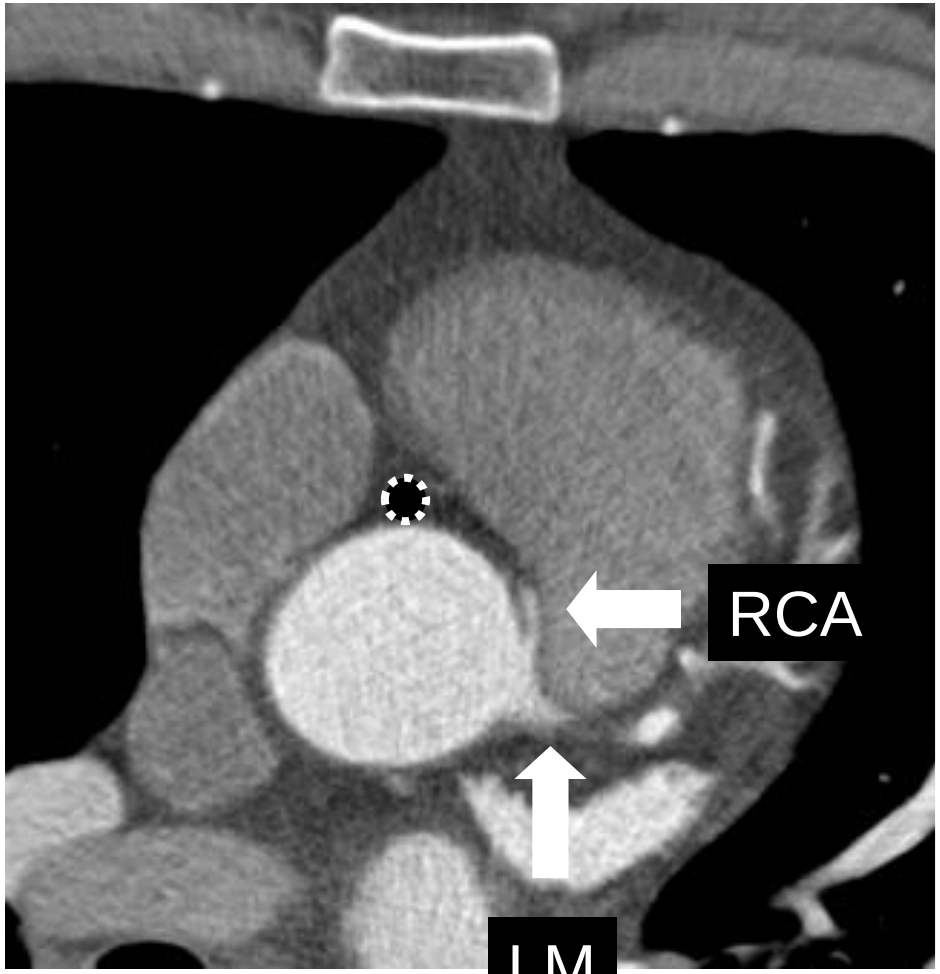
- Inadequate opacification
- Failure of cannulation
- Poor back-up support
- Failure of stent implantation

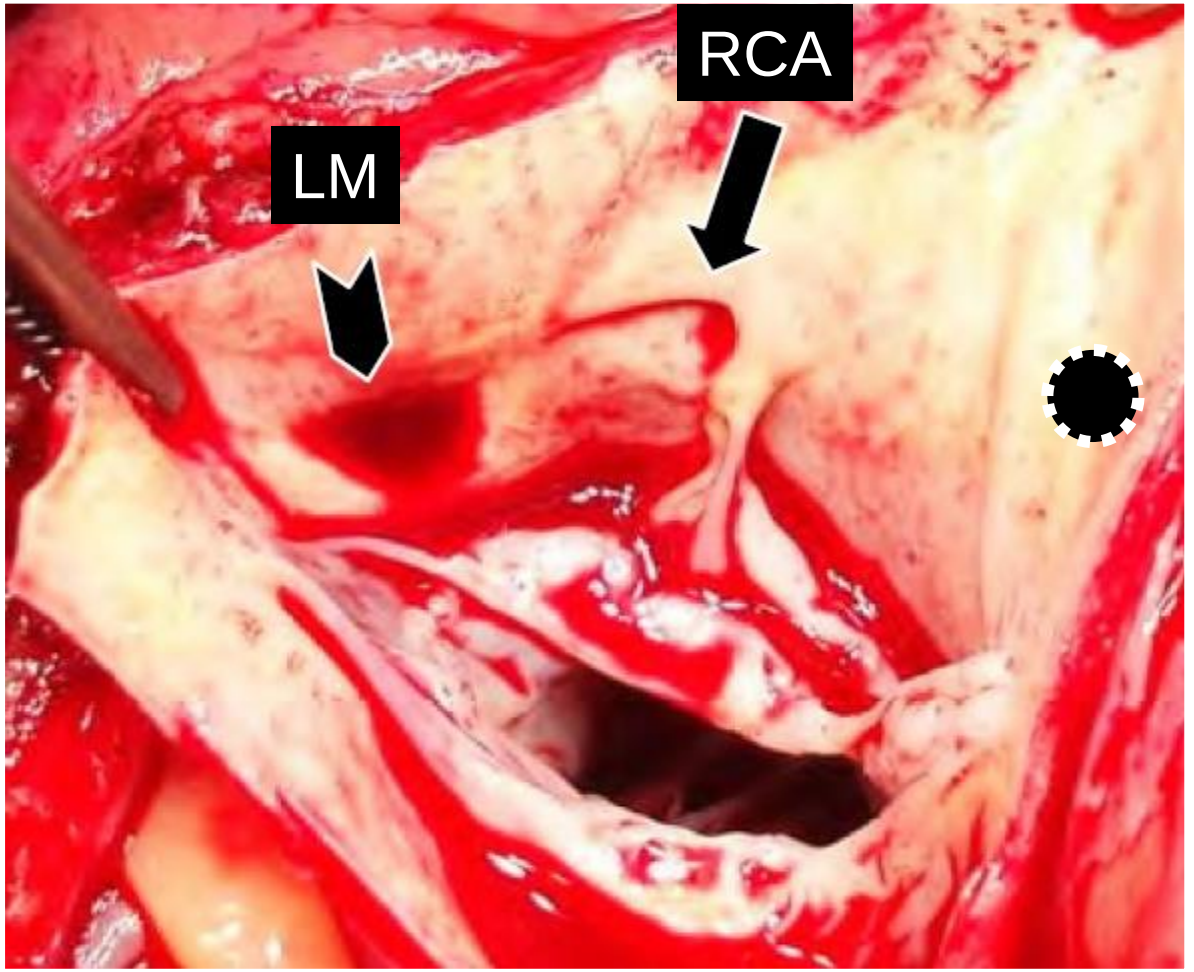
Case 1

Anomalous origin of right coronary artery

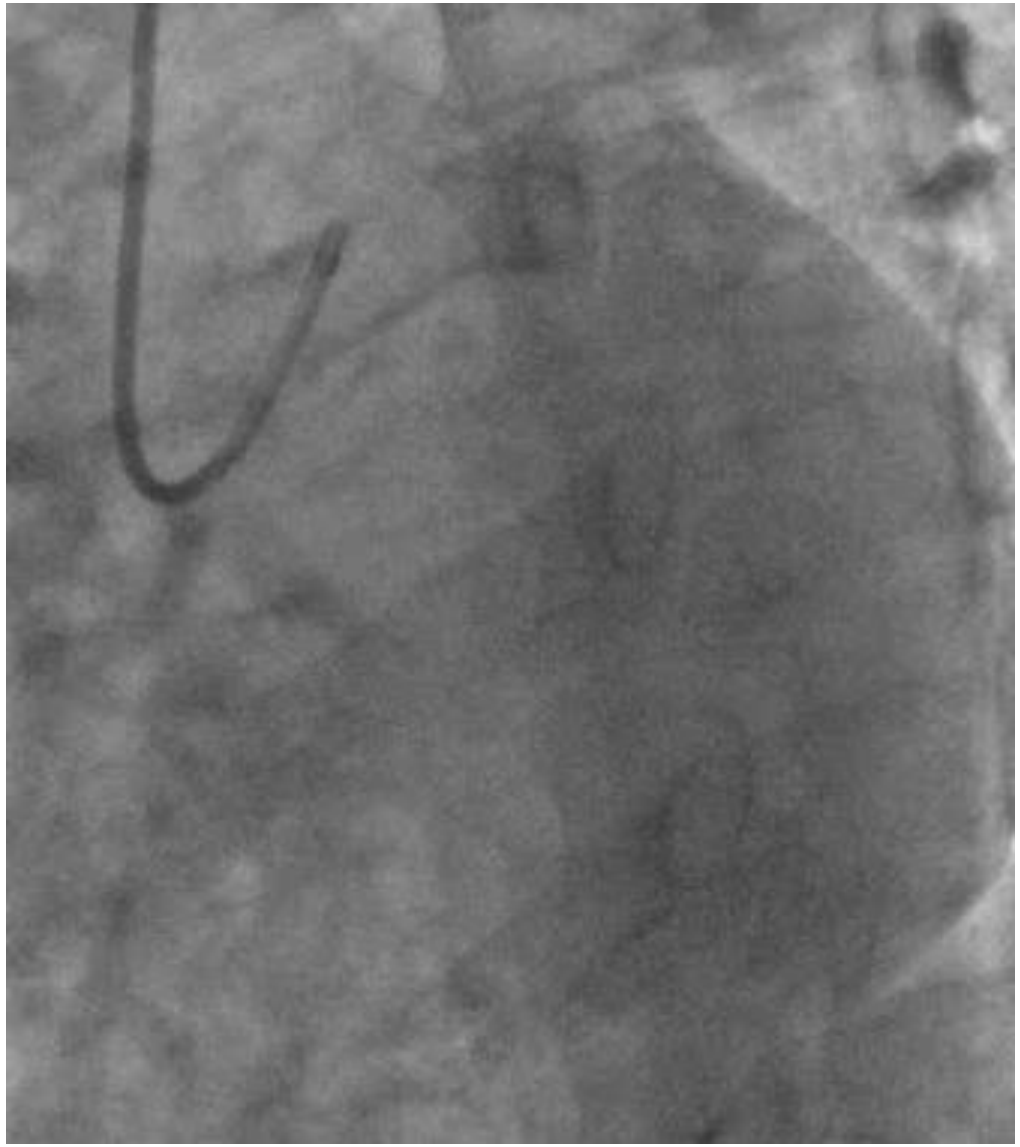
- JR catheter
- Inadequate opacification
- Failure of cannulation

Importance of coronary CT



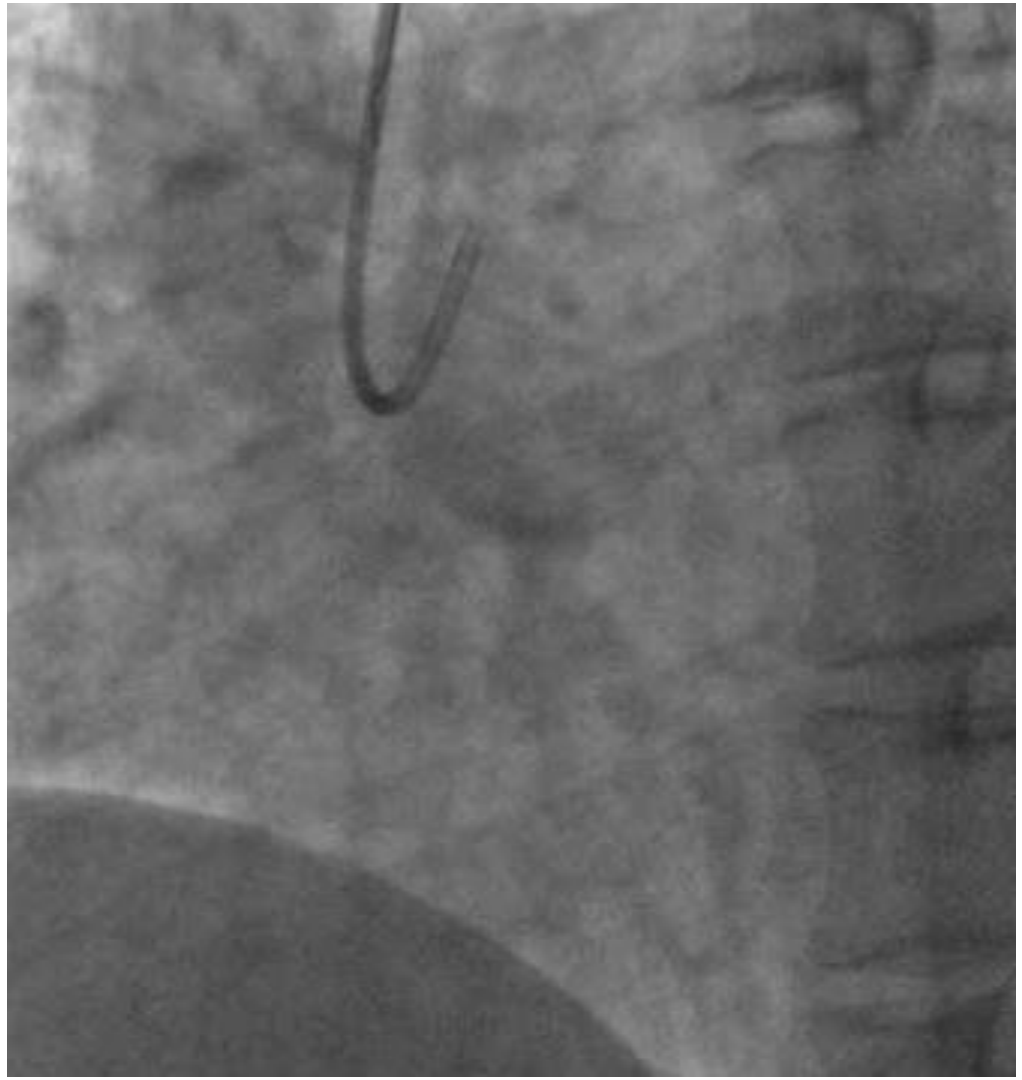


Anomalous origin of right coronary artery



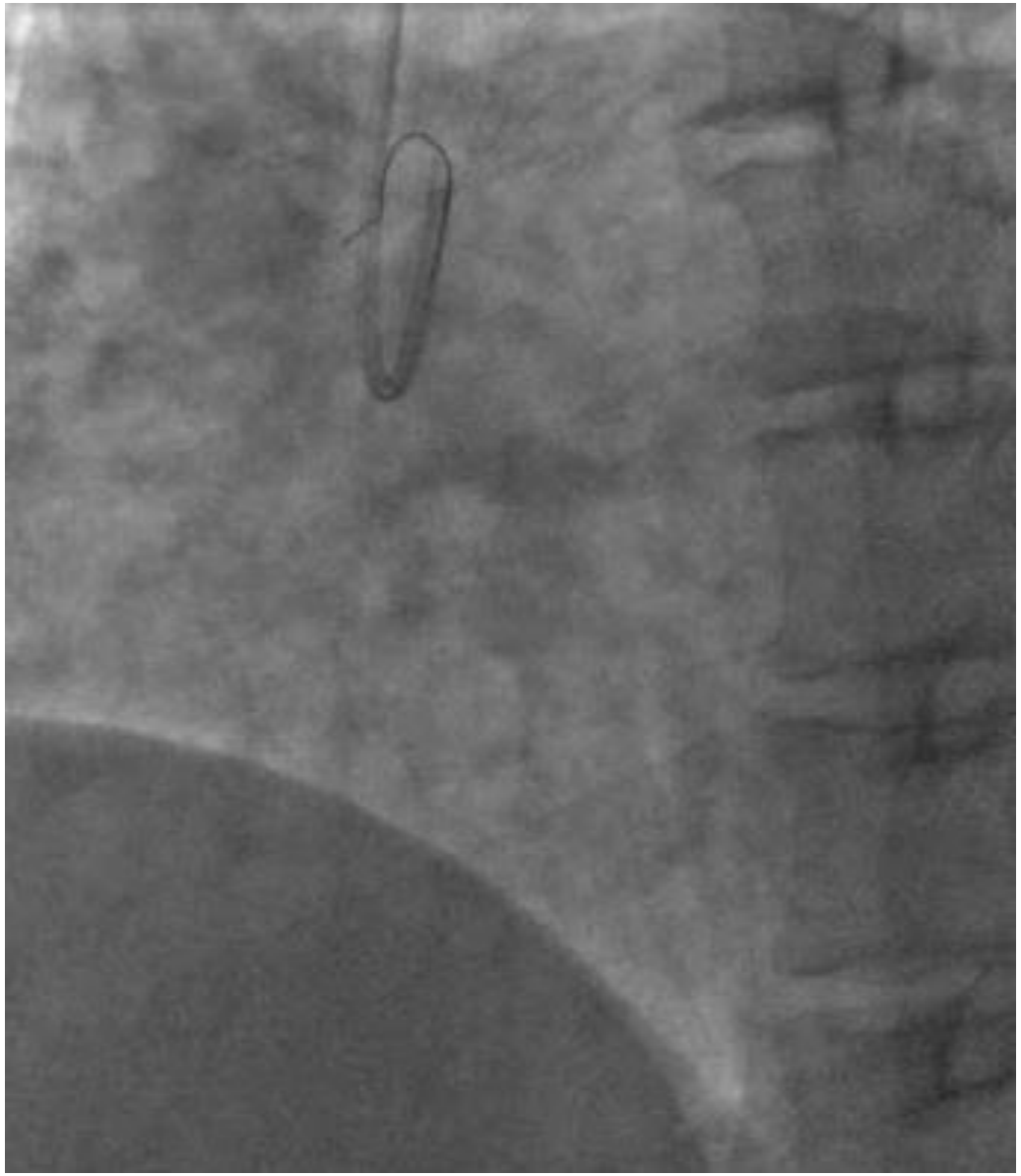
- Choice of access route
- Choice of guiding catheter
- AL or EBU catheters
- Opacification of LM

Anomalous origin of right coronary artery



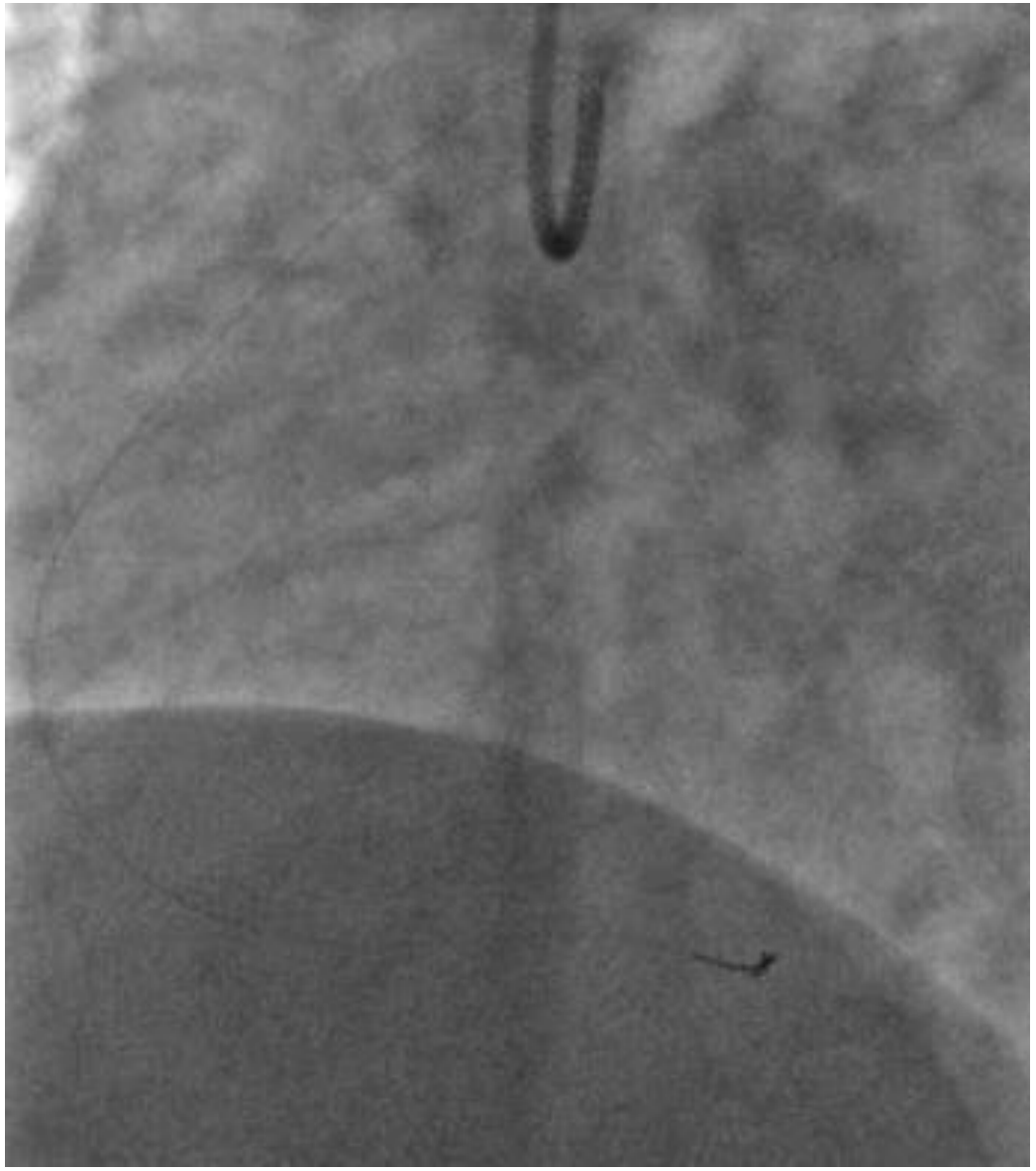
- LAO projection
- Push gently the catheter
- Take-out of the left ostium
- Turn clockwise
- Turn very slowly

Anomalous origin of right coronary artery



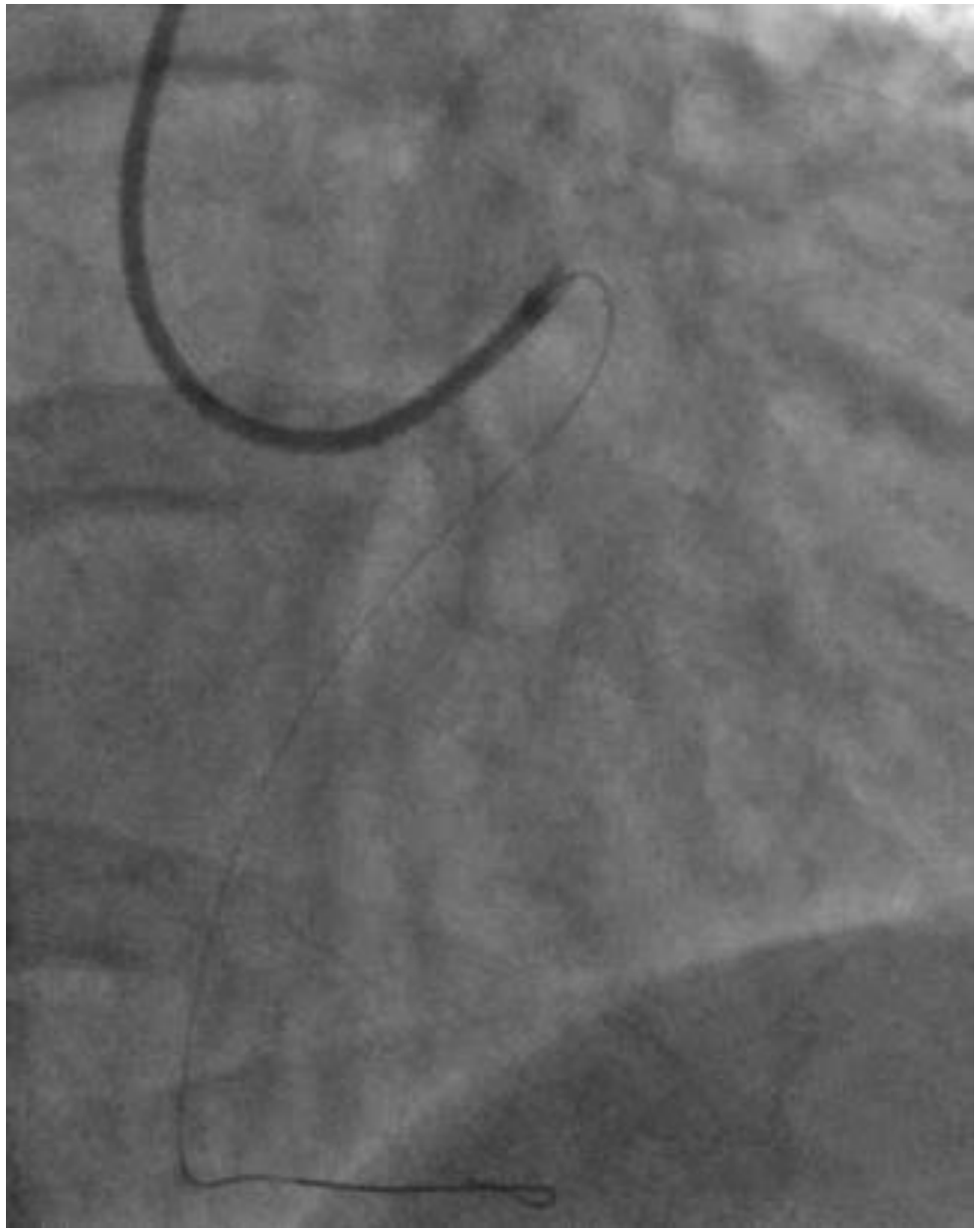
- LAO projection
- Facing the right ostium
- Insert a 0.014 guide wire

Anomalous origin of right coronary artery



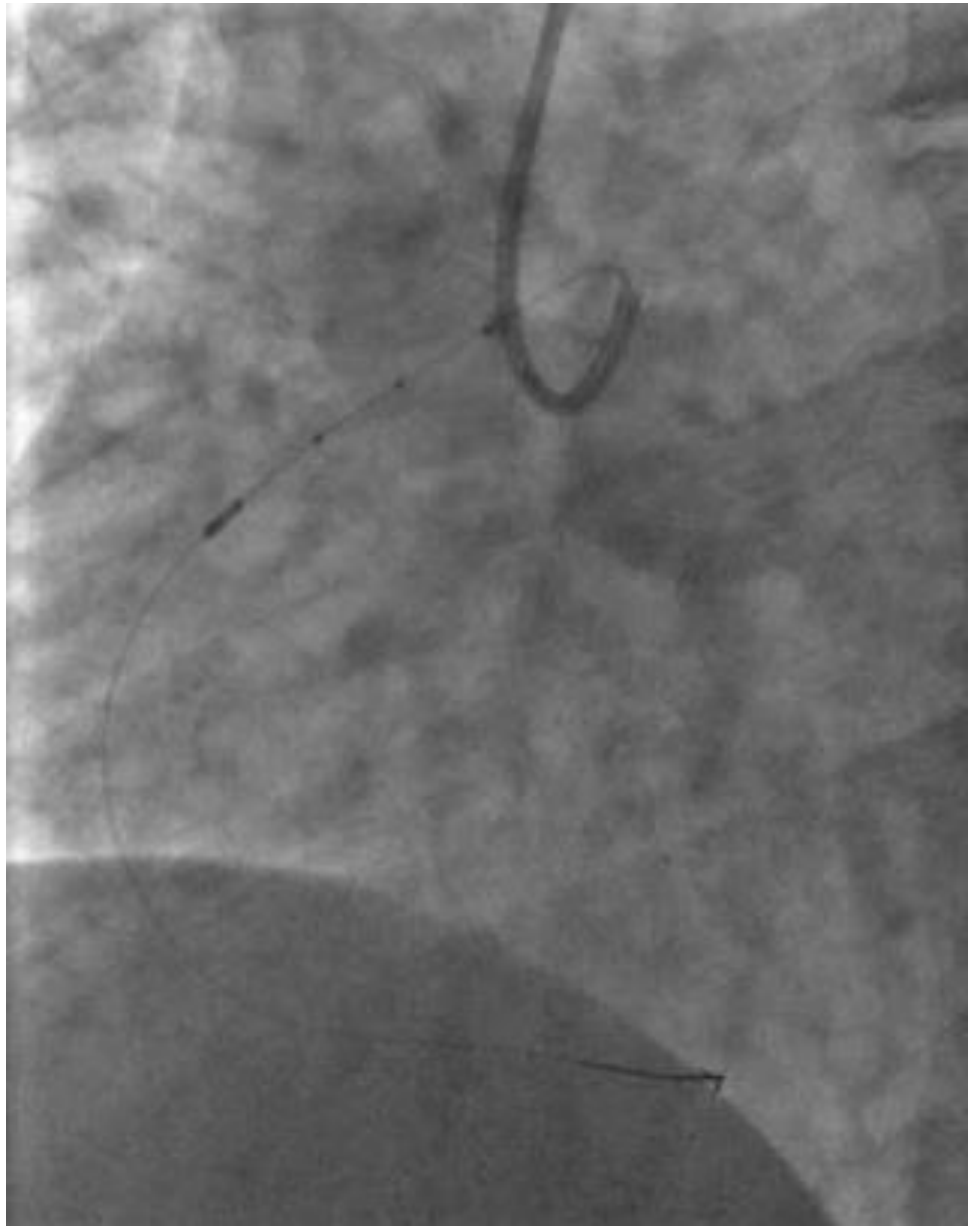
- LAO projection
- Non-selective cannulation
- Better opacification

Anomalous origin of right coronary artery



- RAO projection
- Non-selective cannulation
- Proximal narrowing

Anomalous origin of right coronary artery

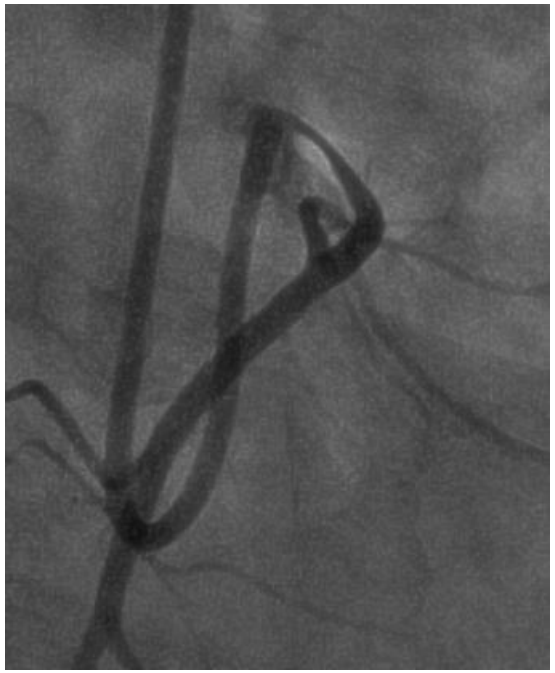


- LAO projection
- Endovascular imaging

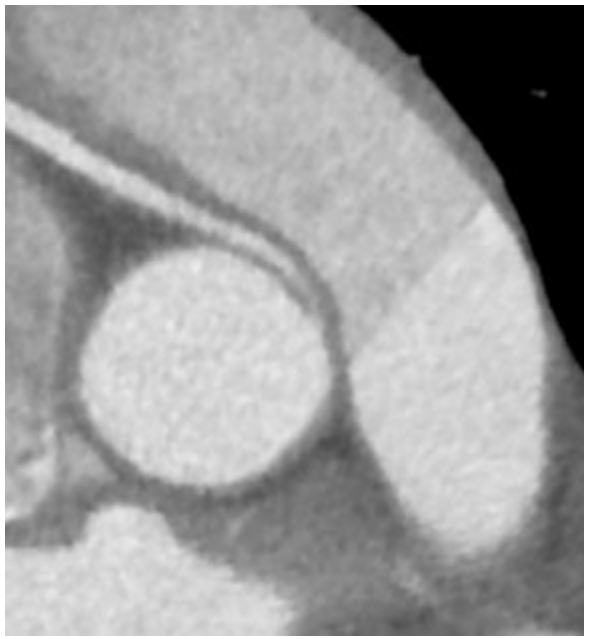
Anomalous origin of right coronary artery

Identification of intramural aortic course

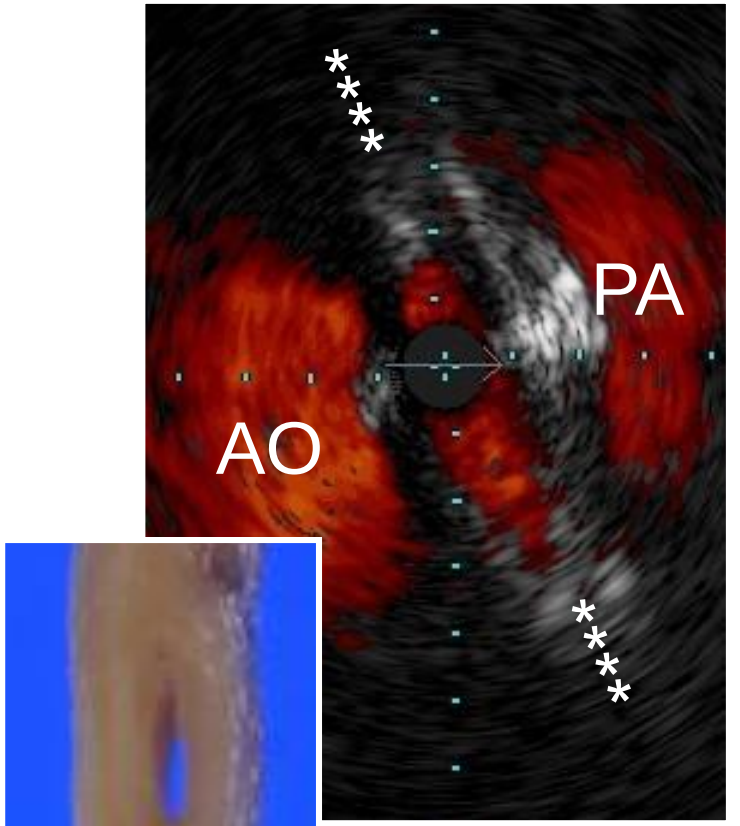
Multimodality imaging



Angio



CT angio

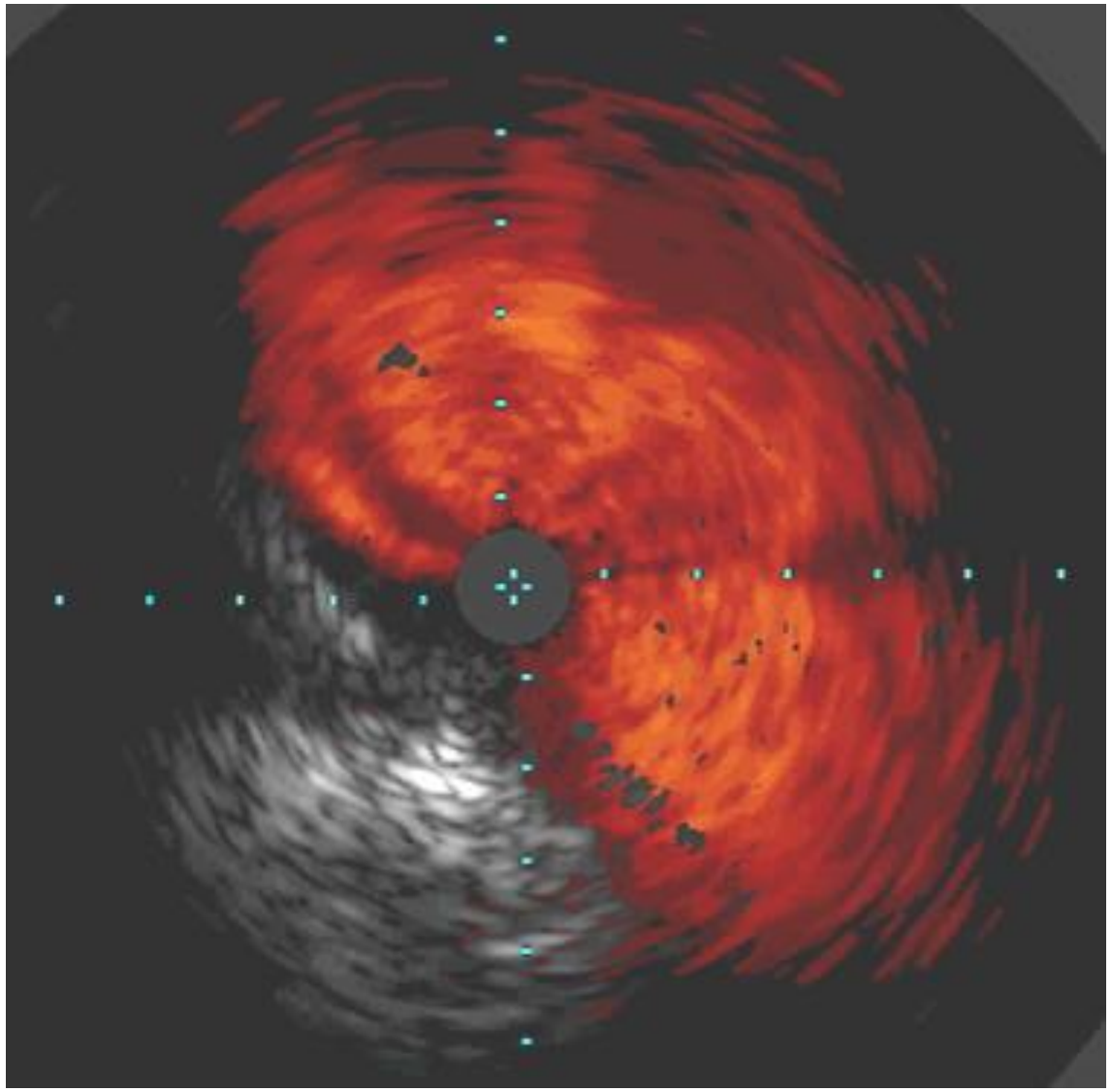


IVUS

* Aortic wall

Hata Y et al.
Cardiovasc Pathol 2014.

IVUS



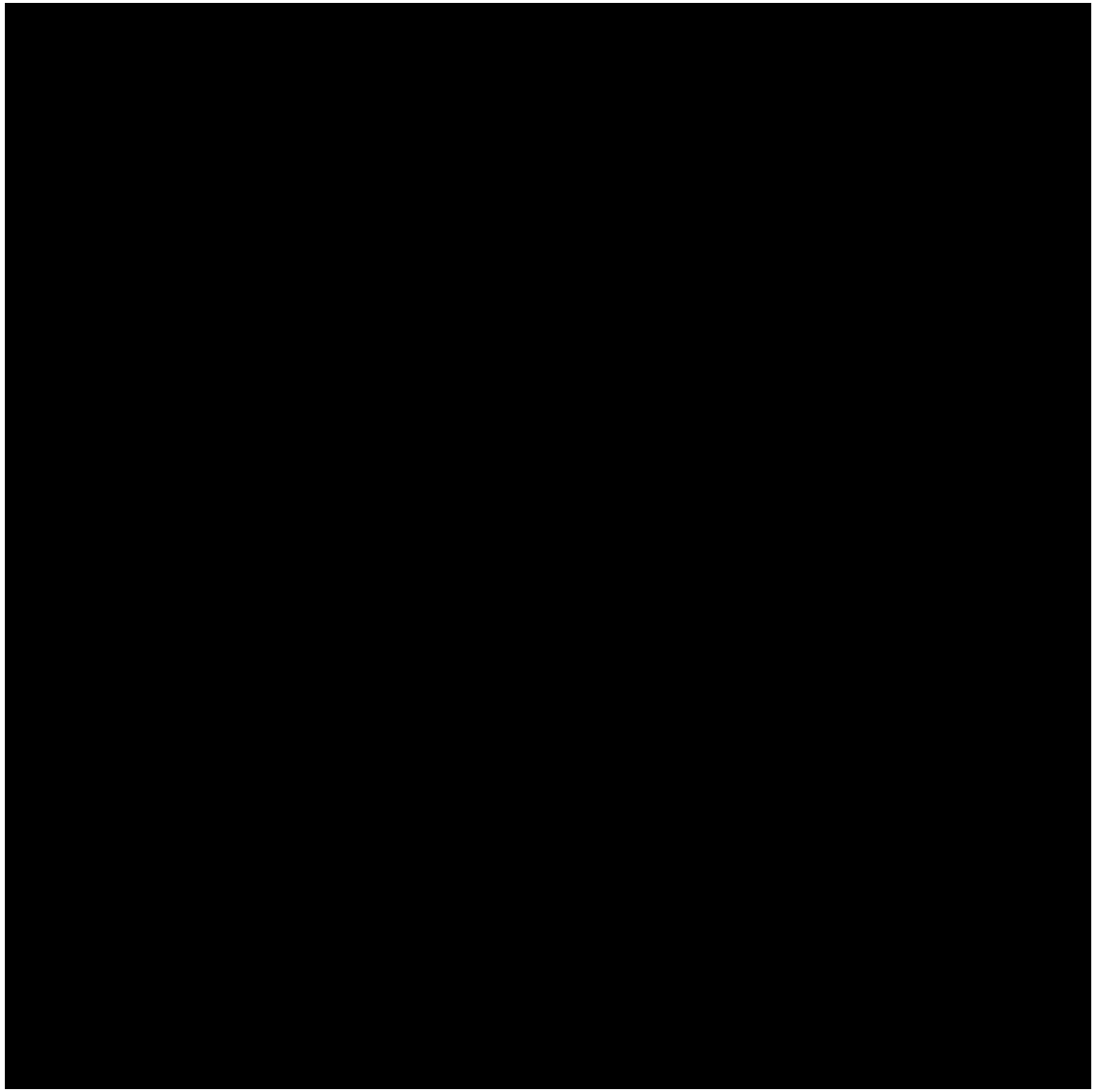
Opacification of anomalous coronary artery

RCA arising within the left coronary sinus

My technique

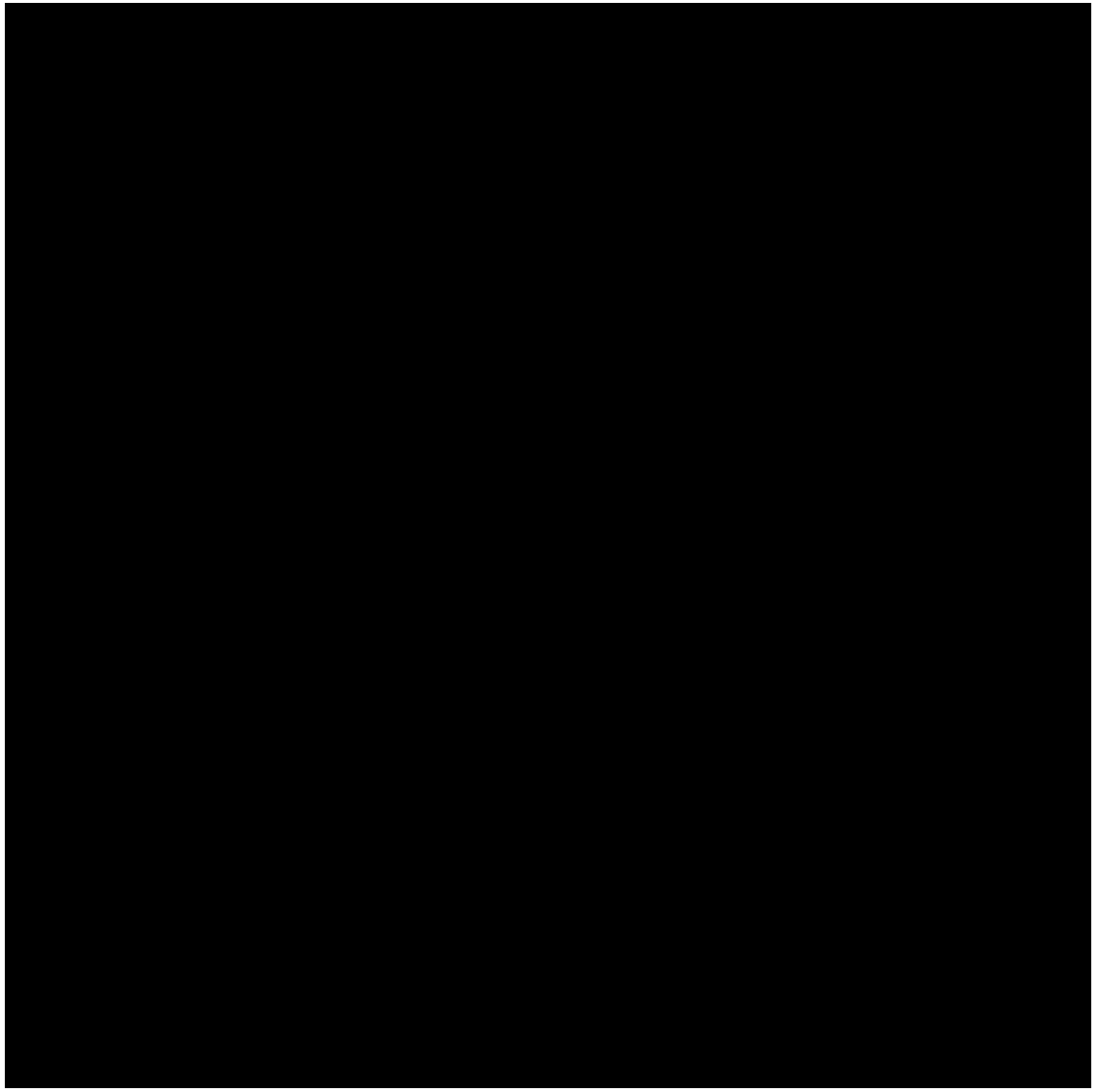
1. Left anterior oblique projection
2. Use of Amplatz Left or Extra Back-Up catheters
3. Use of 6F guiding catheters
4. Cannulation of the left ostium
5. Push gently the catheter to take out of the left ostium
6. Turn clockwise and very slowly the catheter
7. Tip of the catheter facing the ectopic right ostium
8. Insertion of a coronary guide wire (optional)
9. Opacification of the ectopic coronary artery
10. Use of 5F catheter extension (optional)

Anomalous origin of right coronary artery



- LAO projection
- JR catheter
- Poor opacification

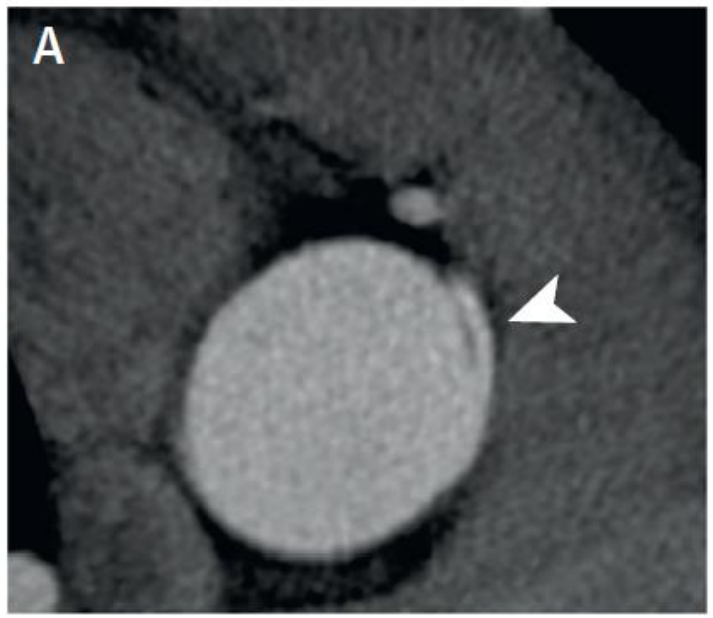
Anomalous origin of right coronary artery

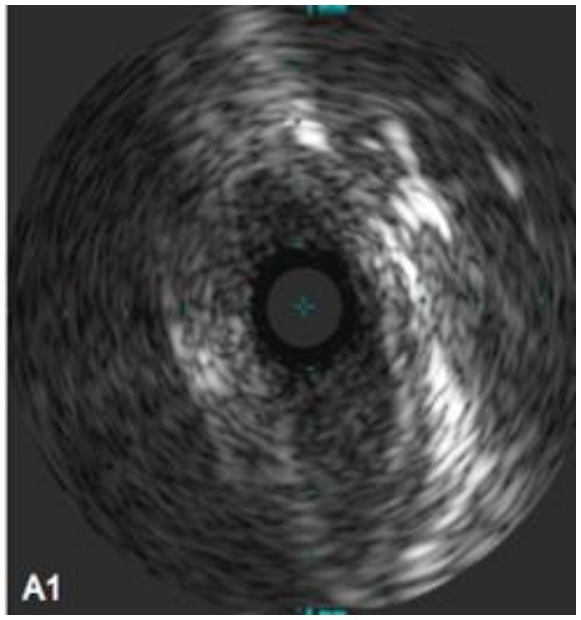


- LAO projection
- EBU catheter
- Catheter extension
- Cannulation
- Better opacification

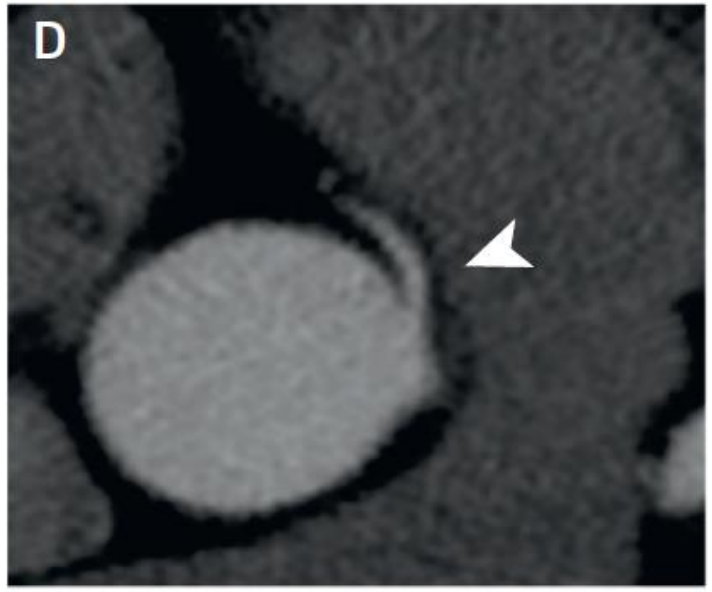
Anomalous origin of right coronary artery

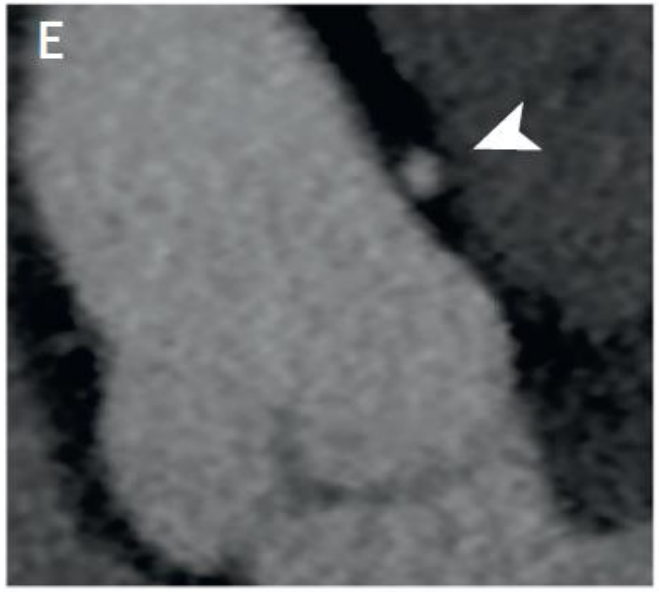
Right AOCA with intramural pathway

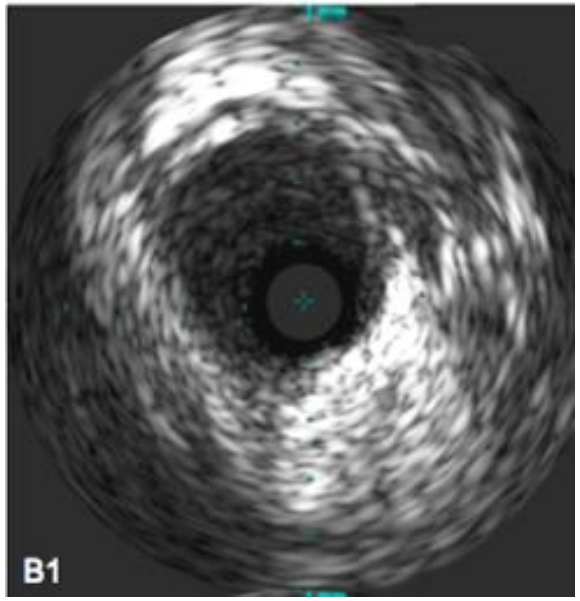




Right AOCA without intramural pathway





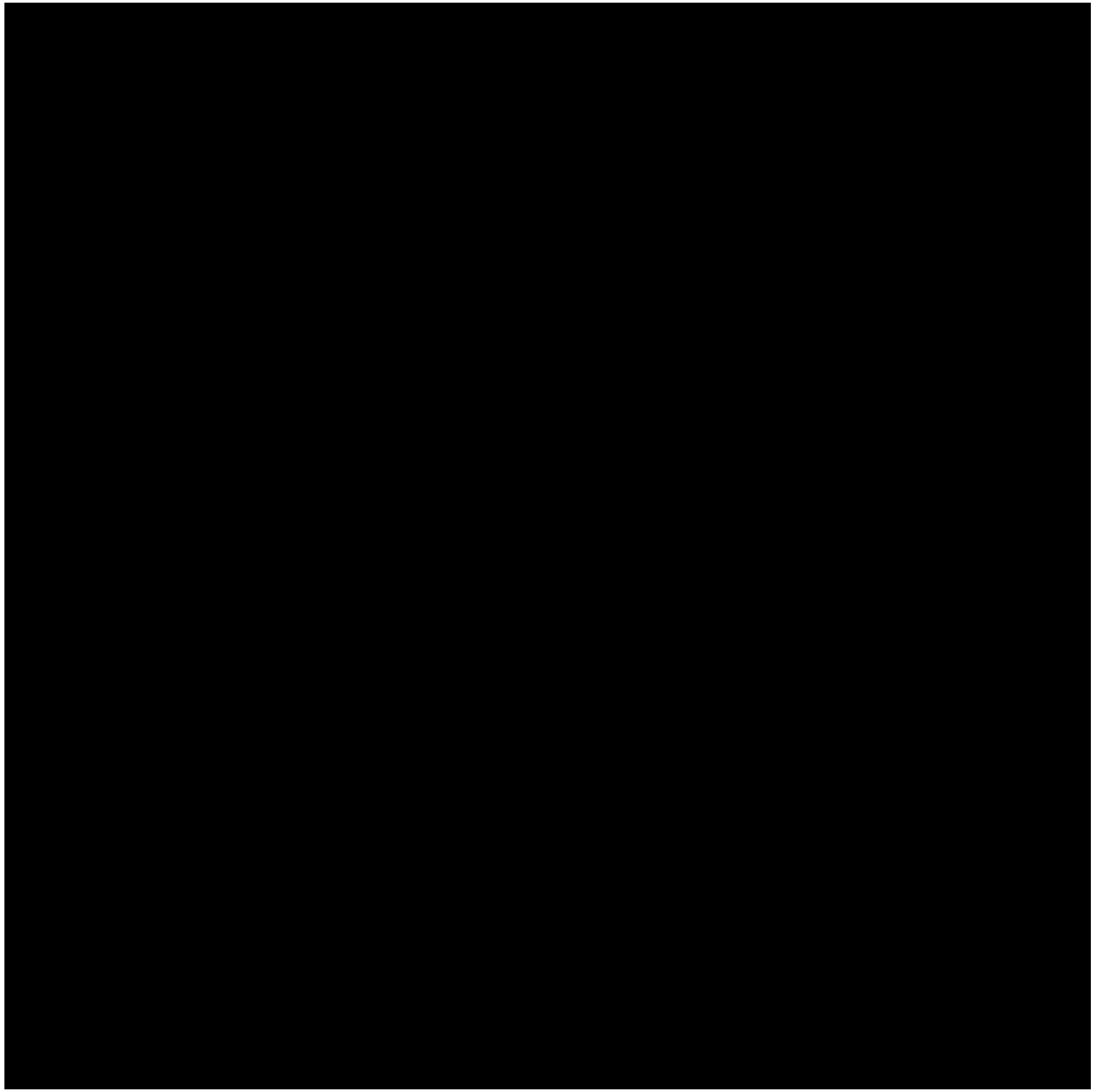


Case 2

Presentation

- 54-year-old man
- Diabetes, dyslipidaemia
- Recent anterior STEMI
- Primary angioplasty LAD with two DES
- EF left ventricular 40%
- Significant lesions mid and distal RCA
- Planned FFR/angioplasty RCA
- Anomalous origin of the RCA

Anomalous origin of right coronary artery



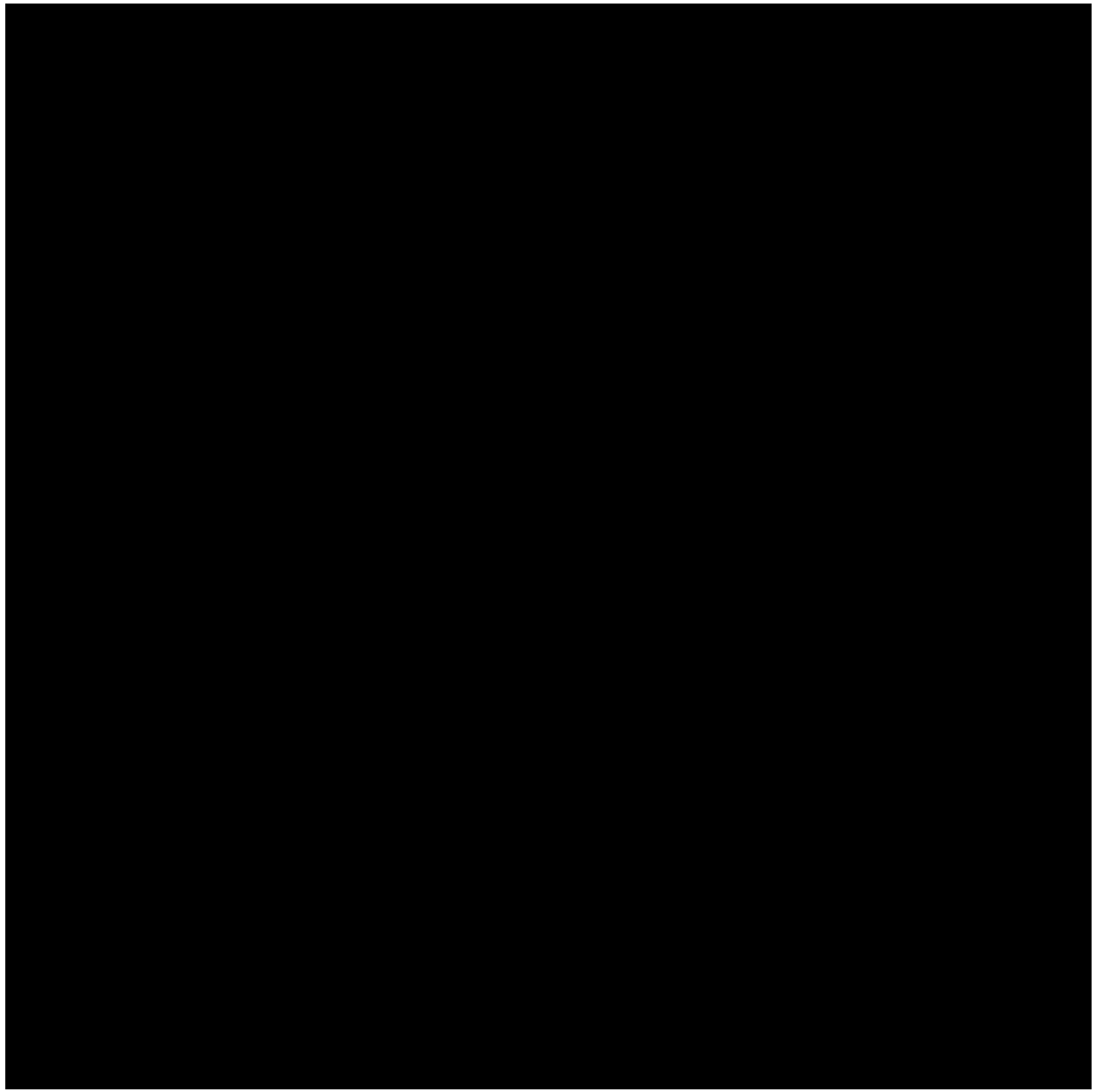
LAO PROJECTION

FEMORAL ACCESS

AL CATHETER

SELECTIVE INJECTION

Anomalous origin of right coronary artery



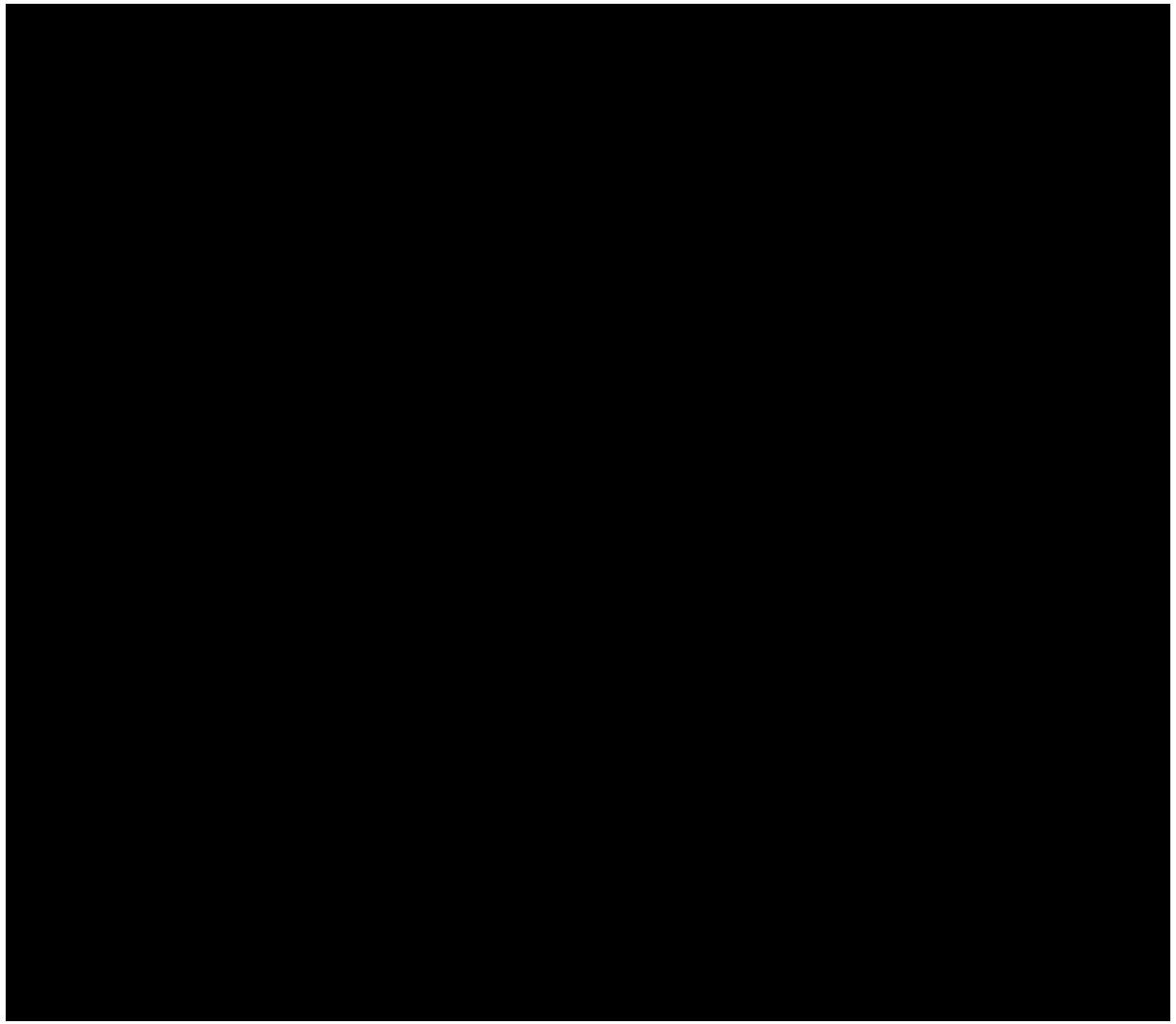
RAO PROJECTION

FEMORAL ACCESS

AL CATHETER

SELECTIVE INJECTION

How to secure catheter maneuvers?



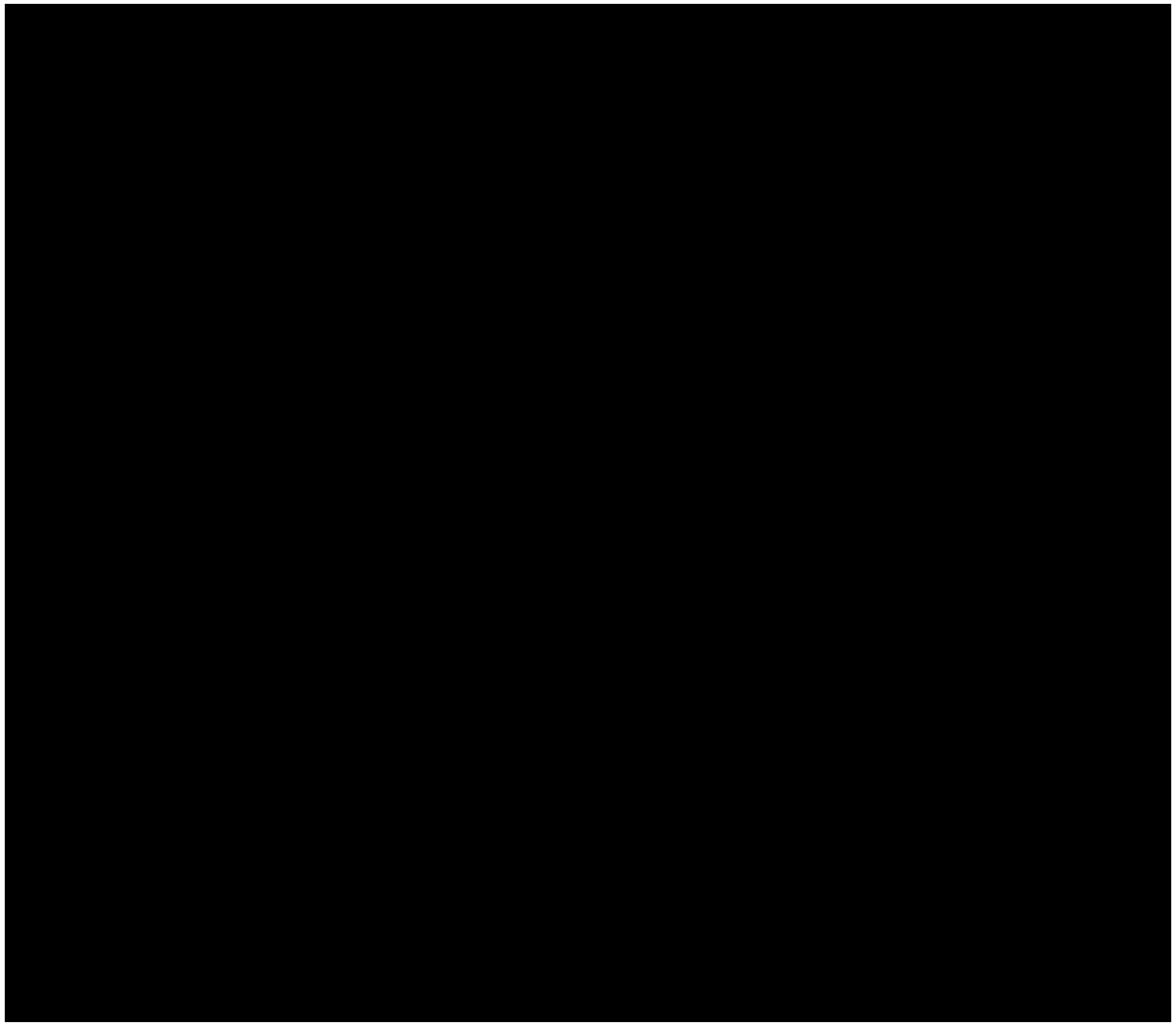
AP PROJECTION

FIRST CGW

SECOND CGW

FFR = 0.74

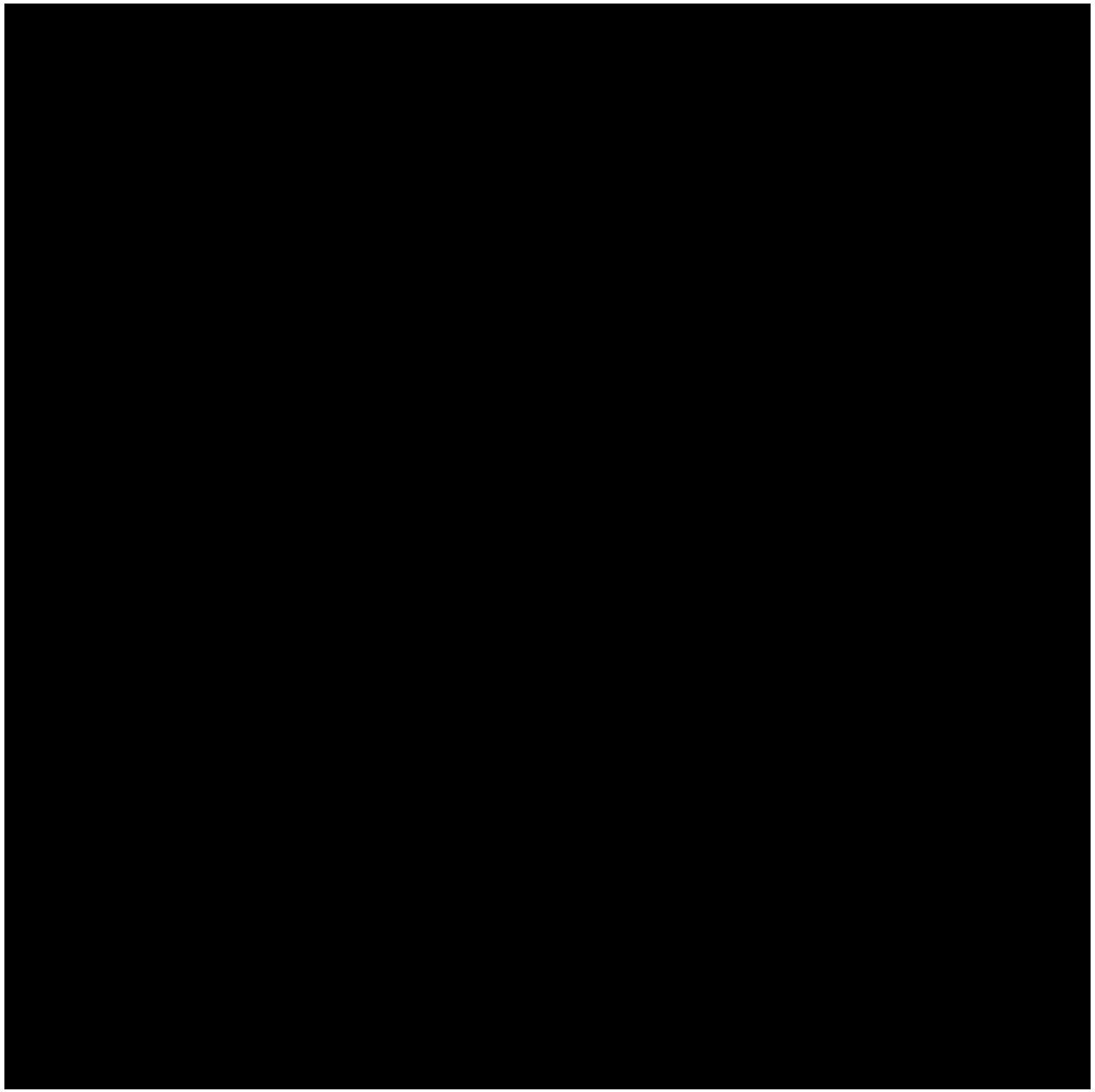
Right AOCA PCI



AP PROJECTION

DISTAL STENT INSERTION

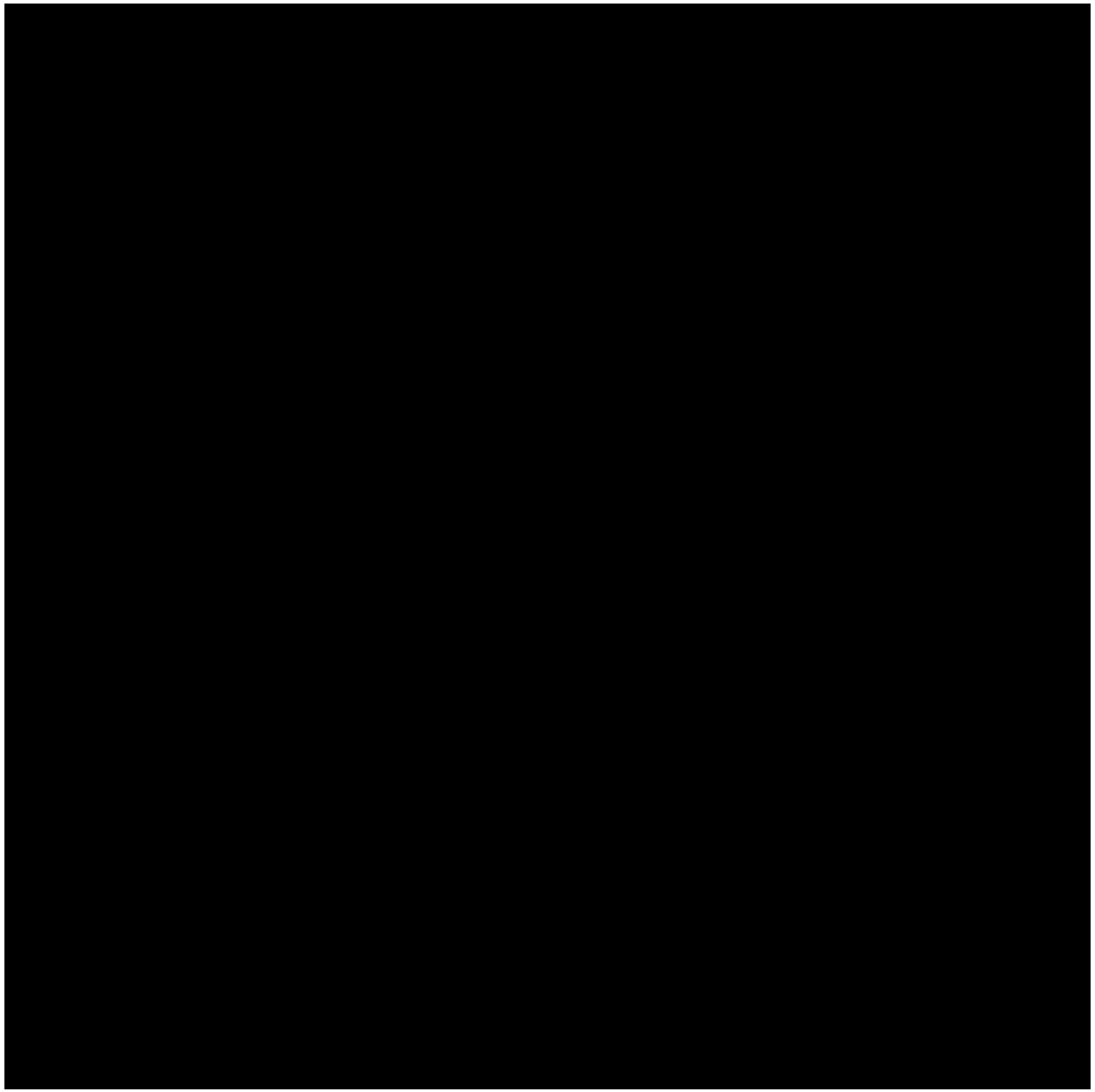
Right AOCA PCI



RAO PROJECTION

PROXIMAL STENT INSERTION

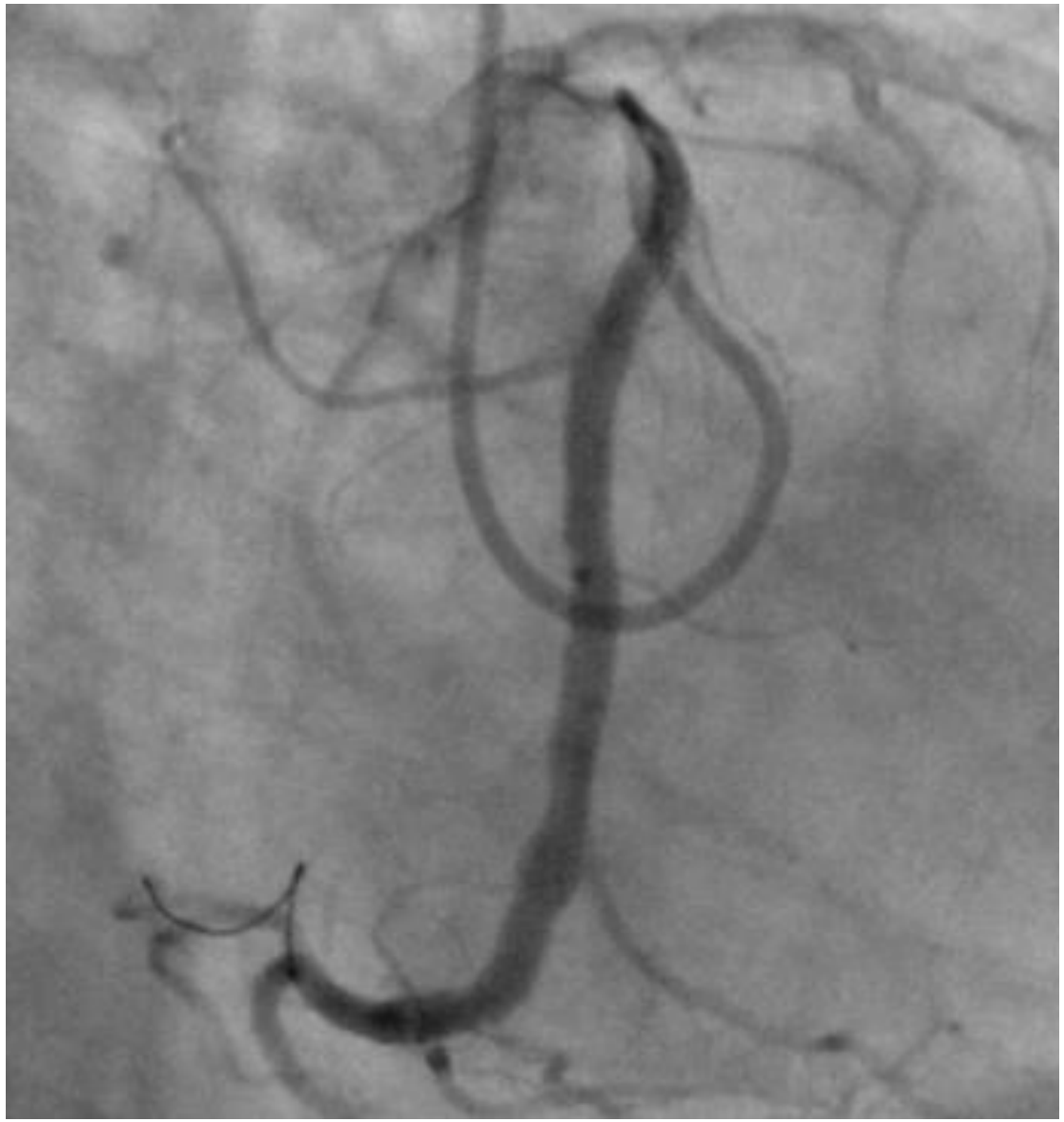
Right AOCA PCI



LAO PROJECTION

PROXIMAL STENT INSERTION

Right AOCA PCI



RAO PROJECTION

FINAL RESULT

PCI of atherosclerosis stenosis

RCA arising within the left coronary sinus

My technique

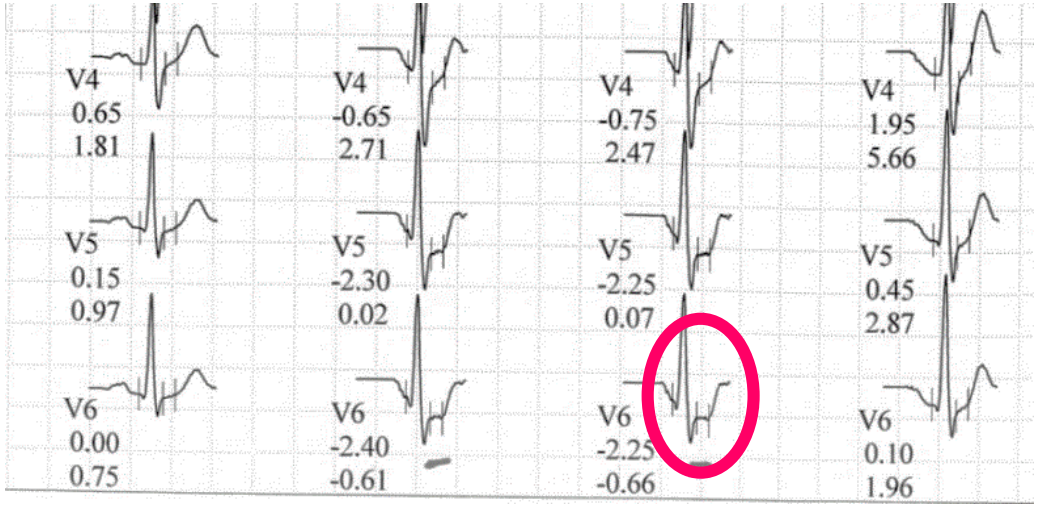
1. Use of Amplatz Left or Extra Back-Up catheters
2. Insertion of a first coronary guide wire
3. Insertion of a second coronary guide wire
4. Use of 5F catheter extension (optional)
5. Use of anchoring balloon (optional)
6. Slow and gentle catheter/balloon/stent maneuvers
7. No indication to treat congenital narrowing (generally)

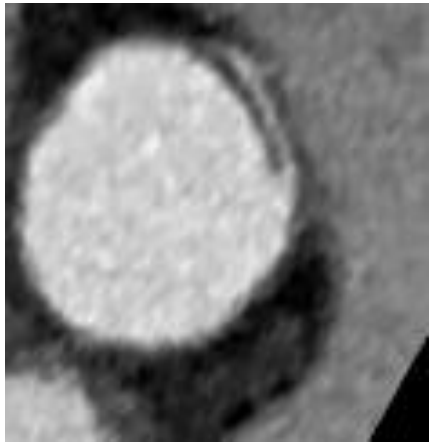
Case 3

Anomalous origin of right coronary artery

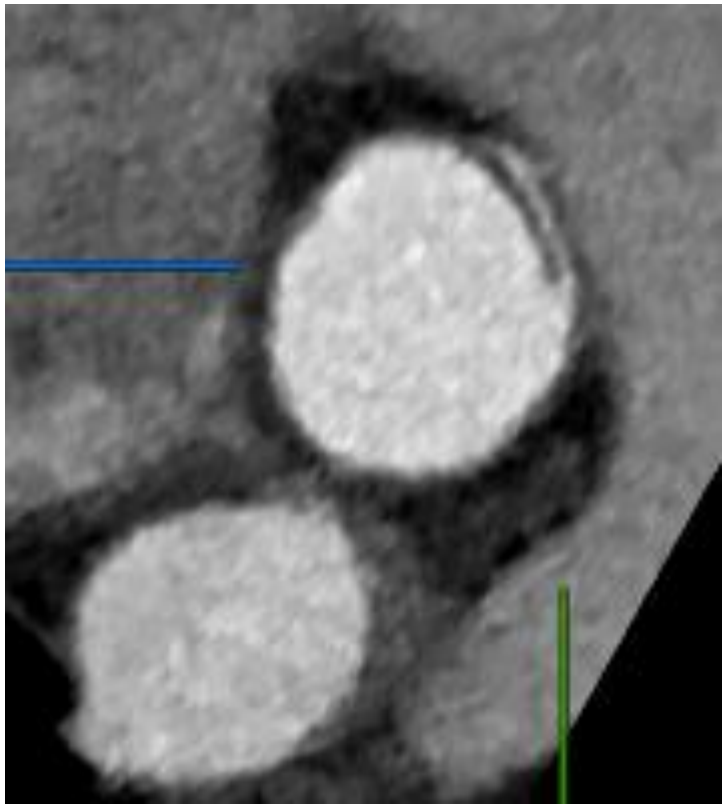
Difficult decision-making

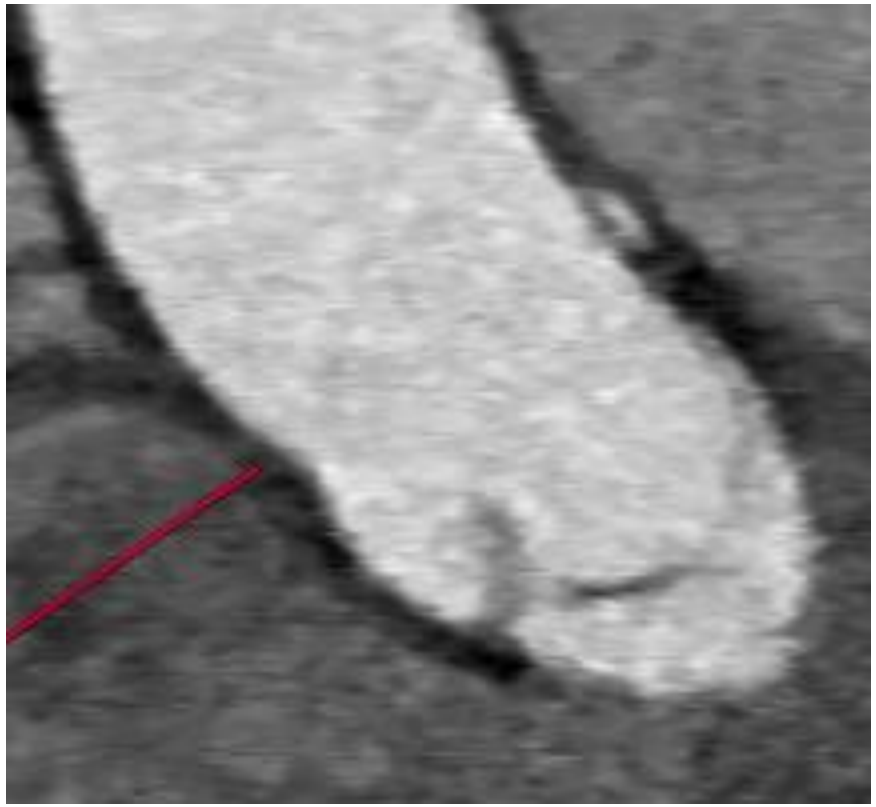
- 64-year-old man
- Intensive sport activities (biking >100 km per week)
- Chest pain during exertion following by pre syncope
- Exercise stress test: asymptomatic (250 watts), ST depression
- CTCA: right coronary anomaly, no significant CAD





CT scan





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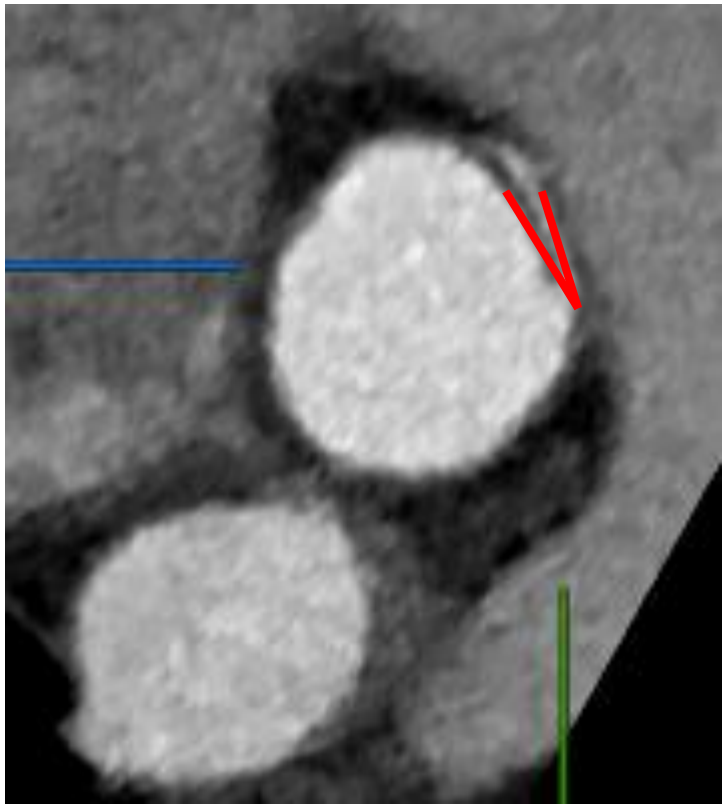
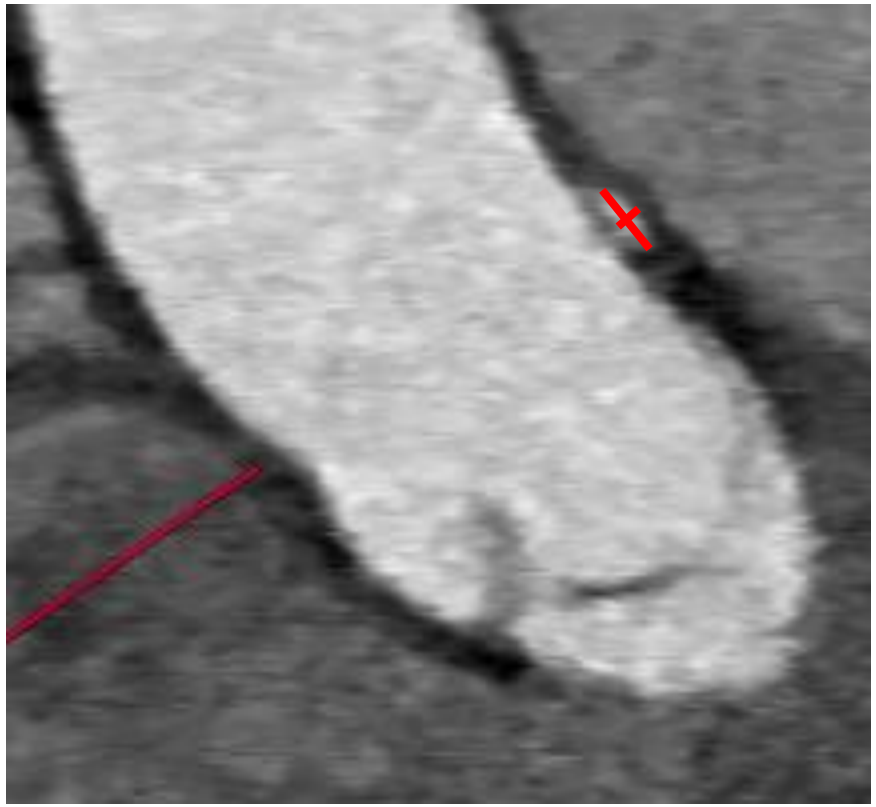
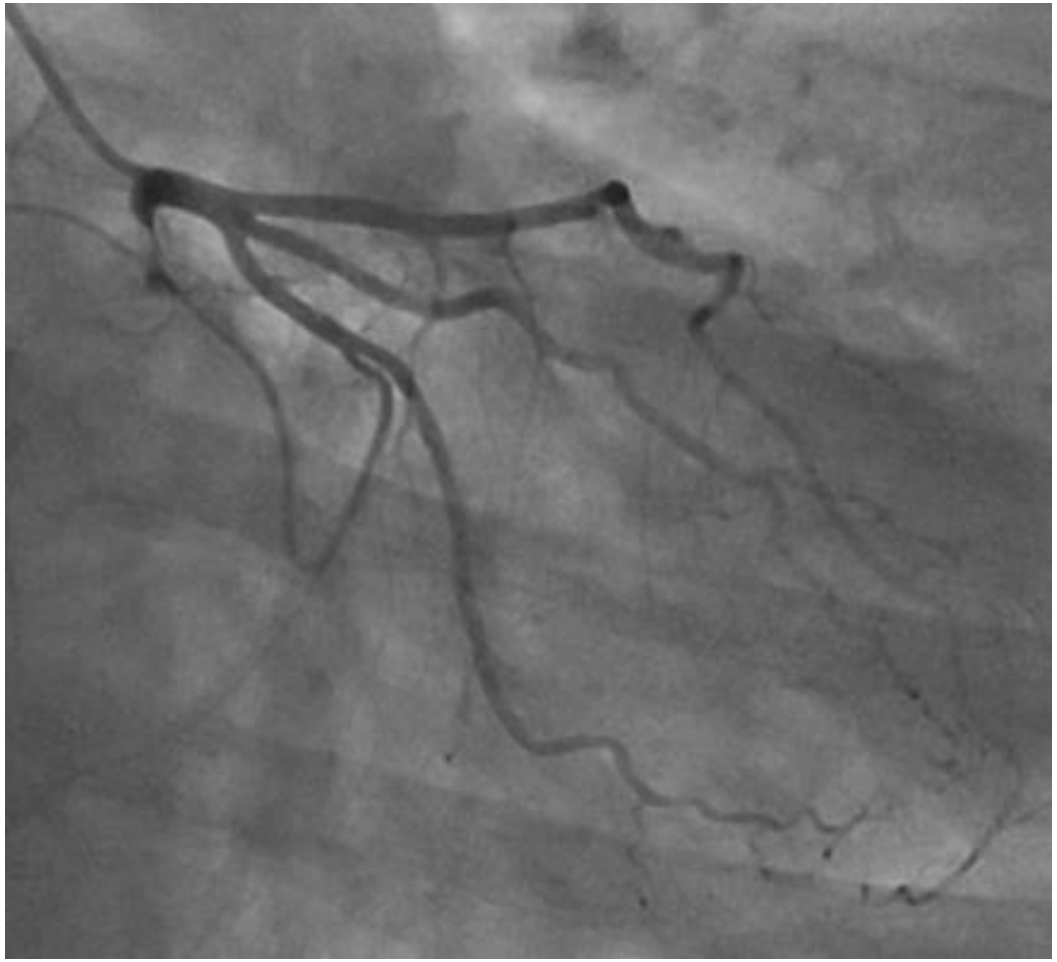


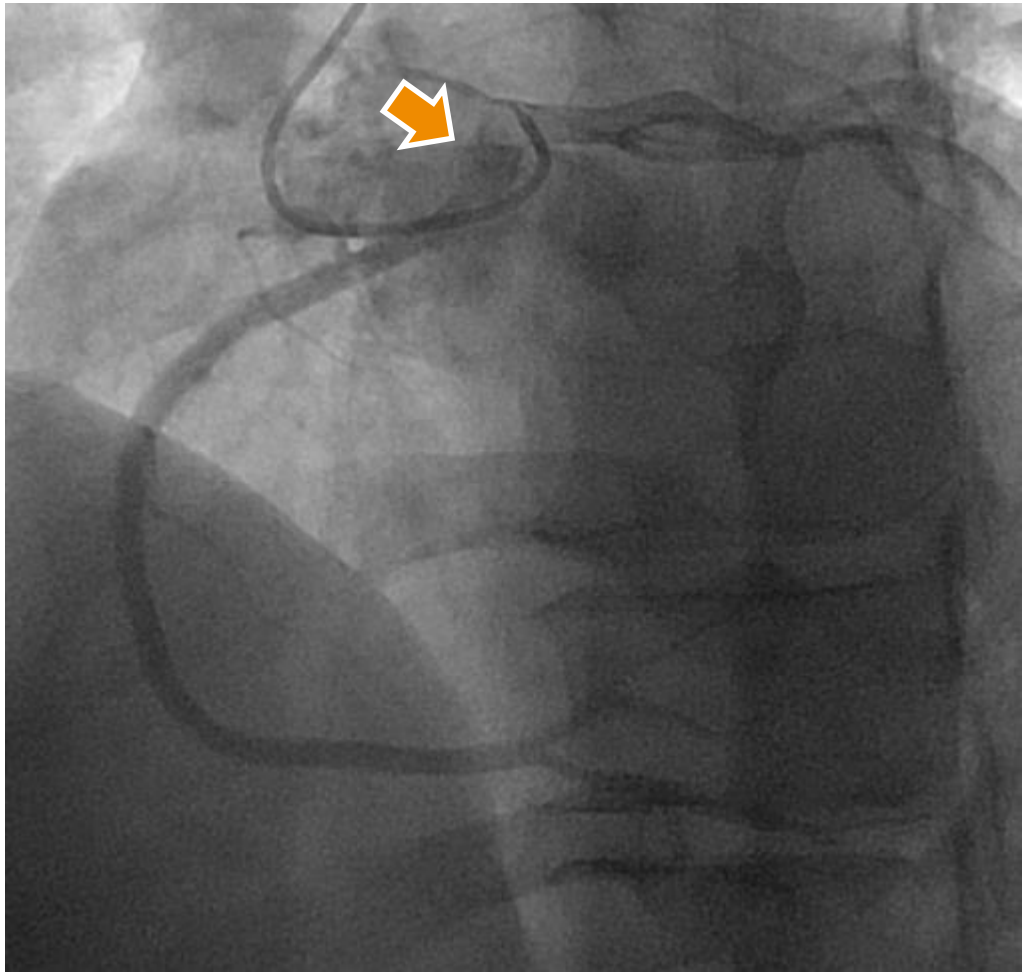
Acute take-off angle



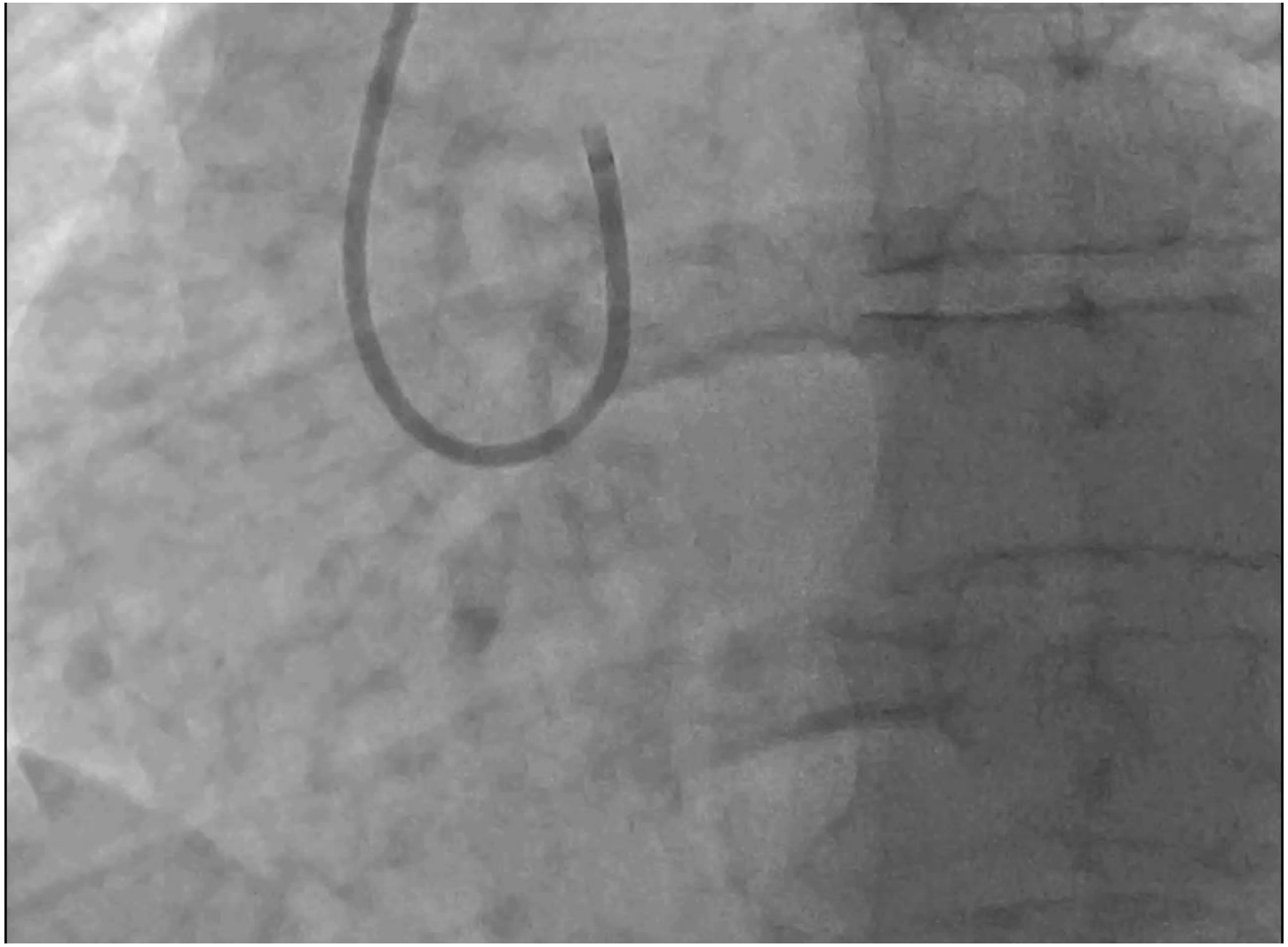
Elliptic shape

Angio

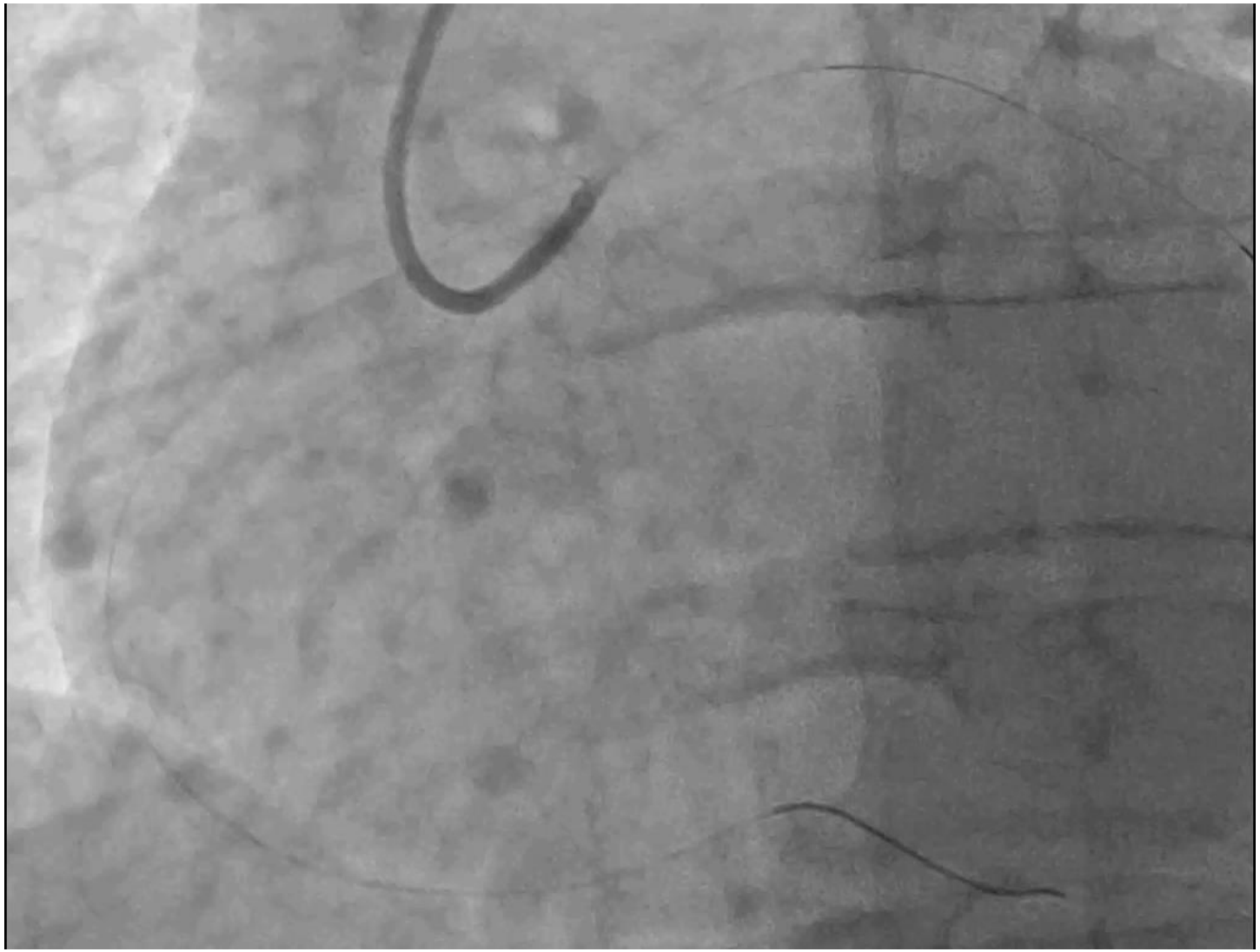




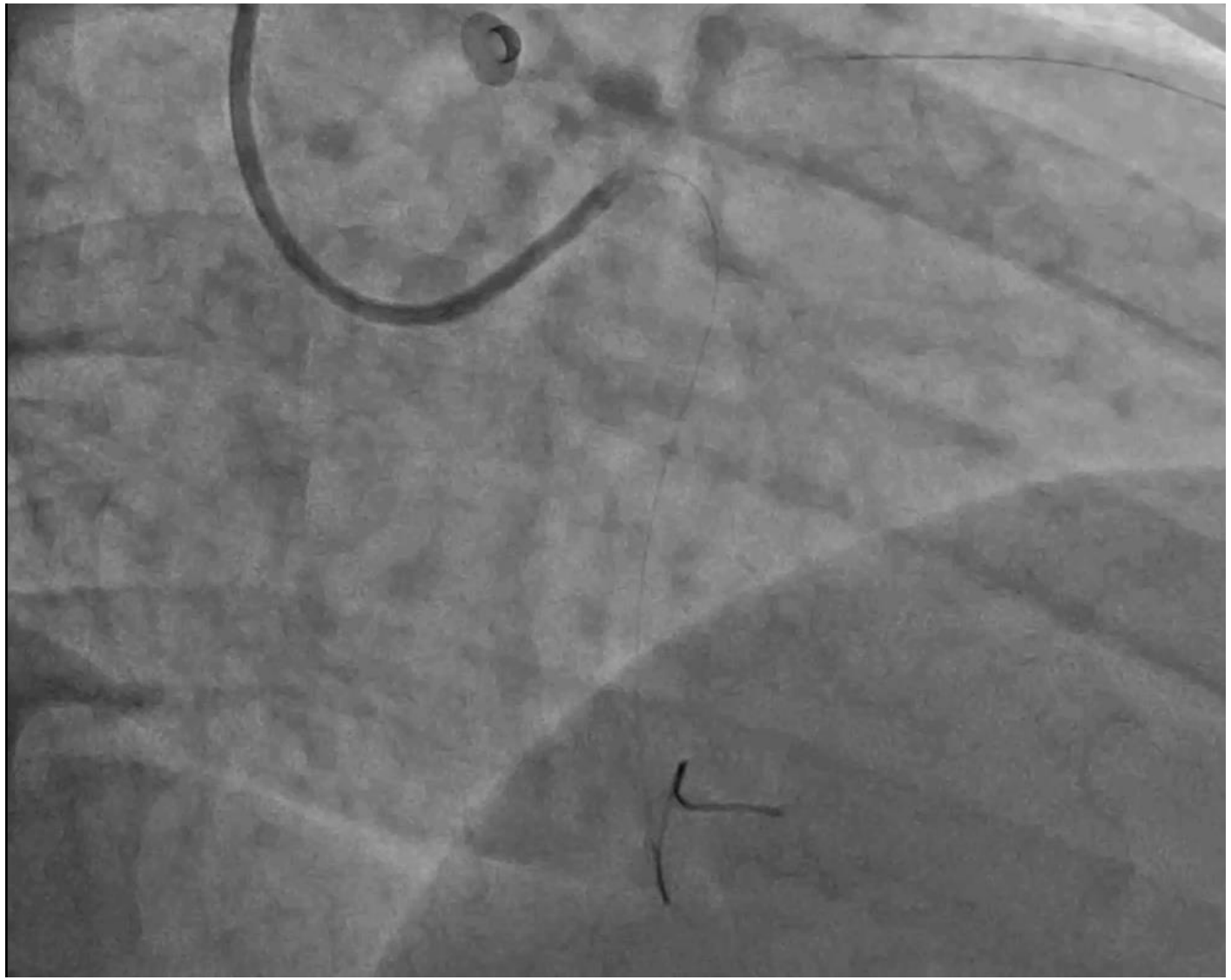
Angio



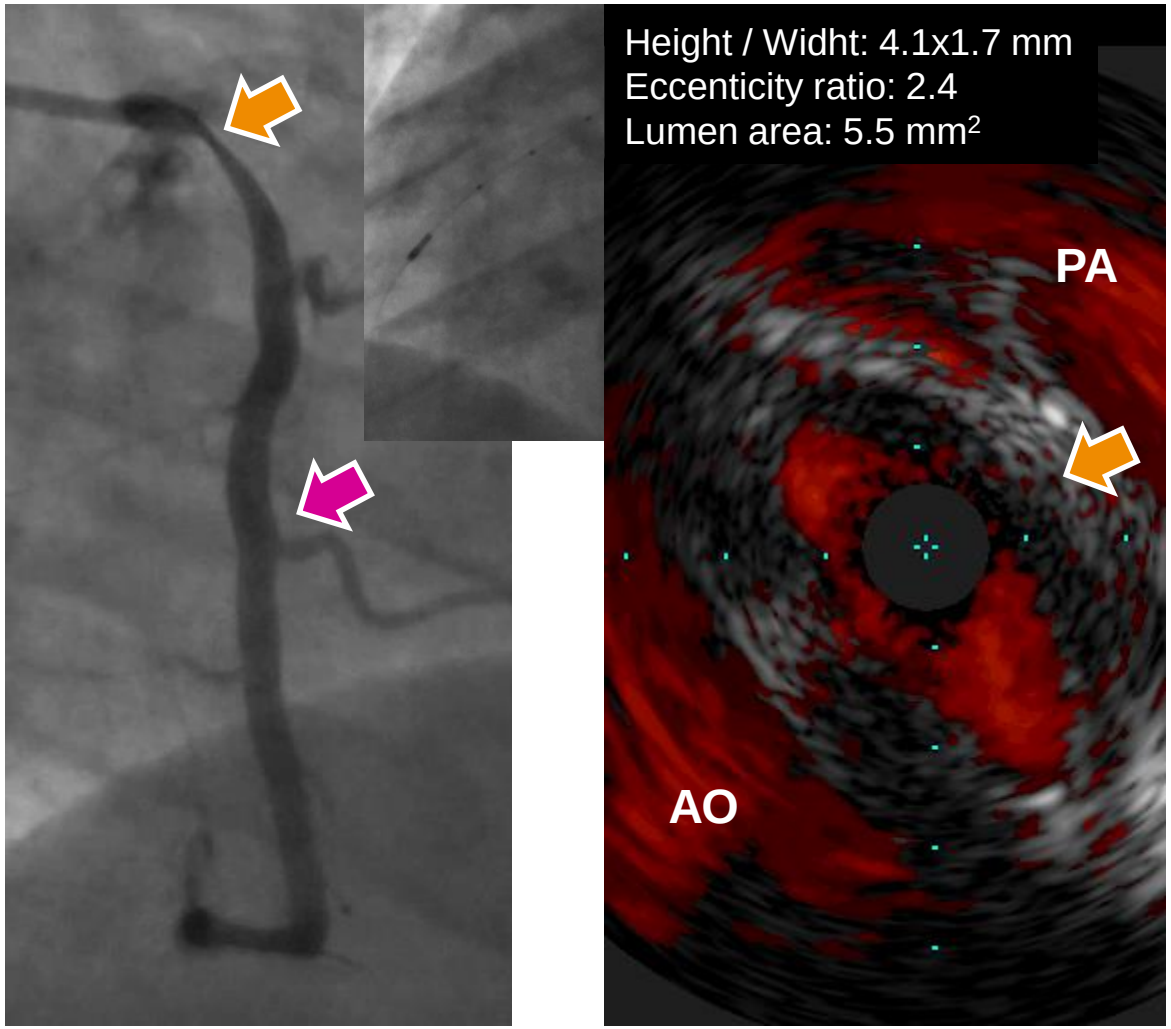
Angio

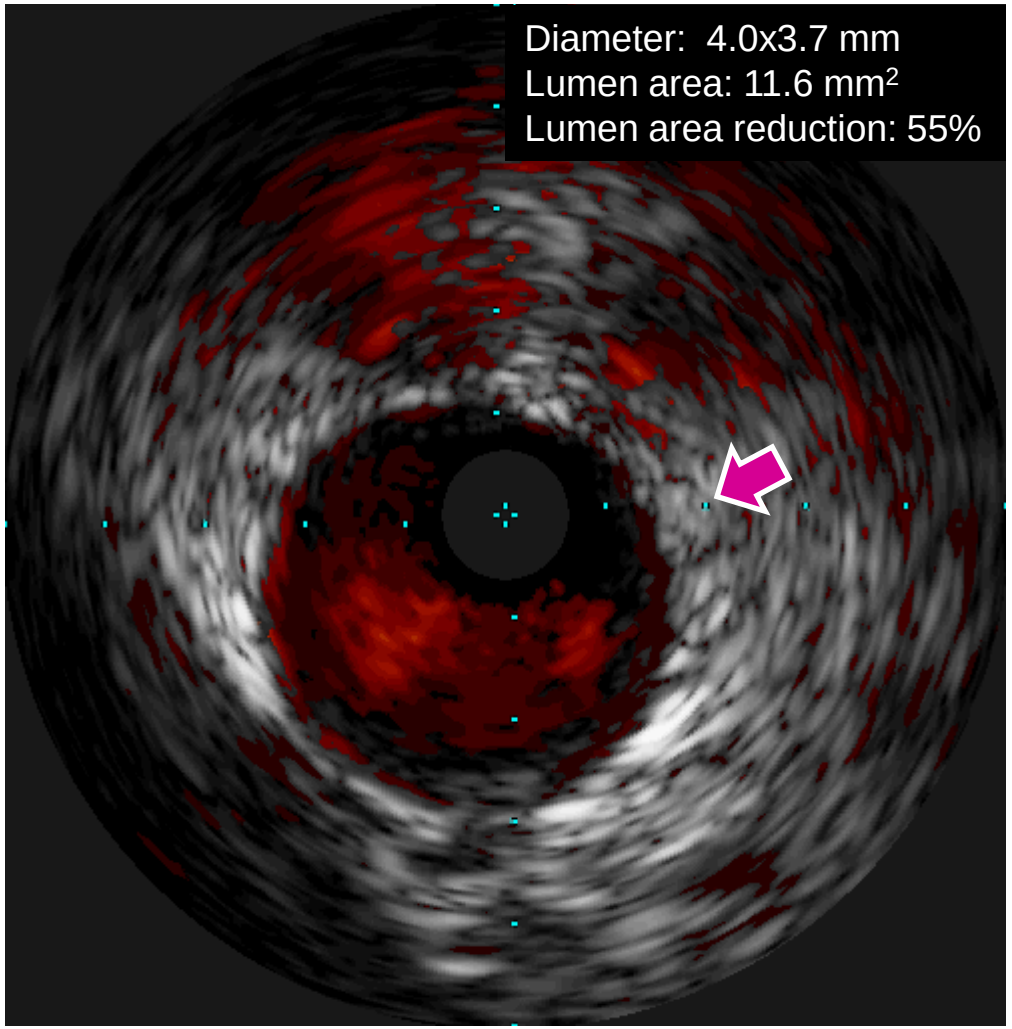


Angio



Angio and IVUS





Anomalous origin of coronary arteries

Recommendations

2020 Guidelines for adult congenital heart disease

Anomalous aortic origin of the coronary artery		
Surgery is recommended for AAOCA in patients with typical angina symptoms who present with evidence of stress-induced myocardial ischaemia in a matching territory or high-risk anatomy.[c]	I	C
Surgery should be considered in *asymptomatic* patients with AAOCA (right or left) and evidence of myocardial ischaemia.	IIa	C
Surgery should be considered in *asymptomatic* patients with AAOLCA and no evidence of myocardial ischaemia but a high-risk anatomy.[c]	IIa	C
Surgery may be considered for symptomatic patients with AAOCA even if there is no evidence of myocardial ischaemia or high-risk anatomy.[c]	IIb	C
Surgery may be considered for *asymptomatic* patients with AAOLCA without myocardial ischaemia and without high-risk anatomy[c] when they present at young age (<35 years).	IIb	C
Surgery is not recommended for AAORCA in asymptomatic patients without myocardial ischaemia and without high-risk anatomy.[c]	III	C

[c]High-risk anatomy includes features such as an intramural course and orifice anomalies (slit-like orifice, acute-angle take-off, orifice >1 cm above the sinotubular junction).

Baumgartner H et al. Eur Heart J. 2020.

Anomalous origin of coronary arteries

Surgical repair

Weaknesses

- Guidelines focused on young people
- Very few patients with history of sudden cardiac arrest
- No randomized controlled studies
- Lack of long-term data after surgical correction
- Possible failure: stenosis/aneurysm/thrombosis/
  aortic regurgitation (unroofing technique)

Anomalous origin of coronary arteries

Risk of sudden cardiac death

Shiwani H. ACC sessions. 2018.

Expert consensus guidelines: Anomalous aortic origin of a coronary artery

Julie A. Brothers, MD,[a] Michele A. Frommelt, MD,[b] Robert D. B. Jaquiss, MD,[c] Robert J. Myerburg, MD,[d] Charles D. Fraser, Jr, MD,[e] and James S. Tweddell, MD[f]

Percutaneous Coronary Intervention

Due to safety issues with stenting anomalous coronary arteries in growing children, this procedure is not advisable in the pediatric population, **but may be considered in select cases in the adult population**.

J Thorac Cardiovasc Surg 2017;153:1440-57

Anomalous origin of coronary arteries

Recommendations

2020 Guidelines on sports cardiologie and exercice in patients with cardiovascular disease

Recommendations for exercise in young individuals/athletes with anomalous origins of coronary arteries

Recommendations	Class[a]	Level[b]
When considering sports activities, evaluation with imaging tests to identify high-risk patterns and an exercise stress test to check for ischaemia should be considered in individuals with AOCA.	IIa	C
In asymptomatic individuals with an anomalous coronary artery that does not course between the large vessels, does not have a slit-like orifice with reduced lumen and/or intramural course, competition may be considered, after adequate counselling on the risks, provided there is absence of inducible ischaemia.	IIb	C
After surgical repair of an AOCA, participation in all sports may be considered, at the earliest 3 months after surgery, if they are asymptomatic and there is no evidence of inducible myocardial ischaemia or complex cardiac arrhythmias during maximal exercise stress test.	IIb	C
Participation in most competitive sports with a moderate and high cardiovascular demand among individuals with AOCA with an acutely angled take-off or an anomalous course between the large vessels is not recommended.[c]	III	C

AOCA = anomalous origin of coronary arteries.
[a]Class of recommendation.
[b]Level of evidence.
[c]This recommendation applies whether the anomaly is identified as a consequence of symptoms or discovered incidentally, and in individuals <40 years of age.

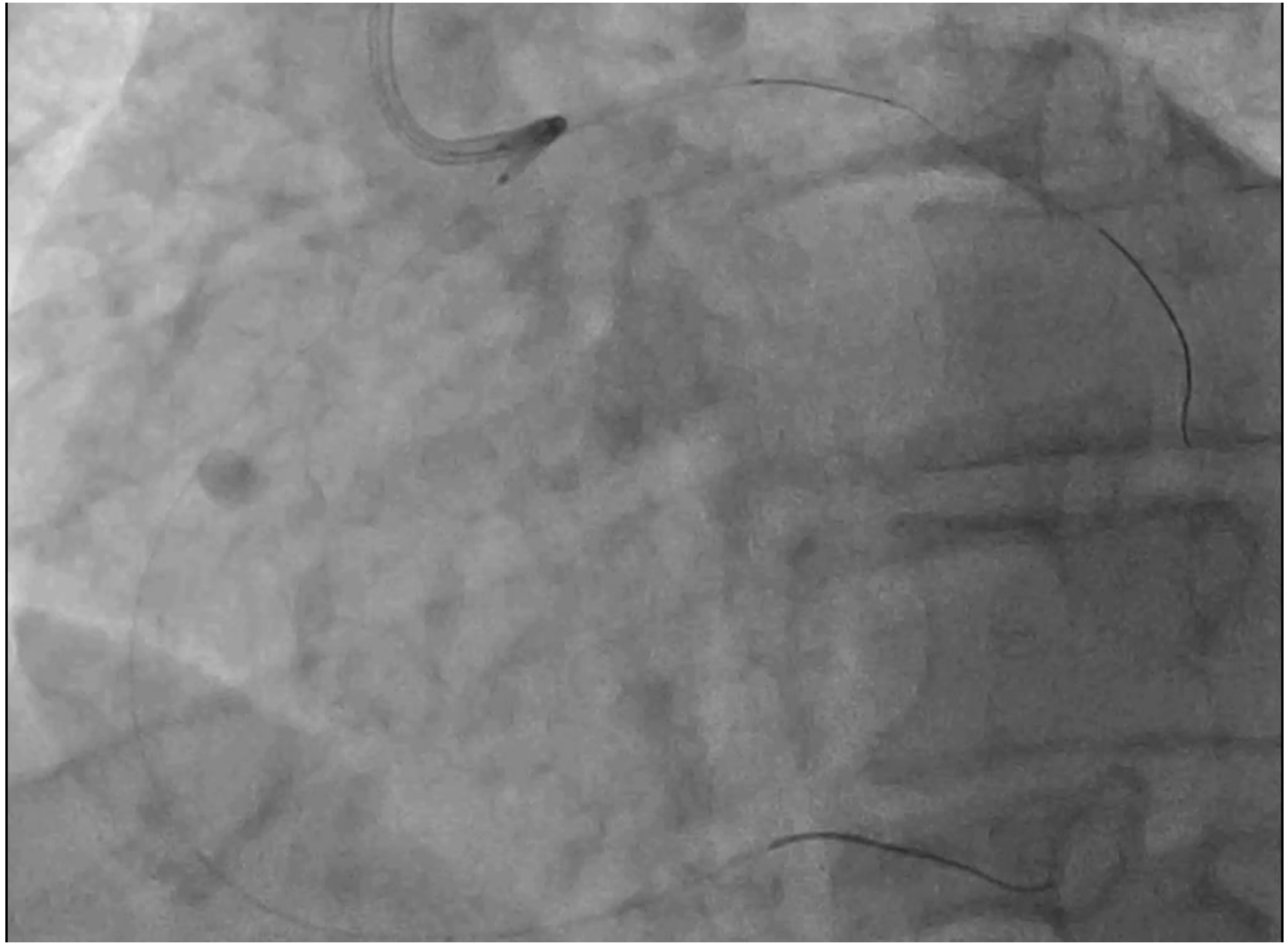
Pelliccia A et al. Eur Heart J. 2020.

Anomalous origin of coronary arteries

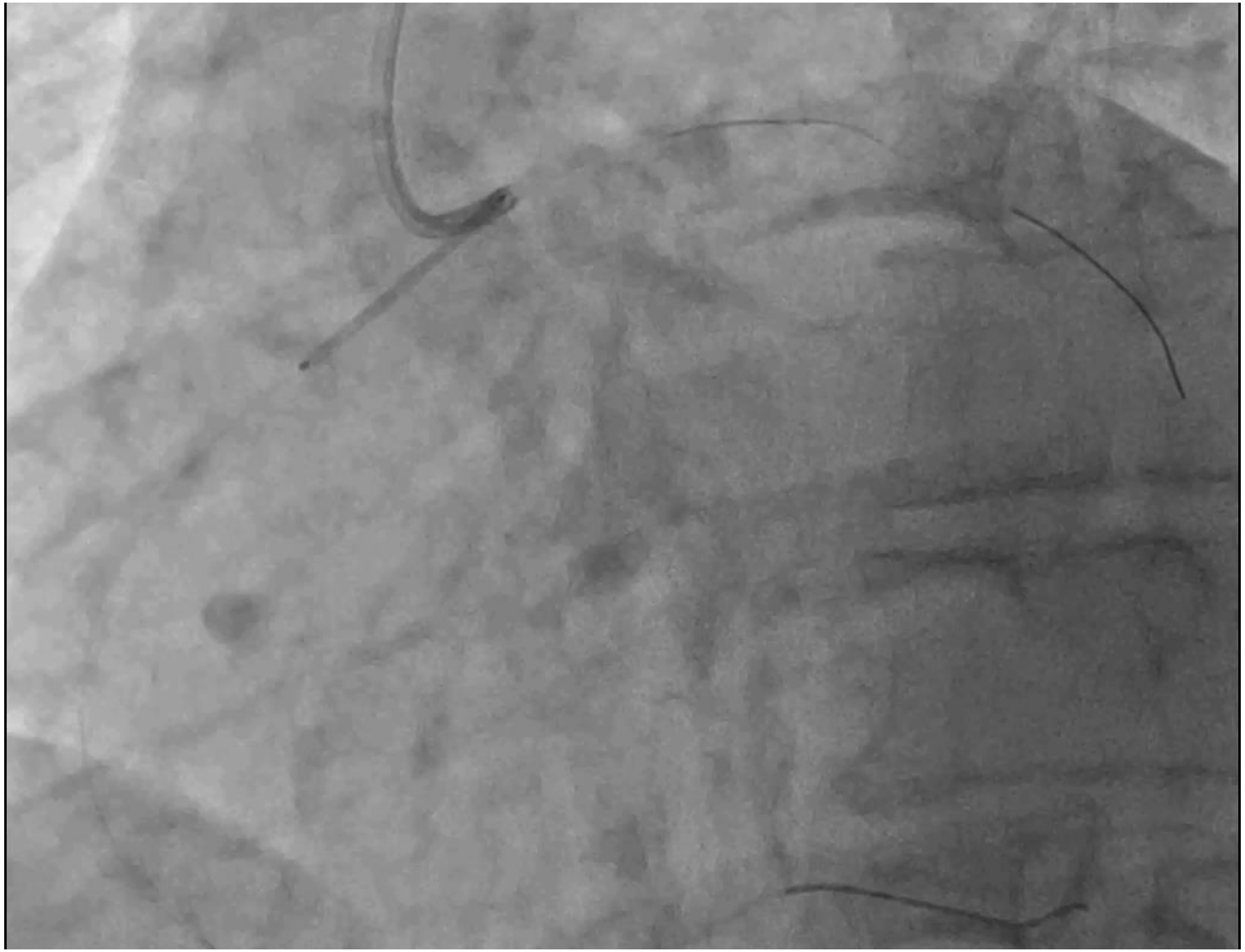
What do you do?

- Surgical repair?
- PCI?
- Nothing?
- Restriction for intensive physical activities ?

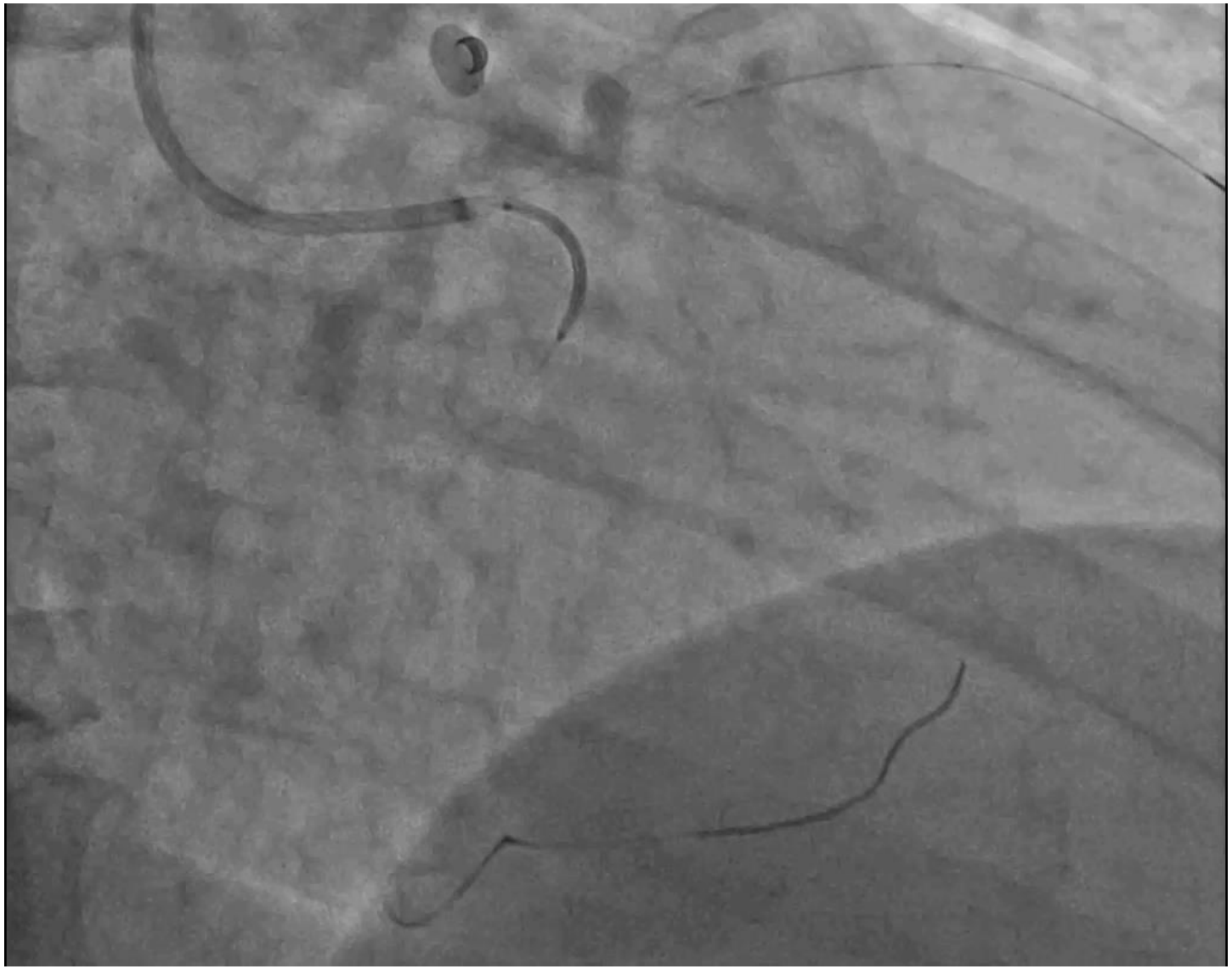
PCI



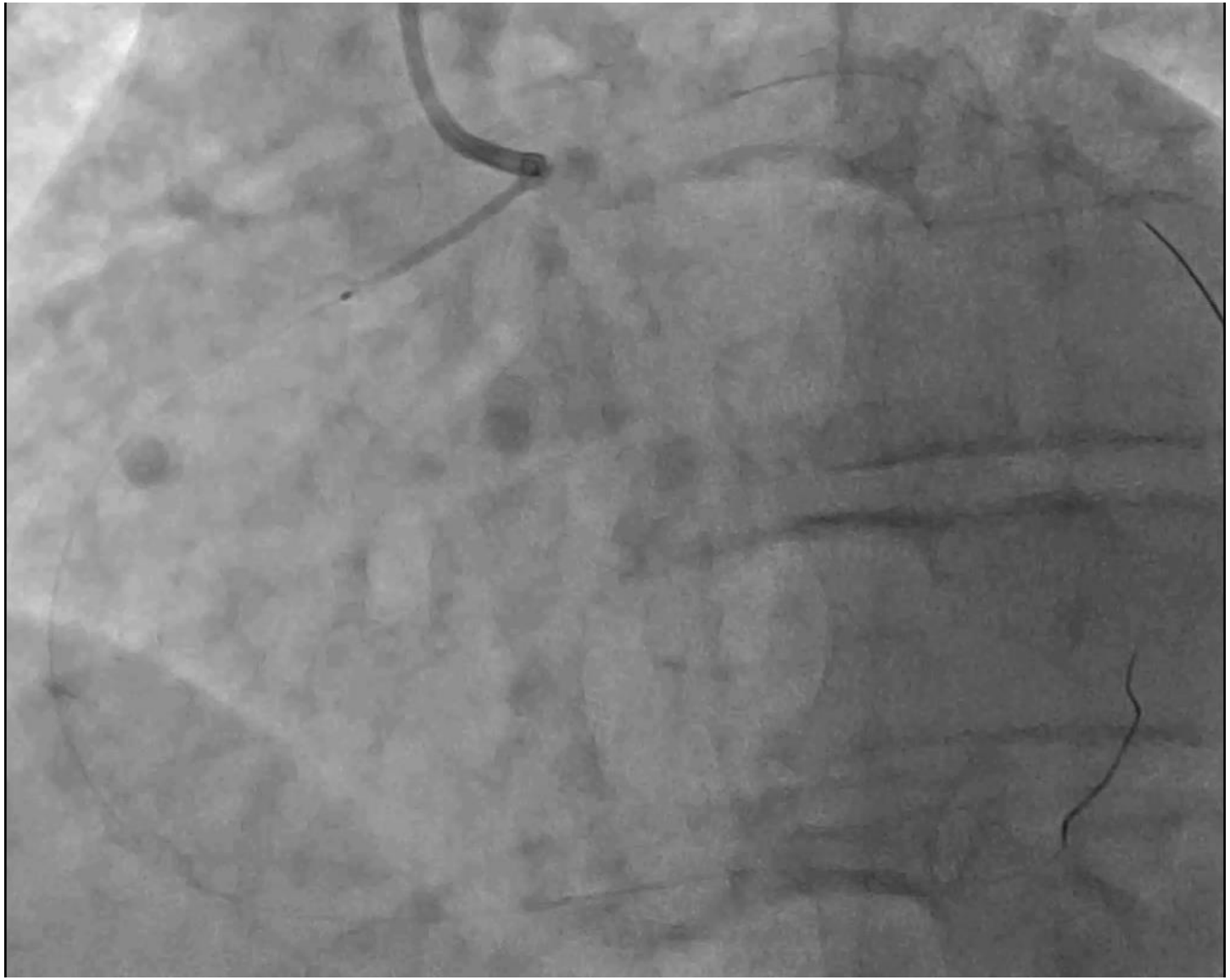
PCI



PCI



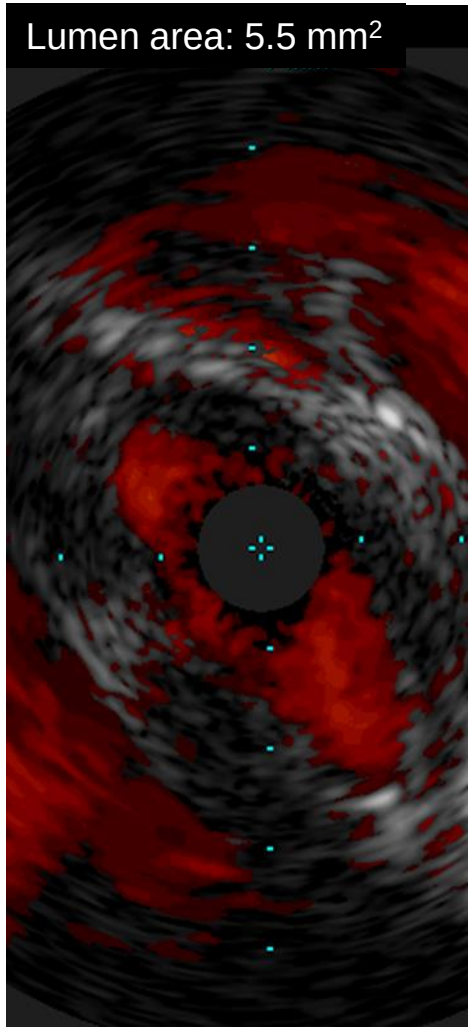
PCI

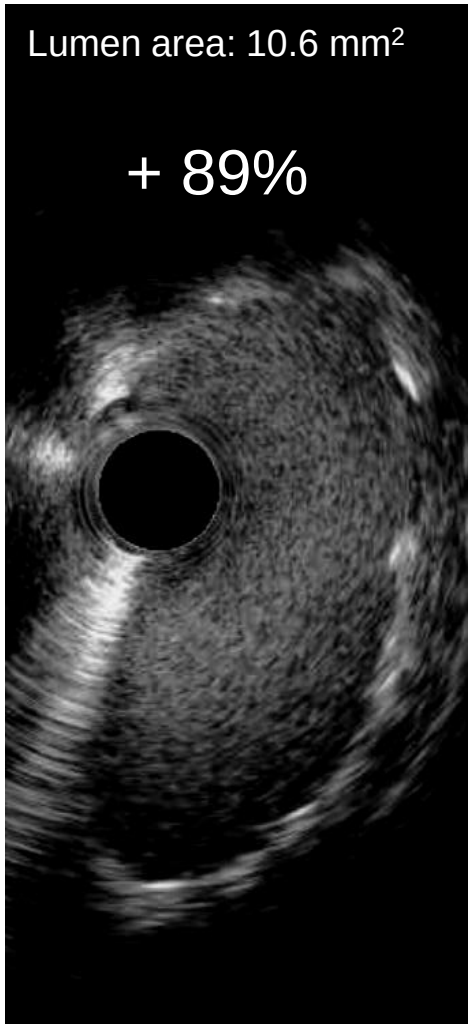


PCI

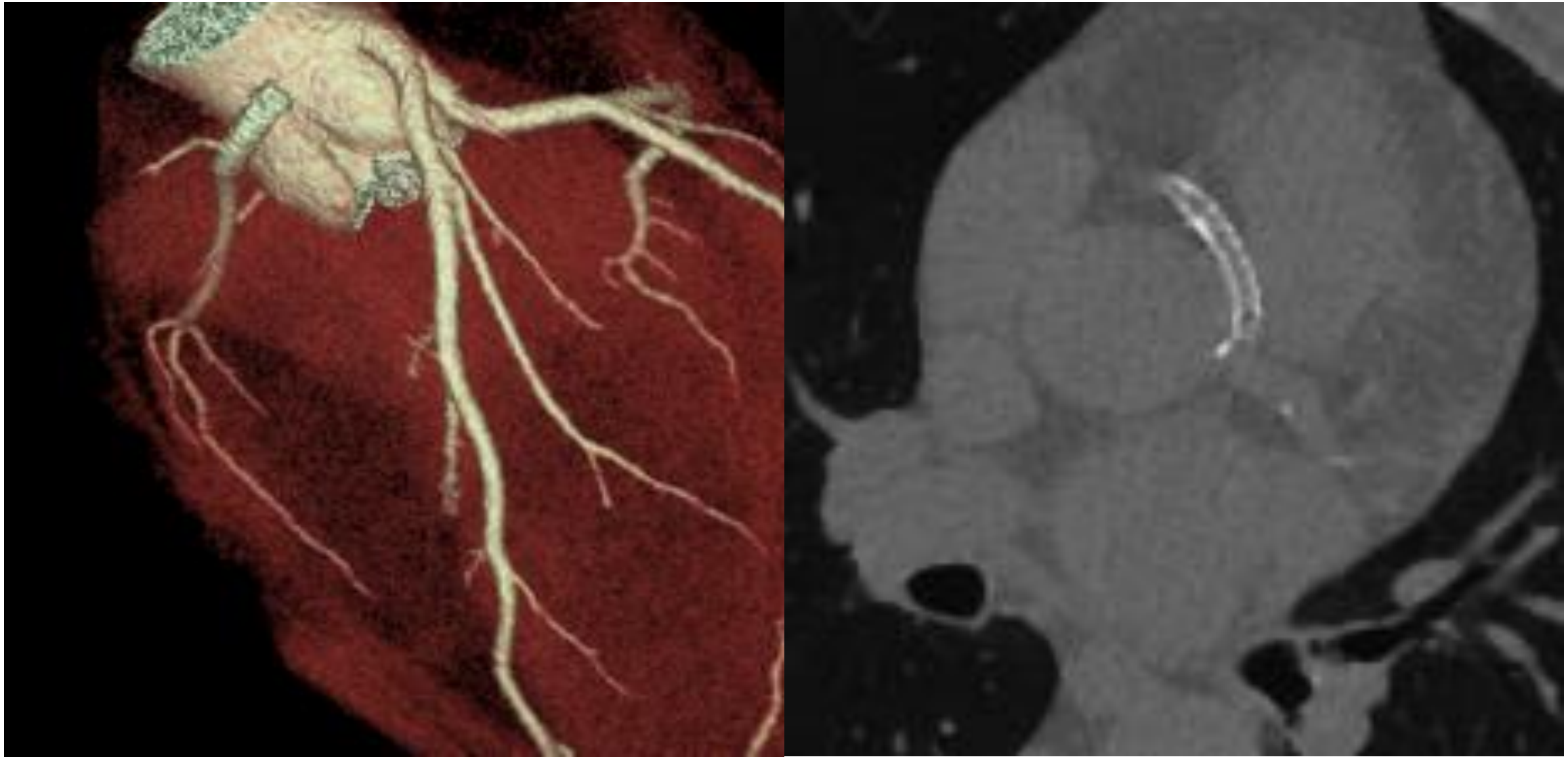
PCI

PCI





CT scan - 6 months



ANOCOR STENTING registry

Multicenter prospective observational study

- ARCA with interarterial course with/without intramural pathway
- Age ≥ 25 years
- No history of aborted sudden death
- Ischemic symptoms and/or documented ischemia
- No significant associated CAD
- PCI under endovascular imaging guidance
- CT follow-up at 6-12 months
- Clinical follow-up at 6, 12 and 60 months

ANOCOR STENTING registry

Baseline and angiographic characteristics

Inclusion period: 2014-2021	N=20
Mean age , years	52 (29-81)
Male sex, n (%)	12 (60)
Presentation	
ACS, n (%)	2 (10)
Stable angina,n (%)	15 (75)
Silent ischemia, n (%)	2 (10)
Syncope, n (%)	1 (5)
Angiography	
ARCA with interarterial course, n (%)	20 (100)
Intramural segment, n (%)	15 (75)

ANOCOR STENTING registry

Procedural characteristics

	N=20
Successful stenting, n (%)	20 (100)
DES use, n (%)	19 (95)
Radial access, n (%)	9 (45)
IVUS/OCT guidance, n (%)	17 (85)
Mean stent diameter (mm)	3.5
Mean stent length (mm)	27
Mean fluoroscopic time (min)	19

ANOCOR STENTING registry

Outcomes

	N=20
Mean troponin (microg/L) at day 1	0.47
In-hospital complications, n (%)	0 (0)
In-stent restenosis rate, n (%)	2 (10)
Stent compression on CT-scan, n (%)	0 (0)
Death during follow-up, n (%)	0 (0)

PCI for anomalous origin of coronary arteries (AOCA)

Stenting of interarterial course of right AOCA

- Not recommended in current european guidelines.
- Interarterial segment stenting of right AOCA appears feasible and safe.
- A longer follow-up and larger population are needed to know whether this technique is suitable for a next therapeutic algorithm.

Thank you