PCI Fellowship course
Angiography: Interpretation

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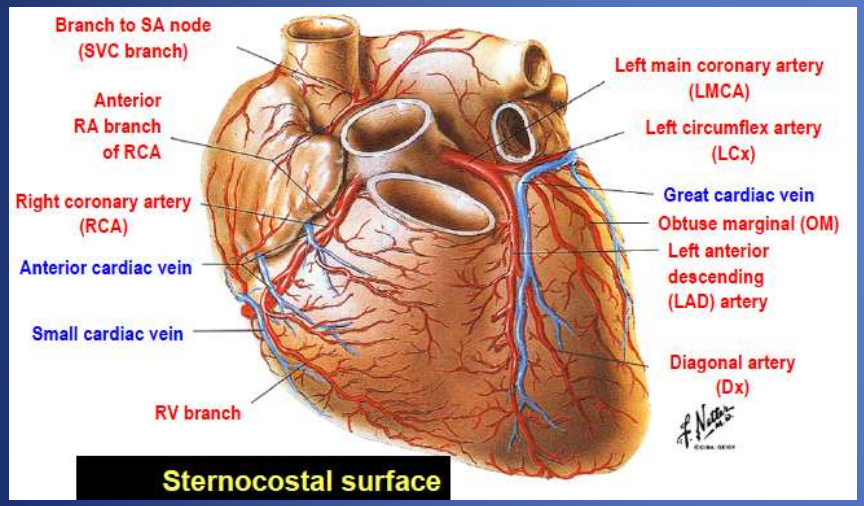
Introduction

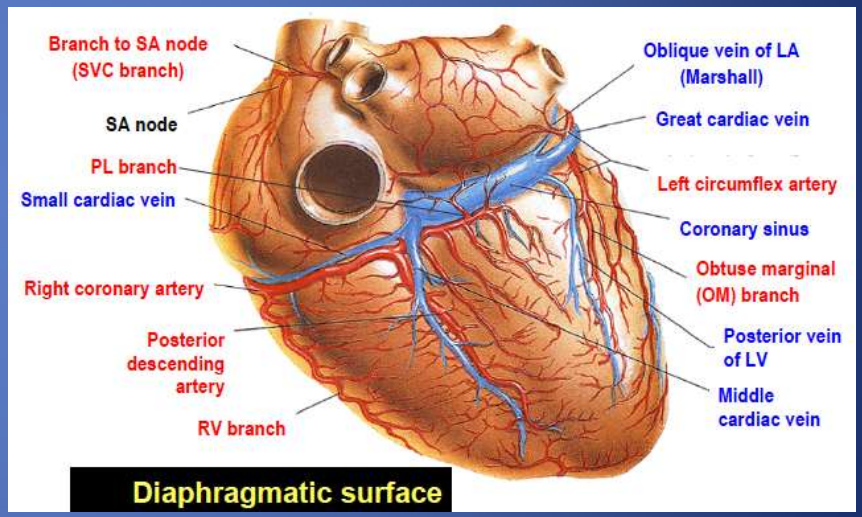
Coronary angiography should be performed in standard views in orthogonal planes to visualize the lesion and serve as a roadmap for PCI

Angiogram-Interpretation

- Lesion quantification in at least 2 orthogonal views:
  - Severity
  - Calcification
  - Presence of ulceration/thrombus
  - Degree of tortuosity
  - ACC/AHA lesion classification
  - Reference vessel size
- Grading TIMI flow
- Grading TIMI myocardial perfusion blush grade
- Identifying and quantifying coronary collaterals

Coronary anatomy





Courtesy of Dr JH Lee

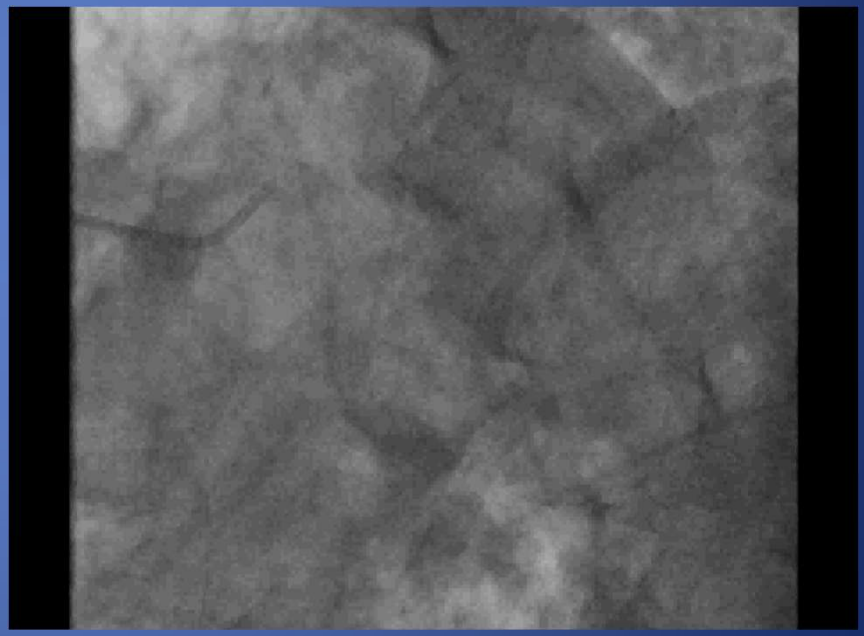
Outlines

1. Standard coronary angiographic views
2. Cases

Standard views in UCH – Left side (1)

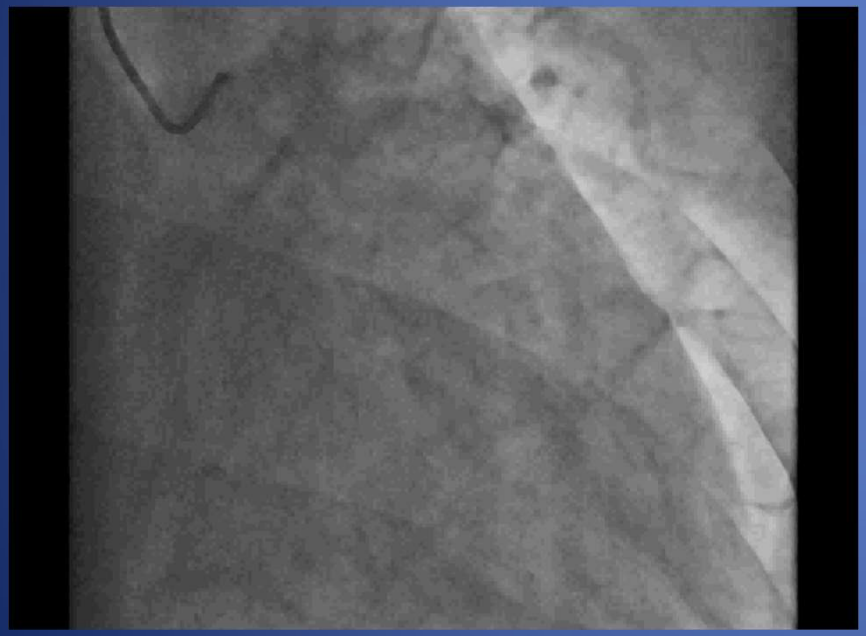
AP Cranial 30

LAO 50 Caudal 25 (spider view)



Standard views in UCH – Left side (2)

RAO 35 Caudal 20



LAO 50 Cranial 20

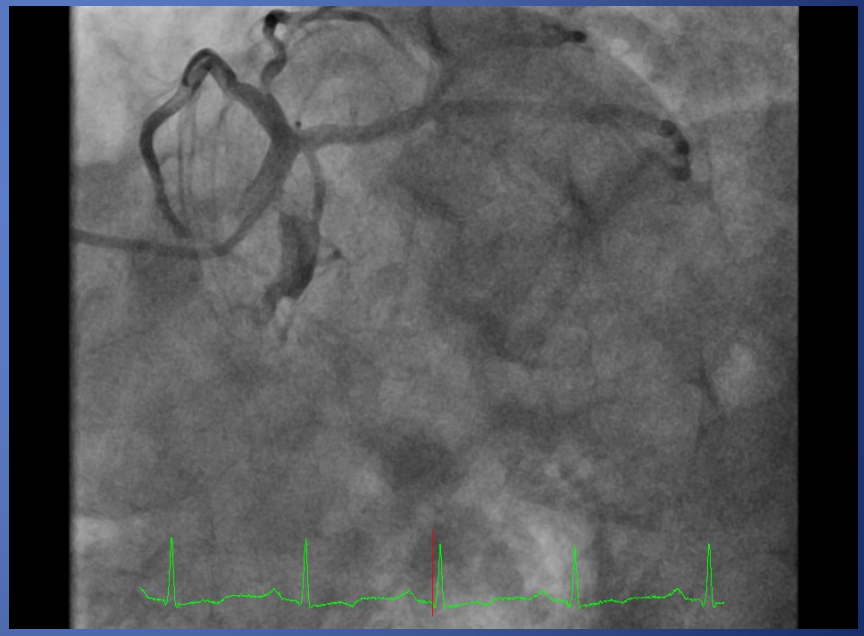
Standard views in UCH – Left side (1)

- **LAO-Caudal view:**

40^0 to 60^0 LAO and 10^0 to 30^0 caudal

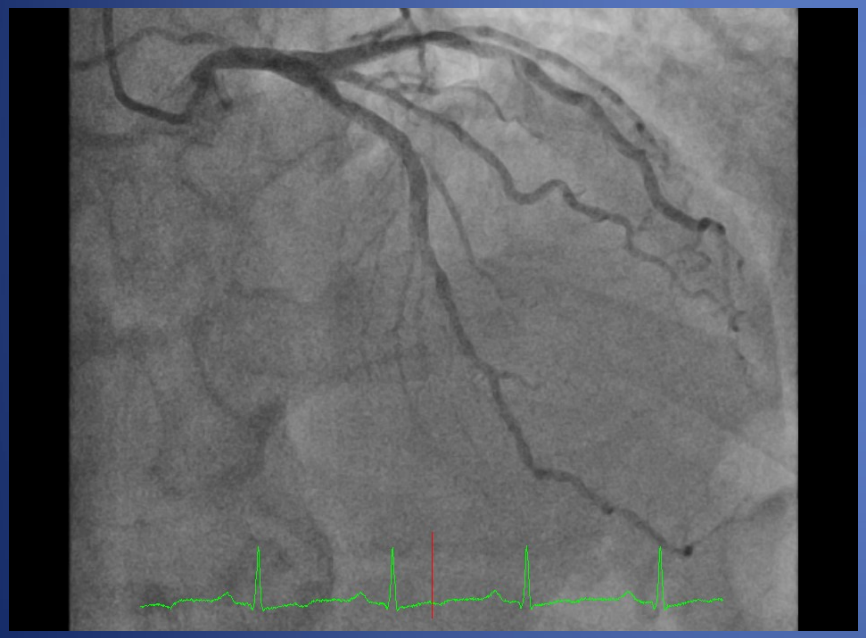
- **Best for visualizing left main, proximal LAD and proximal LCx**

LAO 50 Caudal 25 (spider view)



Standard views in UCH – Left side (1)

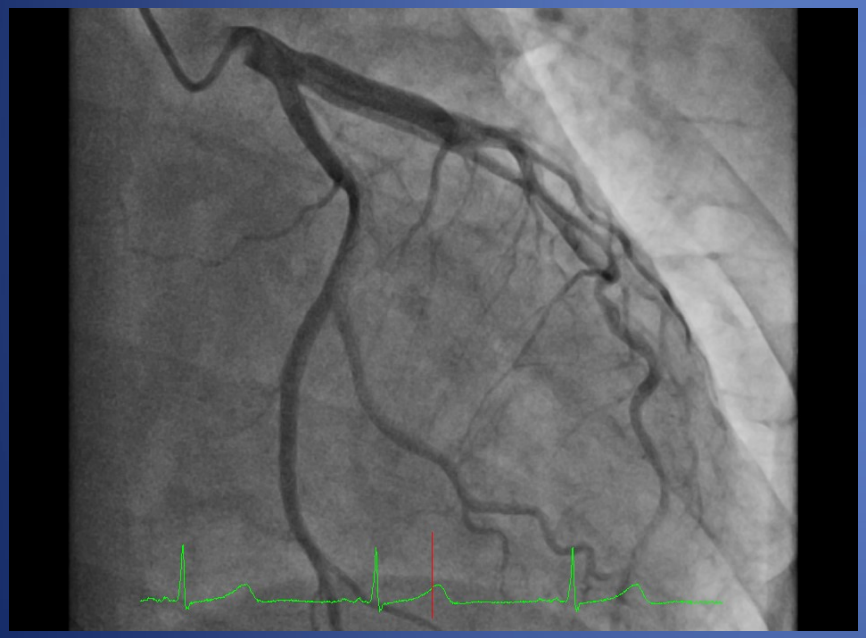
AP Cranial 30



- **Shallow RAO-Cranial view**:
- 0^0 to 10^0 RAO and 25^0 to 40^0 cranial
- **Best for visualizing mid and distal LAD**
- **and the distal LCx (LPDA and LPL)**

Standard views in UCH – Left side (2)

RAO 35 Caudal 20



RAO-Caudal view: **10^0 to 20^0 RAO and 15^0 to 20^0 caudal**

- **Best for visualizing left main bifurcation, proximal LAD and the proximal to mid LCx**

Standard views in UCH – Left side (2)

LAO-Cranial view: **30^0 to 60^0 LAO and 15^0 to 30^0 cranial**

Best for visualizing mid and distal LAD, and the distal LCx in a left dominant system

LAD 50 Cranial 20

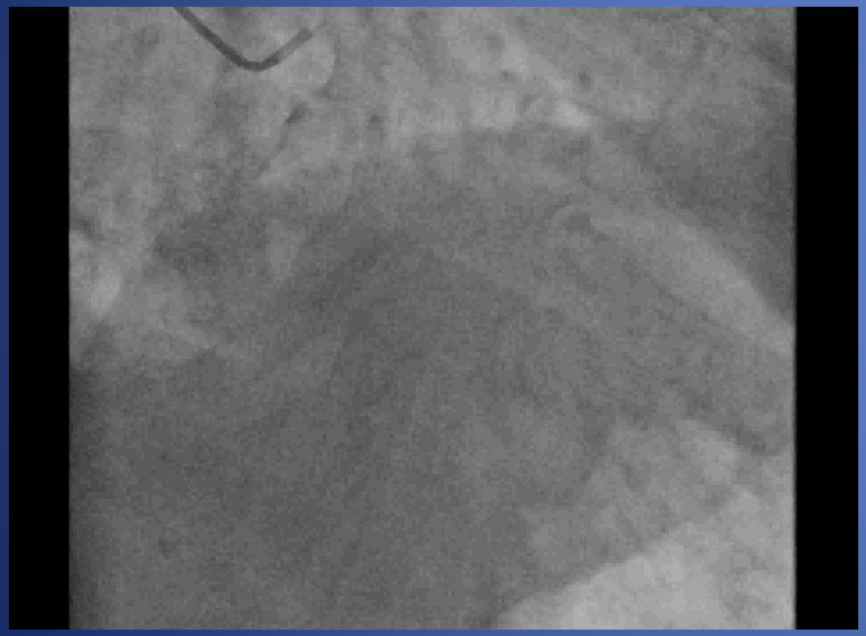
Standard Angiographic Views

Left Coronary Artery (other views)

- PA-Caudal view: 0^0 lateral and 20^0 to 30^0 caudal
  - Best for visualizing distal left main bifurcation as well as the proximal LAD and the proximal to mid LCx
- Left lateral view:
  - Best for visualizing proximal LCx, proximal and distal LAD
  - Also good for visualizing LIMA to LAD anastomotic site

Standard views in UCH – RCA

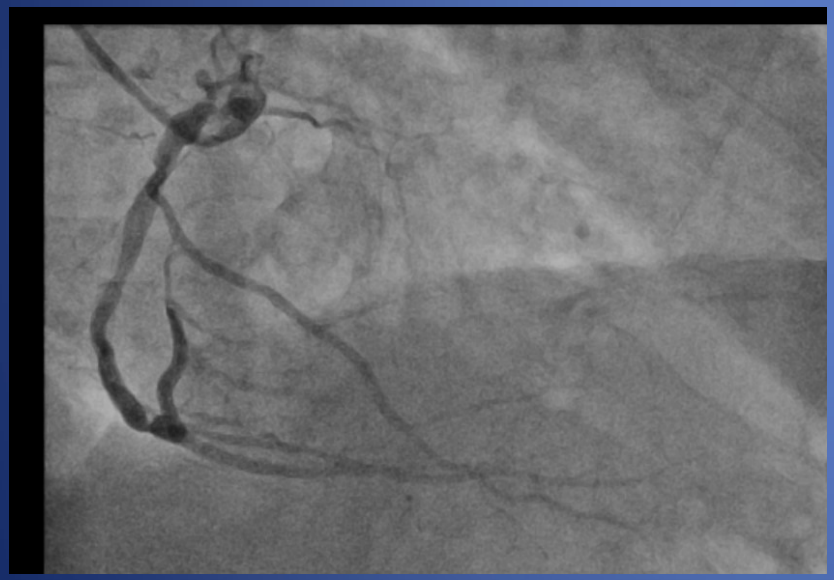
RAO 30



LAO 40

Standard views in UCH – RCA

RAO 30: best for mid RCA and PDA



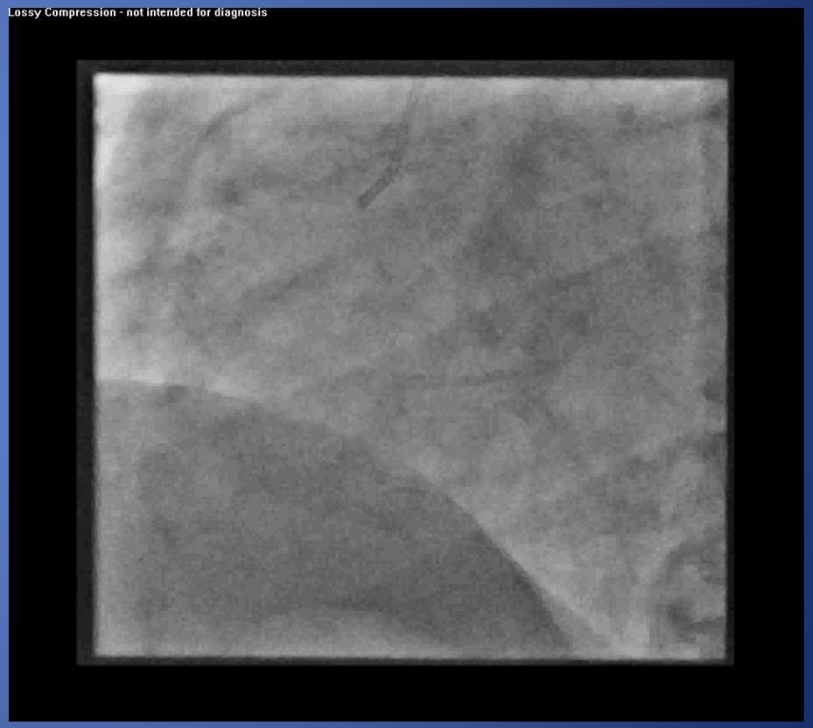
LAO 40: best for ostial and prox RCA

Personal tip

- Cranial view: usually better for distal segments
- Caudal view: usually better for proximal segments

ANGIOGRAM CASES

Case 1: RAO 30 and LAO 40



Which view is the best for PDA/PLV bifurcation

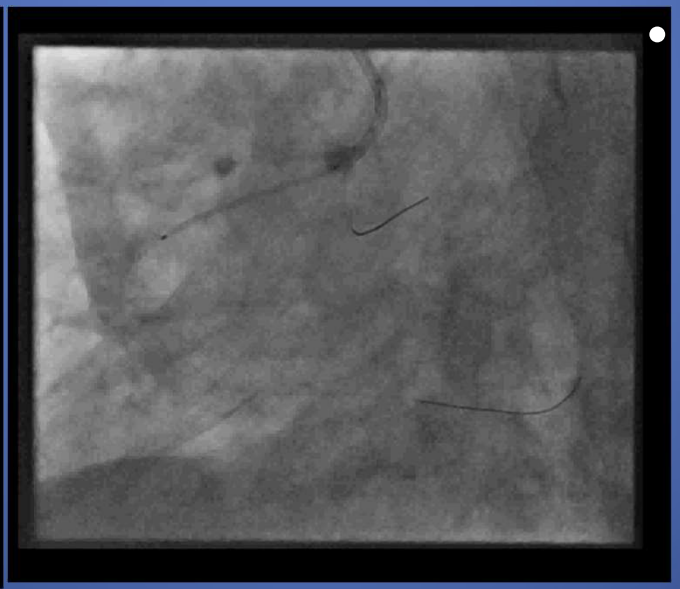
- A. RAO
- B. LAD
- C. AP Cranial
- D. AP Caudal

AP cranial: Best for visualizing distal RCA bifurcation and the PDA/PLV branches

Case 2: ostial RCA

Usual LAO

LAO 40 Caudal 20

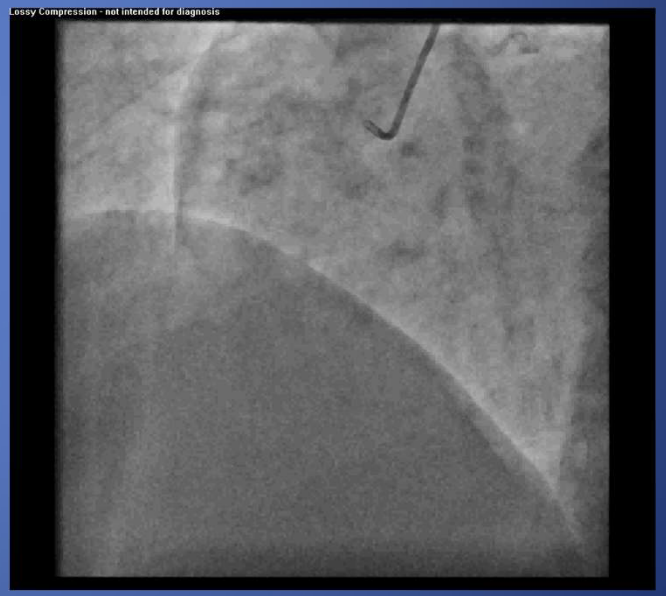


- View for oRCA: LAO caudal
- Or extreme LAO position (>50)

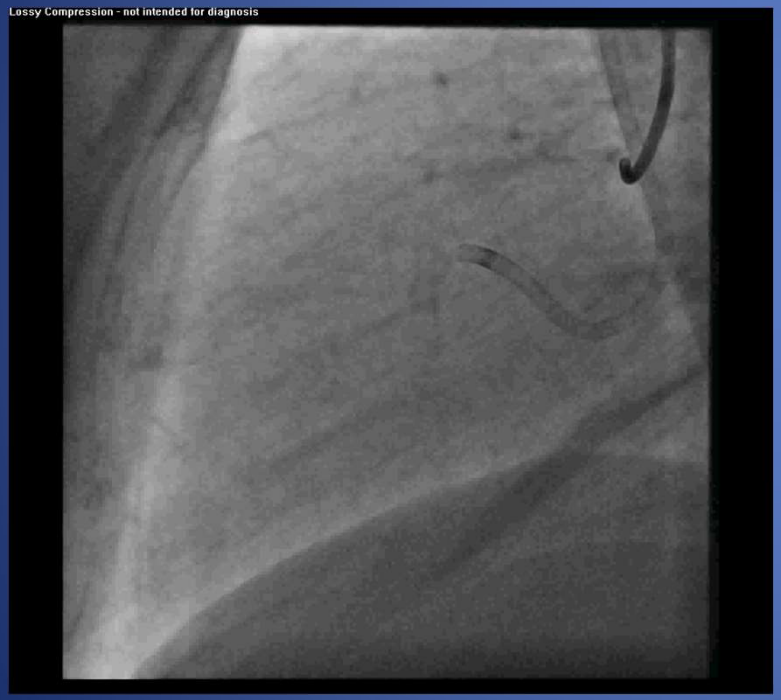
Case 3: mid RCA CTO

RAO 30

LAO 40

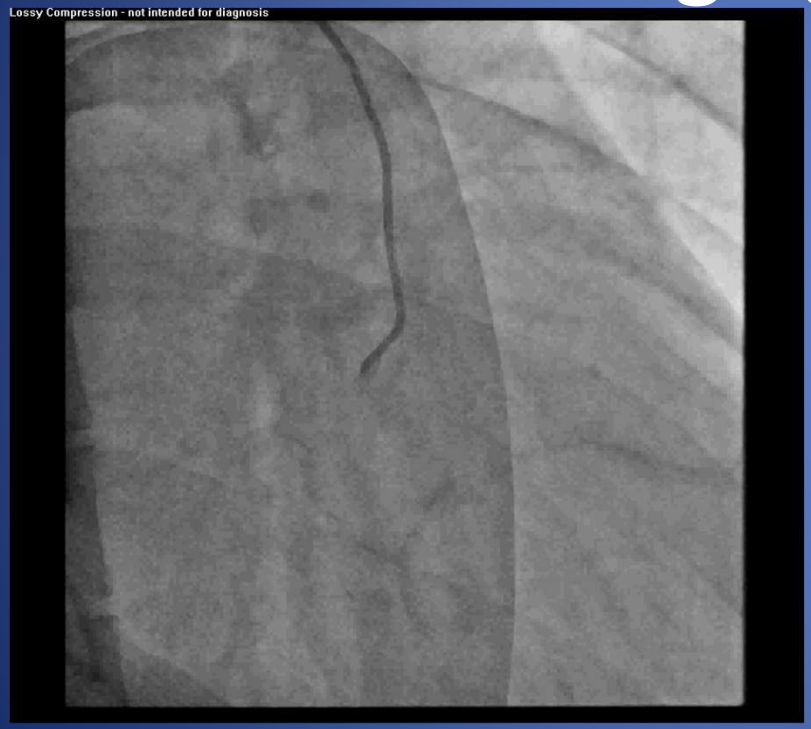


Case 3: mid RCA CTO (left lateral 90^0)



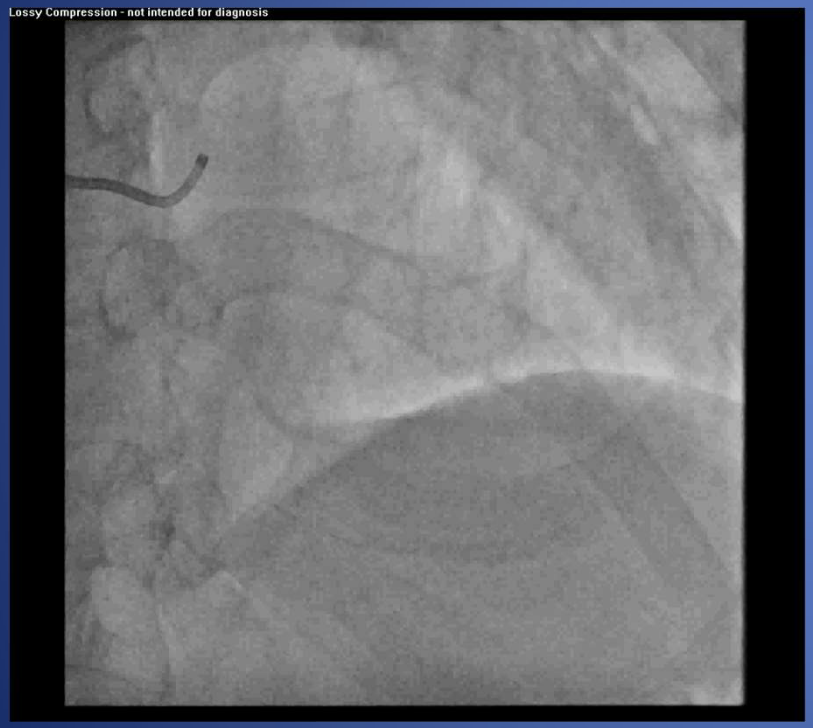
- Left lateral view:
- mid-portion of RCA
- Separation of RCA with its RV branches
- Ostium of RCA

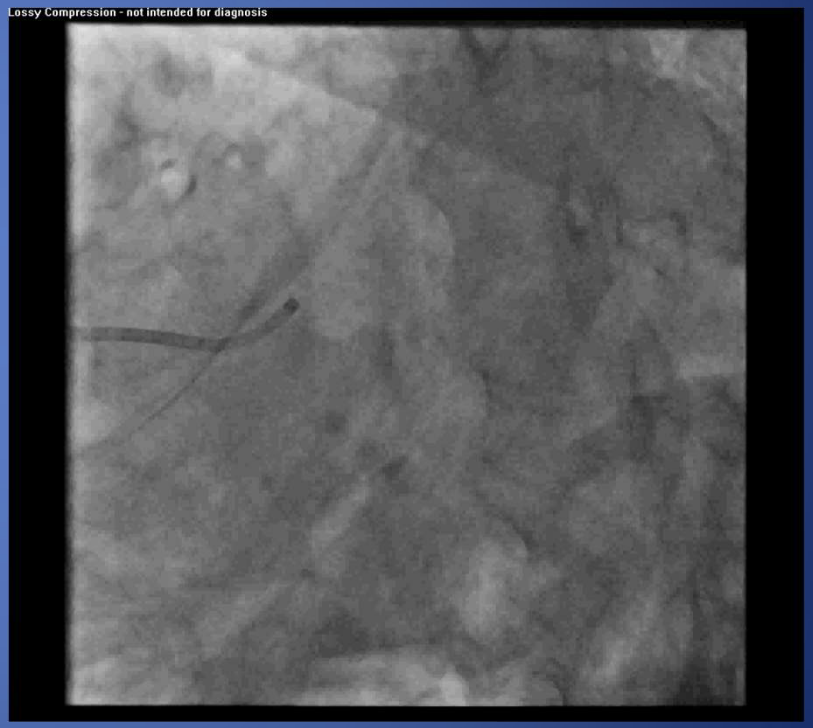
Case 4: Any problems with this angiogram?



- “deep seating” of the catheter → may miss an ostial lesion beyond which the catheter has moved
- An adequate reflux back of contrast into the aorta

Case 5: Any significant stenosis?

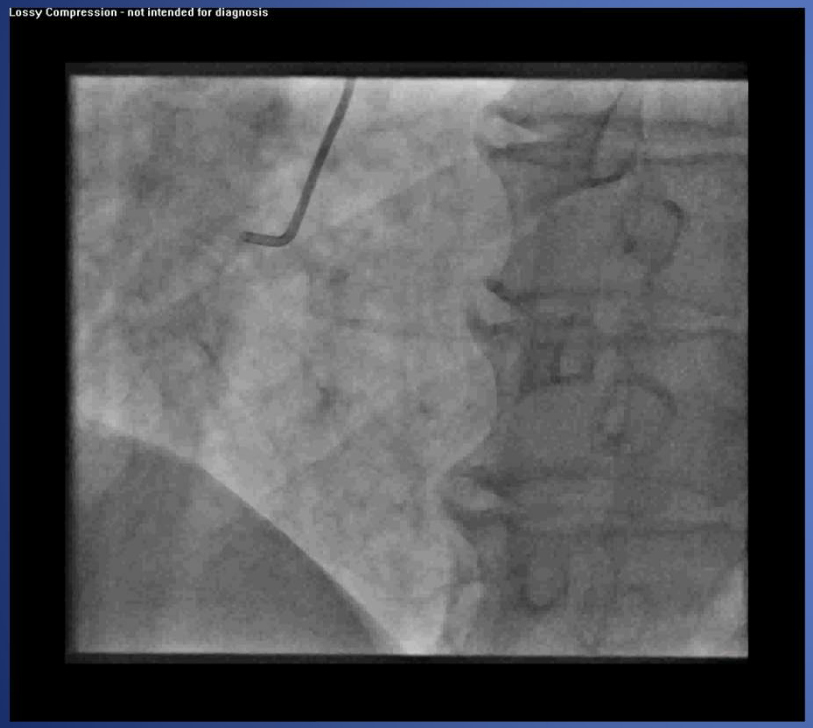




Post PCI to LM

- Don’t miss ostial lesions of major vessels!
- Need multiple views

Case 6: Is there significant oRCA disease?

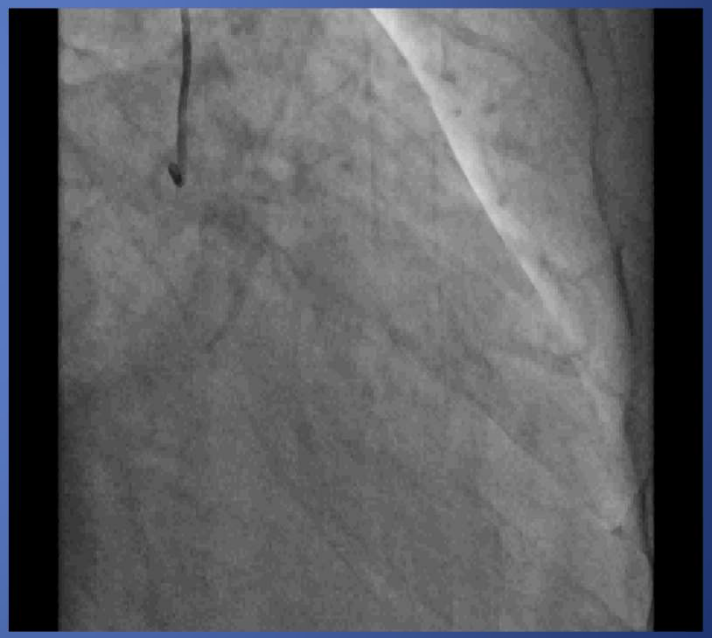


- A. Yes. Stent it!
- B. No. Leave it alone
- C. IVUS/OCT/physiology
- D. Repeat after IC nitrocine

Case 6, another example:

Ostial LAD disease, ? Distal LAD

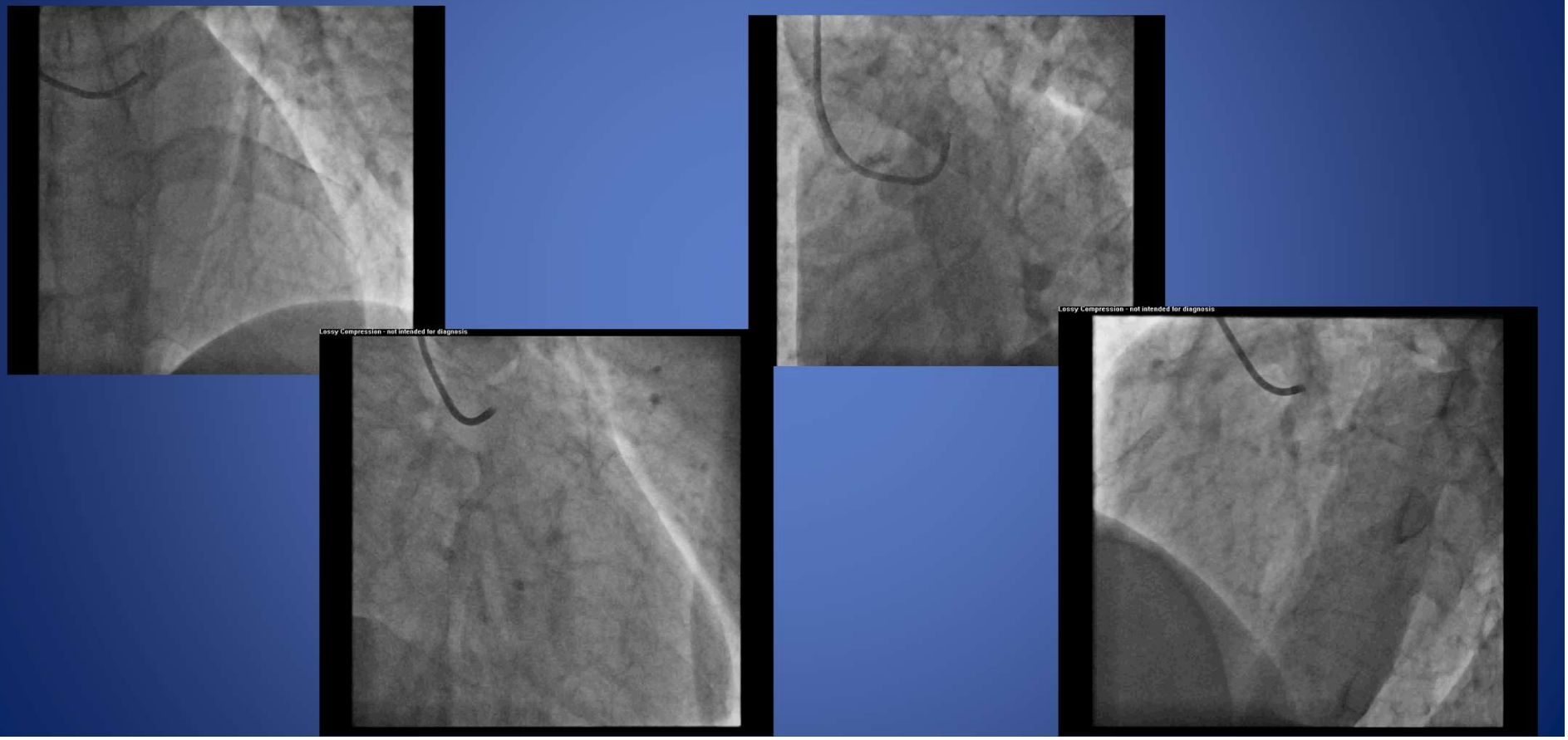
After IC nitrocine



Coronary artery spasm

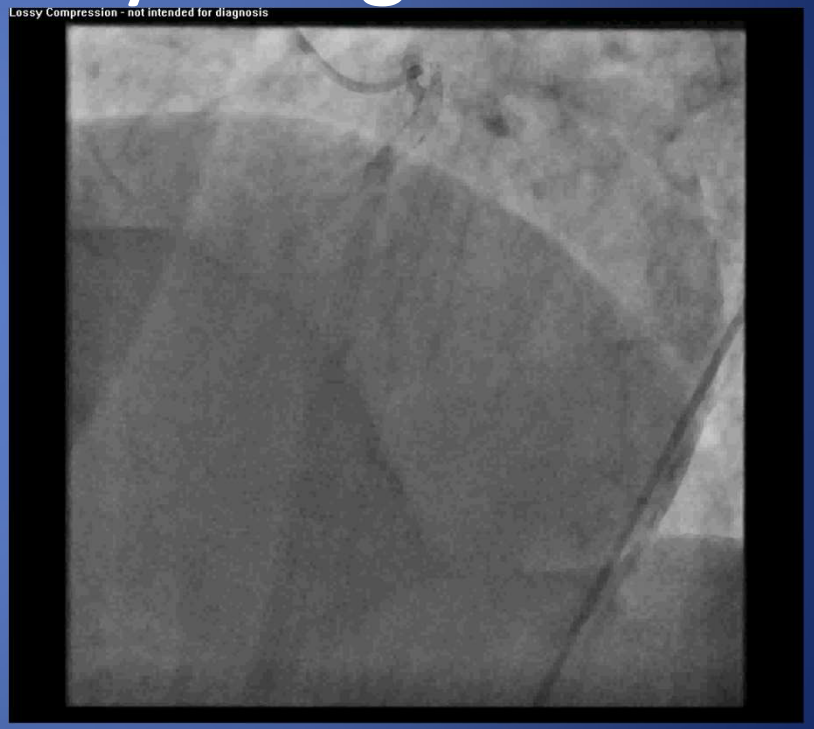
- It is routine in many lab to administer IC nitroglycerin to relieve catheter induced spasm that can mimic stenosis (more common in RCA)
- Tips: for ostial RCA → IC nitrocine → partial disengage the catheter and do a non-selective injection

Case 7: distal LM/ostial LAD/LCx, which view?



Distal LM bifurcation/ostial LAD & LCx – AP Caudal view

Another example of ostial LAD/LCx – cranial views usually not good



Best is AP caudal view

- Don’t miss ostial lesions of major vessels
- Need extra / multiple views

Case 8: ostial LM stenting

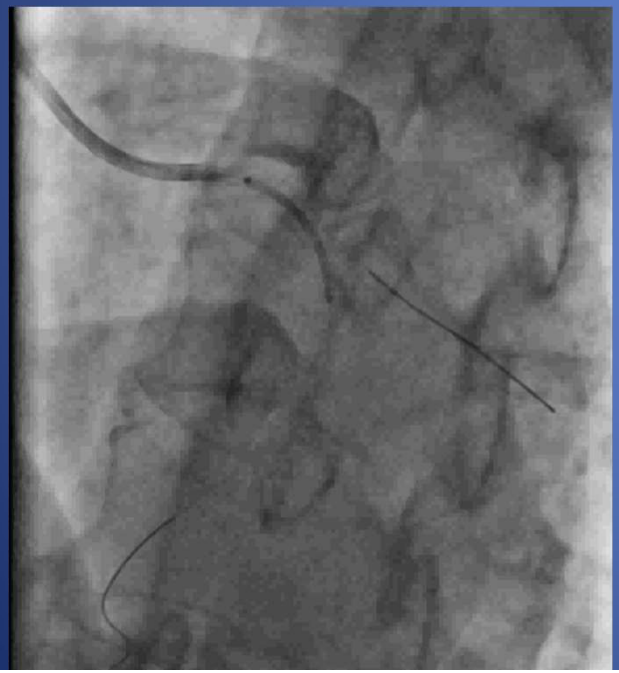
LAO 20 Cranial 20

- Caudal views (RAO caudal/spider) → usually not good
- Best is bi-cranial view
- Try LAD 20 Cranial 20

Case example: ostial LM stenting

Best view is usually LAO cranial

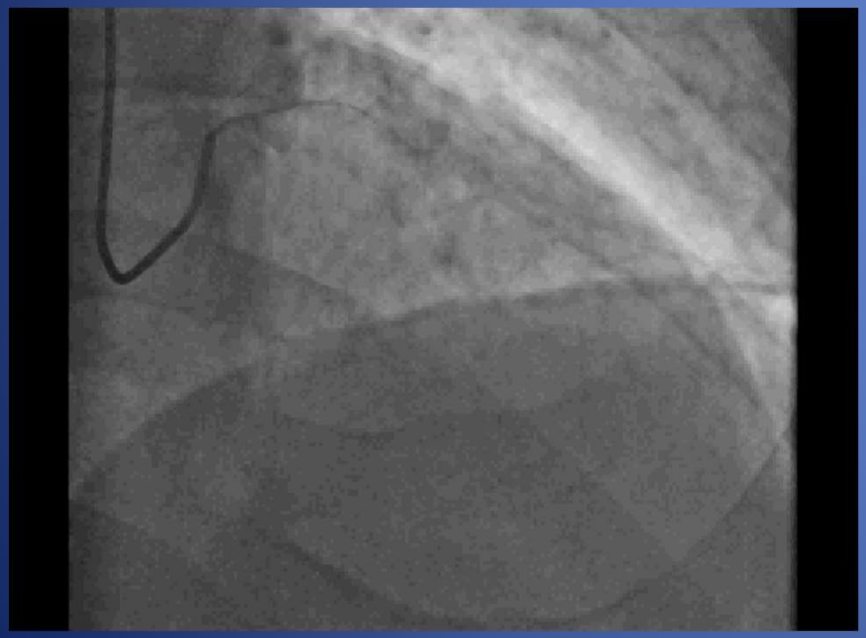
(or bi-cranial view)



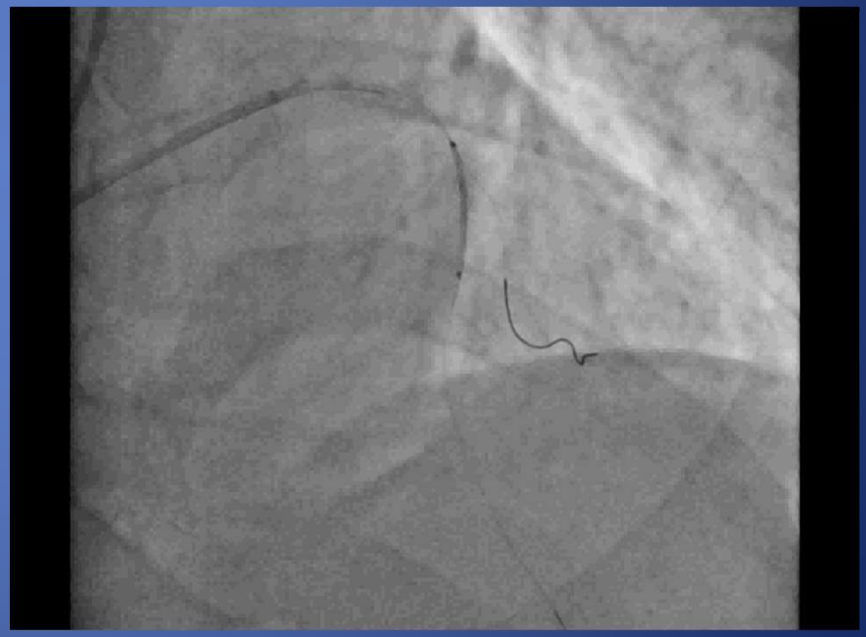
LAO 22 cranial 21

Case 9: LAD/Diagonal Bifurcation

RAO 15 Cranial 35: ostium of diagonal not well seen and overlapping by LCx, ? Which view

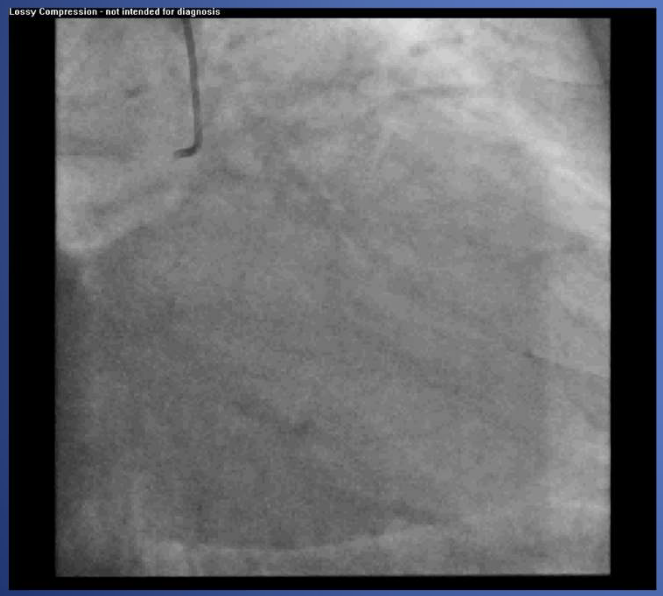


Shallow LAO Cranial view
(LAO 10 Cranial 30)



Case 10: distal LCx in L dominant system

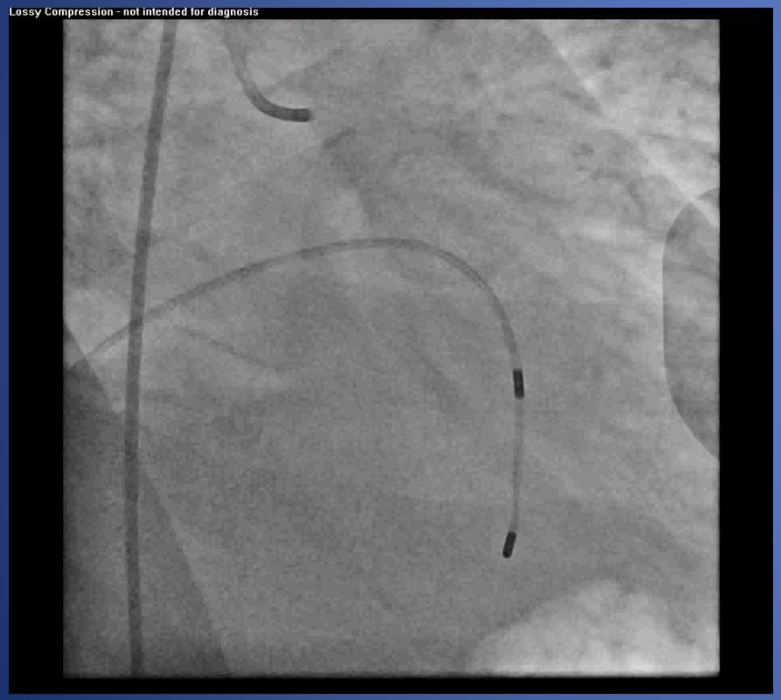
RAO caudal: cannot see the dLCx CTO clearly



Cranial views for distal LCx

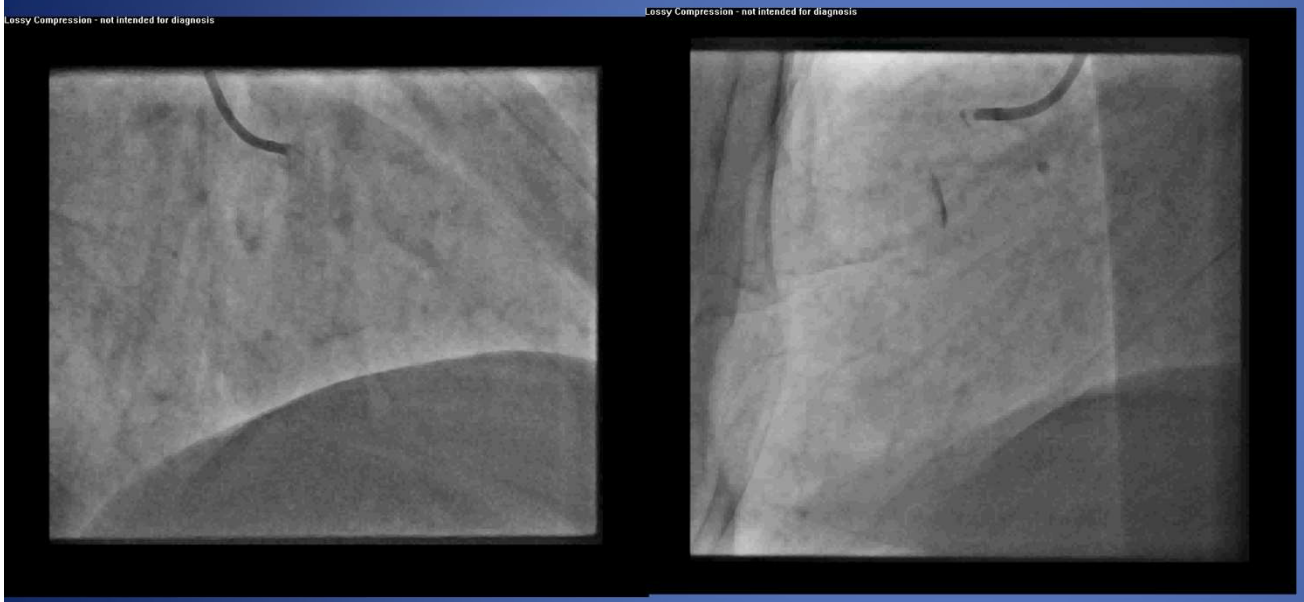
(RAO 20 Cranial 30)

Case example: left LCx in a L dominant system (bi-cranial views)



Case 11. M/65, NSTEMI, diagnosis?

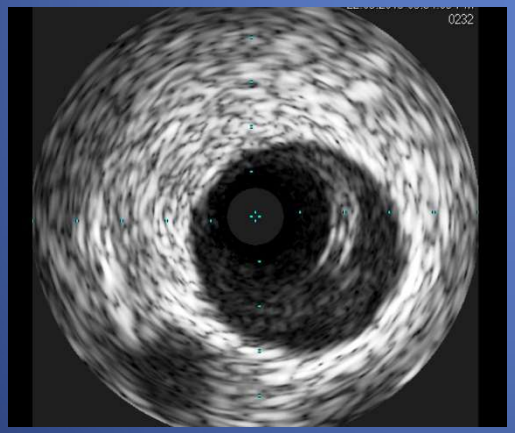
M/65, NSTEMI, diagnosis?



A. Aneurysm
B. Pseudoaneurysm
C. Thrombus
D. Dissection and intramural haematoma

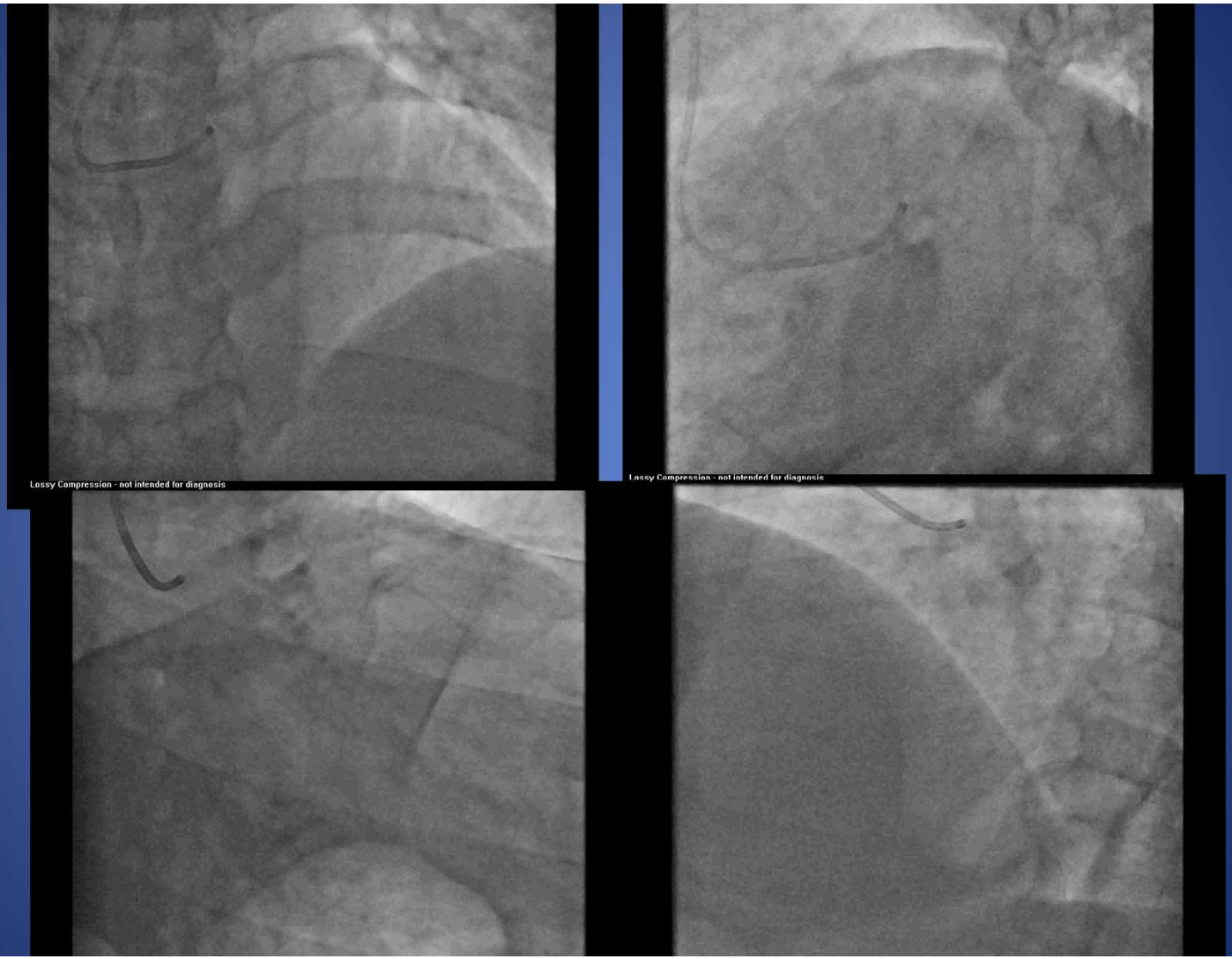
Dissection of plaque with IMH

- Confirmed with OCT & IVUS
- PCI with long stents



Case 12

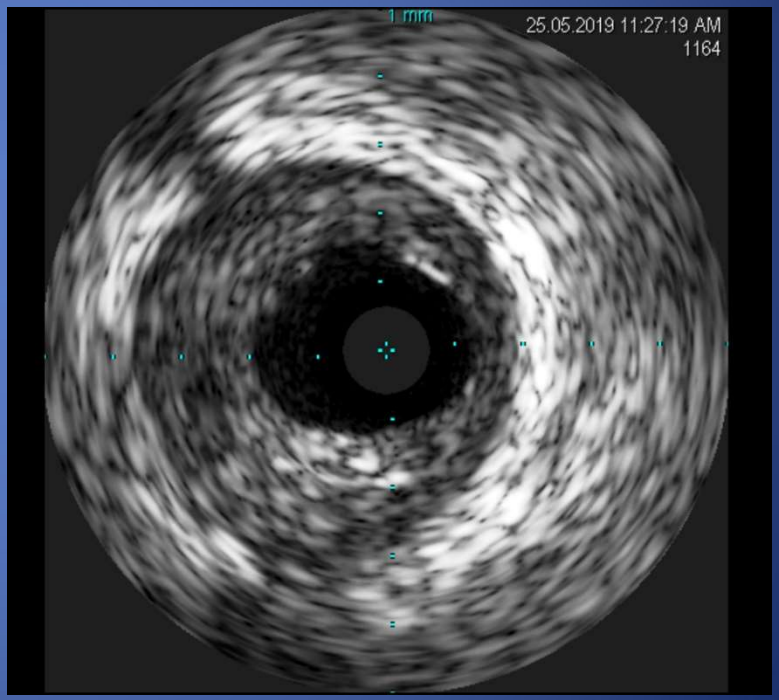
M/75, ischaemic APO



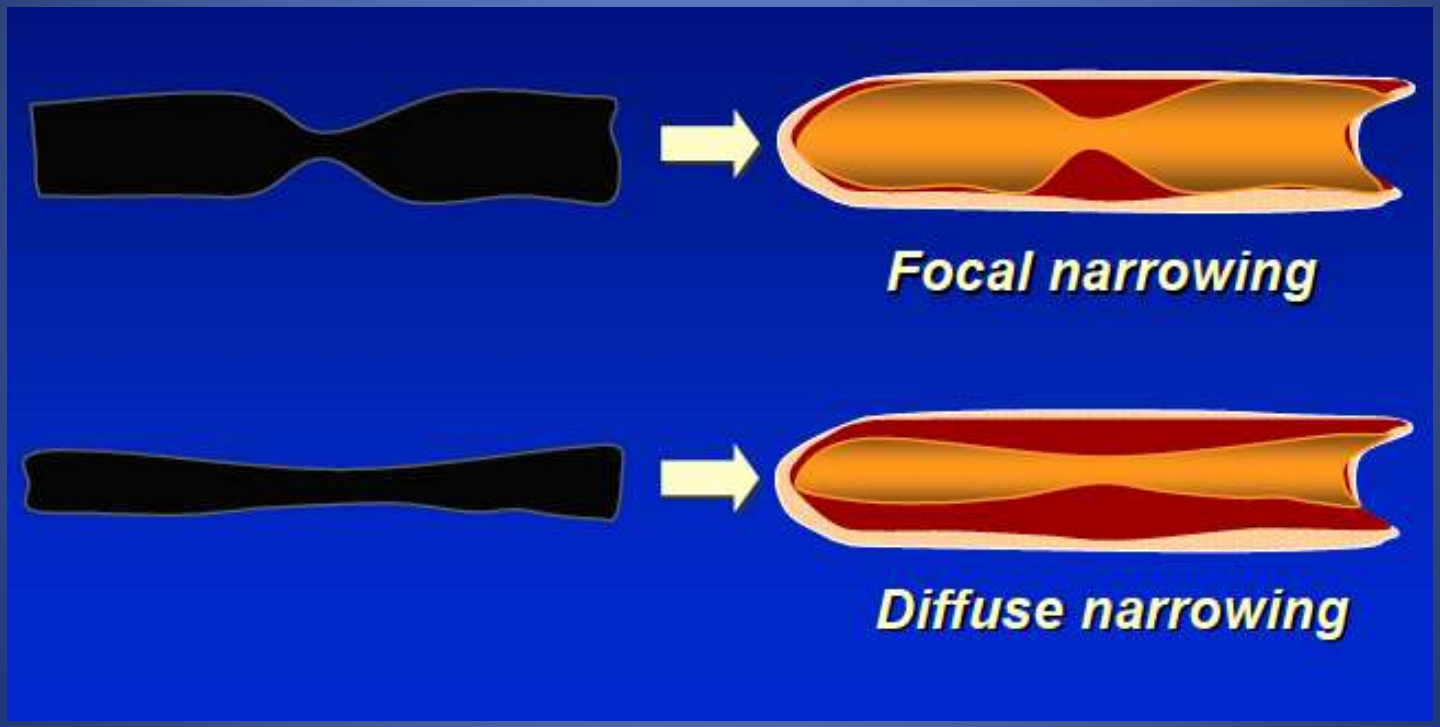
Any LM disease?

- Problems:
- Short LM, “deep seating” of catheter inside LM
- Pitfall: may miss an ostial or LM lesion
- Adequate reflux of contrast back into aorta to ensure that an ostial lesion is not present

Repeat angiogram after disengaging the catheter: any LM disease?



Pitfalls of coronary angiogram: Lumen-o-gram



Pitfalls of coronary angiogram: Lumen-o-gram: how to solve it

- Multiple projections with different angles
- Have a sense of caliber of major coronaries

LMCA 4.5 ± 0.5mm

LAD 3.7 ± 0.4mm

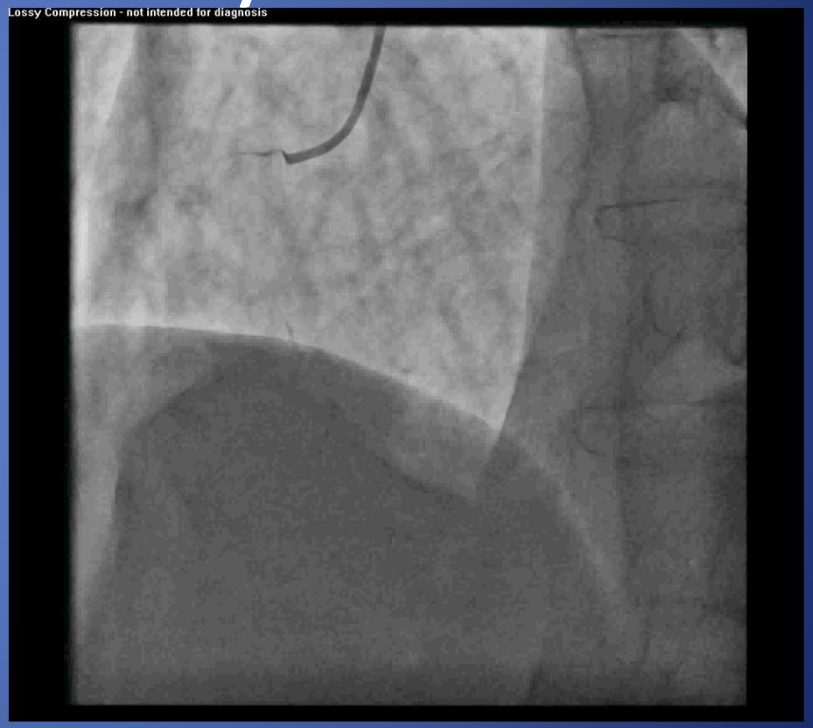
LCx 3.0mm

RCA 3.9 ± 0.6mm for dominant

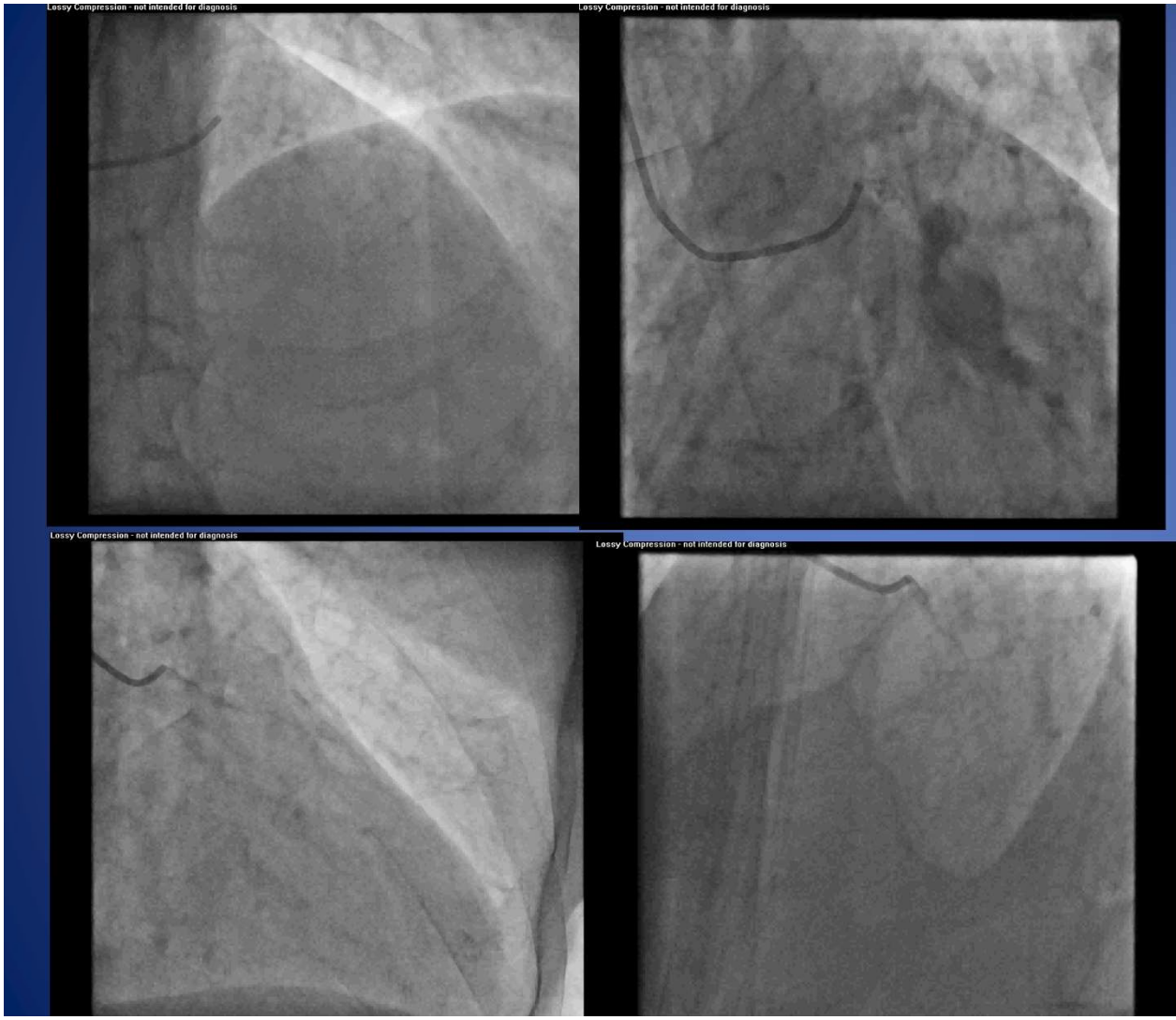
- Compare the size of target vessel with other segments
- IVUS/OCT/functional study

Courtesy of Dr JH Lee

Case 13. M/60, inf STEMI, PCI 24 hrs after successful lytics



A. Anomalous coronary artery origin
B. Coronary artery fistula
C. Ostial LM disease
D. Spontaneous coronary artery dissection



Hints x absence of LCx artery:

1. When you see a very long “left-main” segment
2. Part of the LV is not supplied by any vessels
3. RAO caudal view helpful

When the LCx is absent in left coronary angiogram …

- Total occlusion at the ostium
- Super-selective injection
- Anomalous LCx origin

--> what to do when suspect an anomalous LCx origin

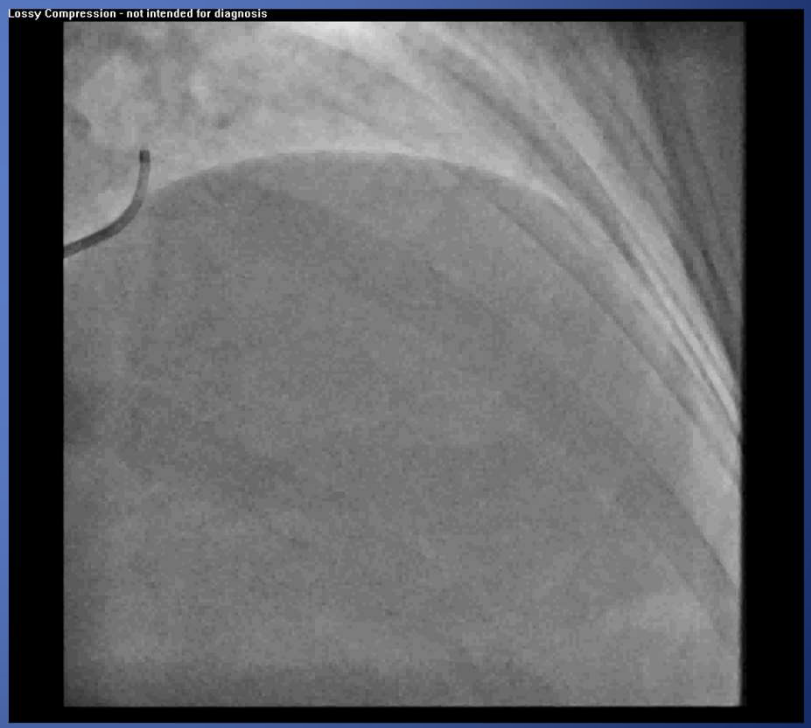
Most of time you can find the LCx by non-selective injection at R cusp

Case 14. F/45, no CV risk factors, NSTEMI, RCA normal

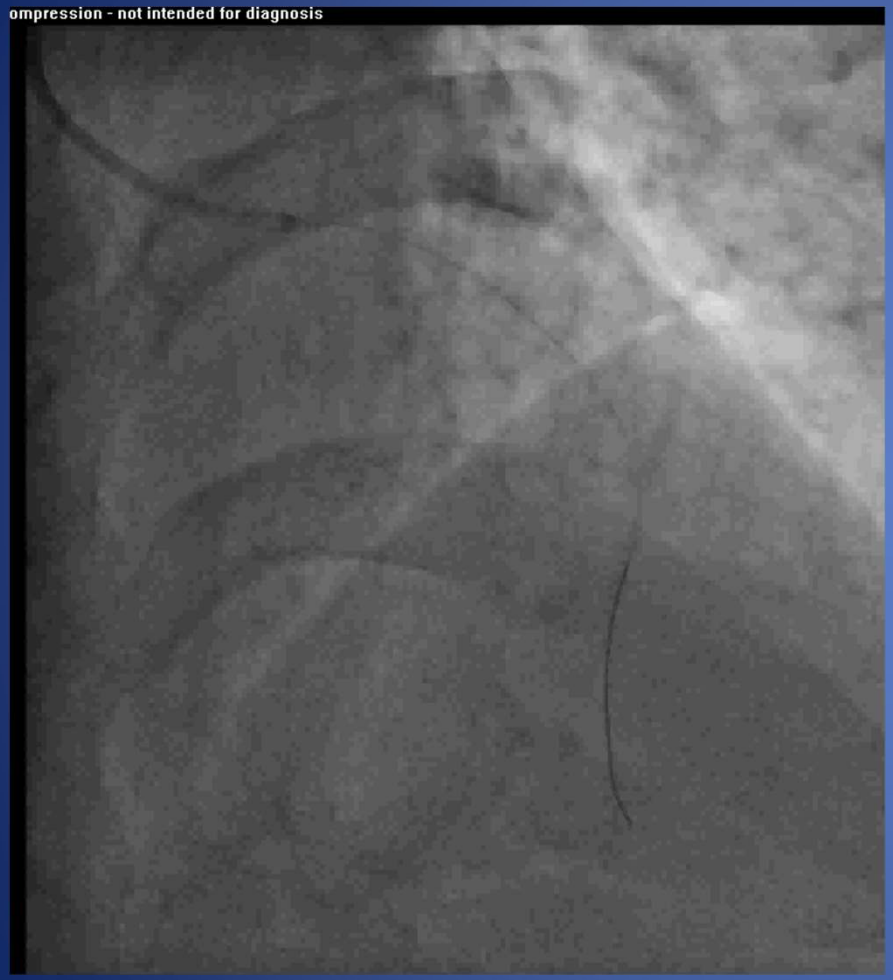
- Diagnosis?
- A. atherosclerotic coronary artery disease
- B. coronary artery spasm
- C. Myocardial bridging
- D. Spontaneous coronary artery dissection

Hints for spontaneous coronary artery dissection

- 1. Clinical history
  - Young female patient
  - Absence of CV risk factors
- 2. Majority of case: long and diffuse narrowing on angiography due to intramural haematoma (dissection plane <30% of cases)
- 3. Absence of coronary artery disease in other vessels



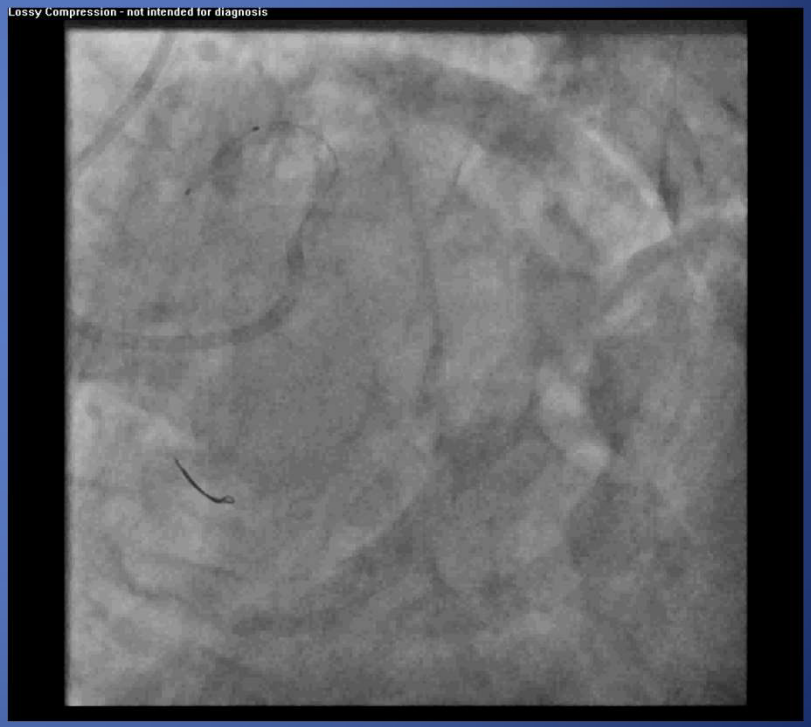
Restudy cc 3 months later



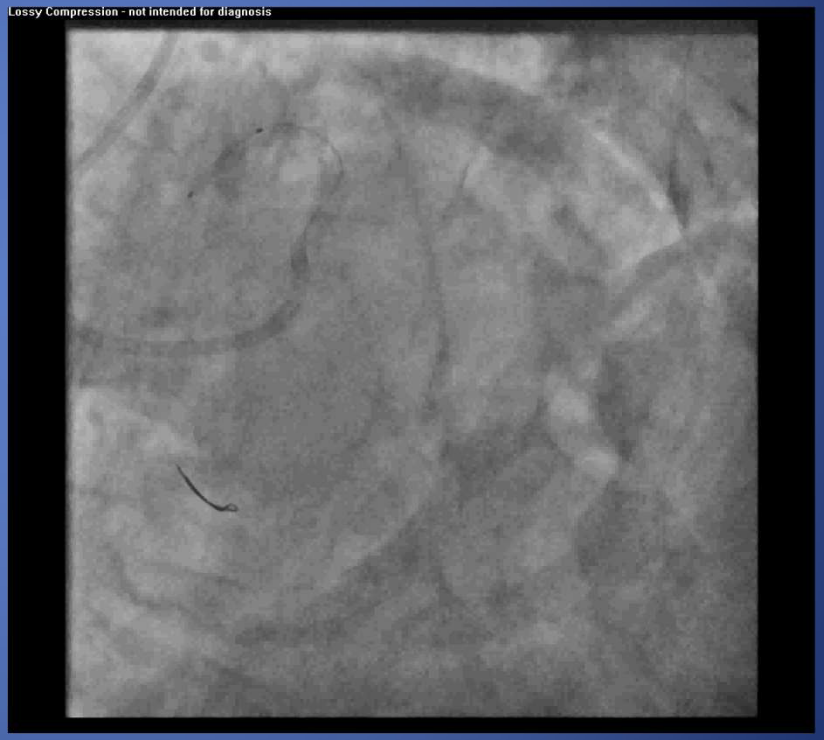
Case 15

- Air embolism
- Tips: watch out for air bubbles inside guiding catheter during fluoroscopy

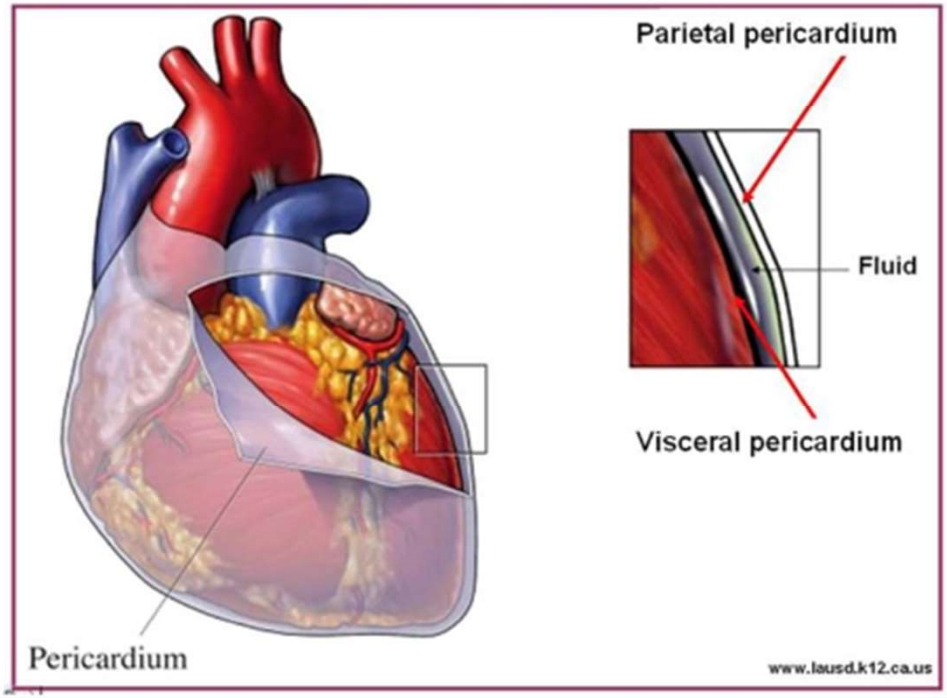
Case 16: What PCI complication(s) can you see?



Case 16. LAD perforation & pericardial effusion

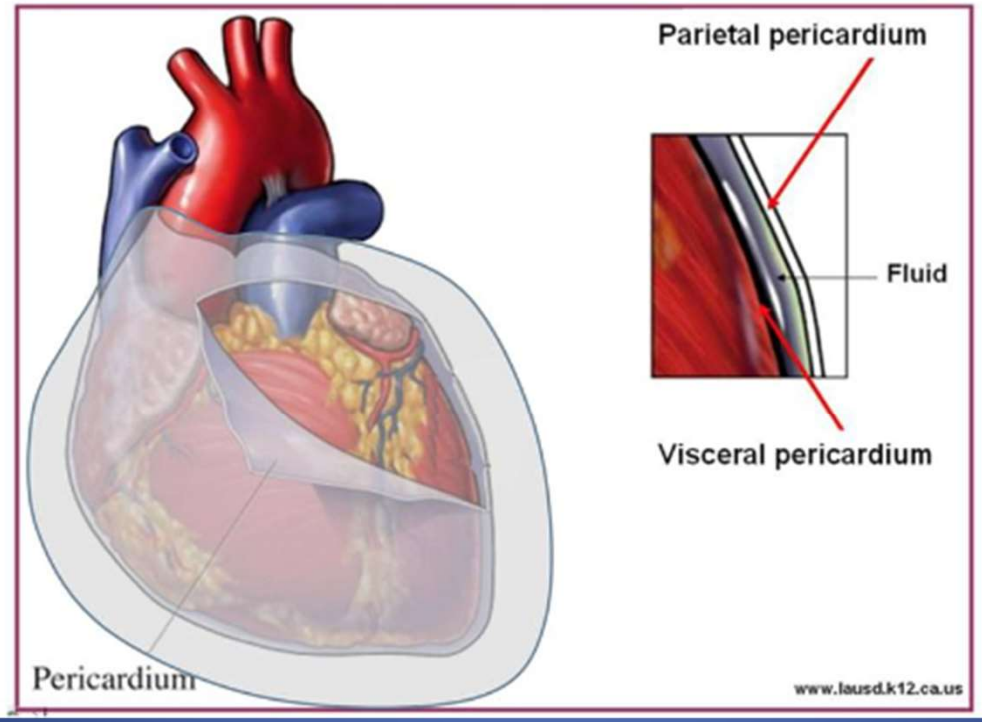


Lesson from Anatomy : Pericardium

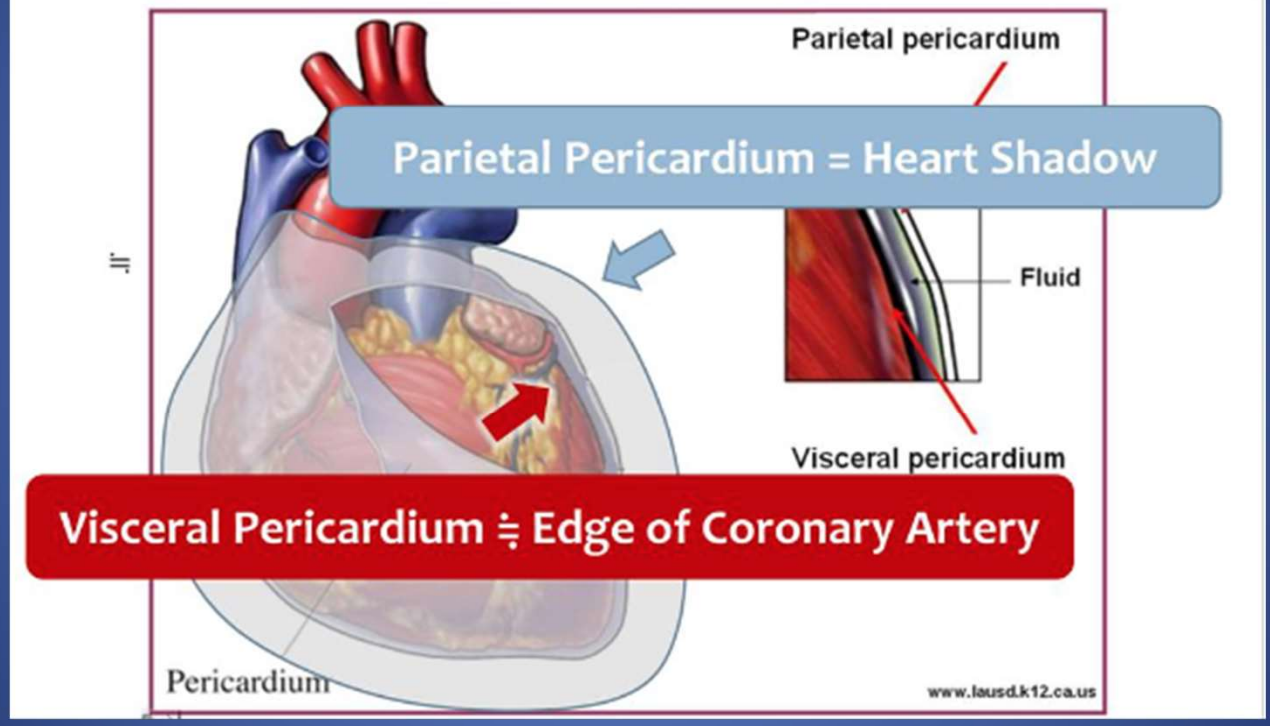


Courtesy of Dr. Sumitsuji

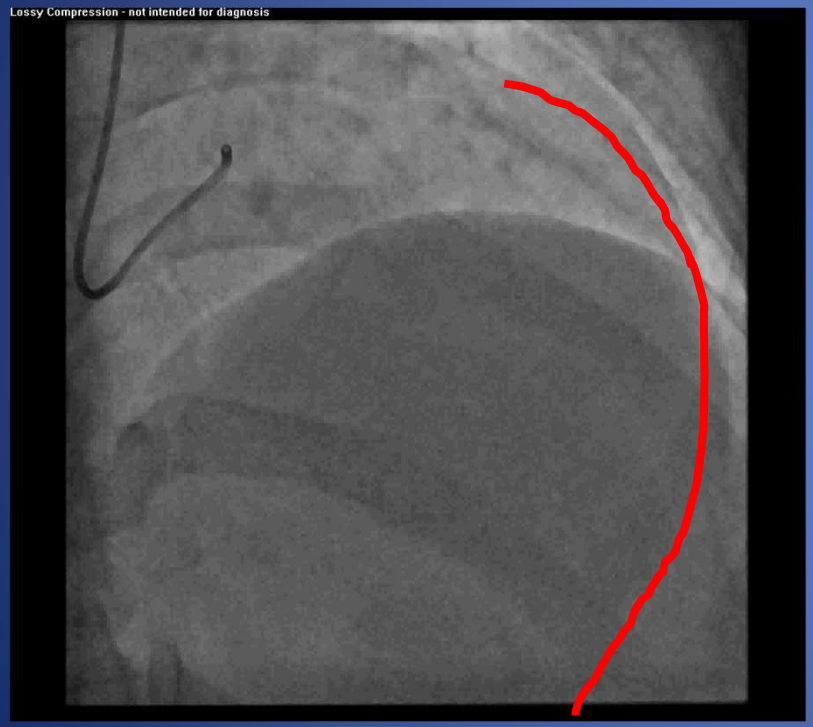
PE collect between Parietal Pericardium and Visceral Pericardium



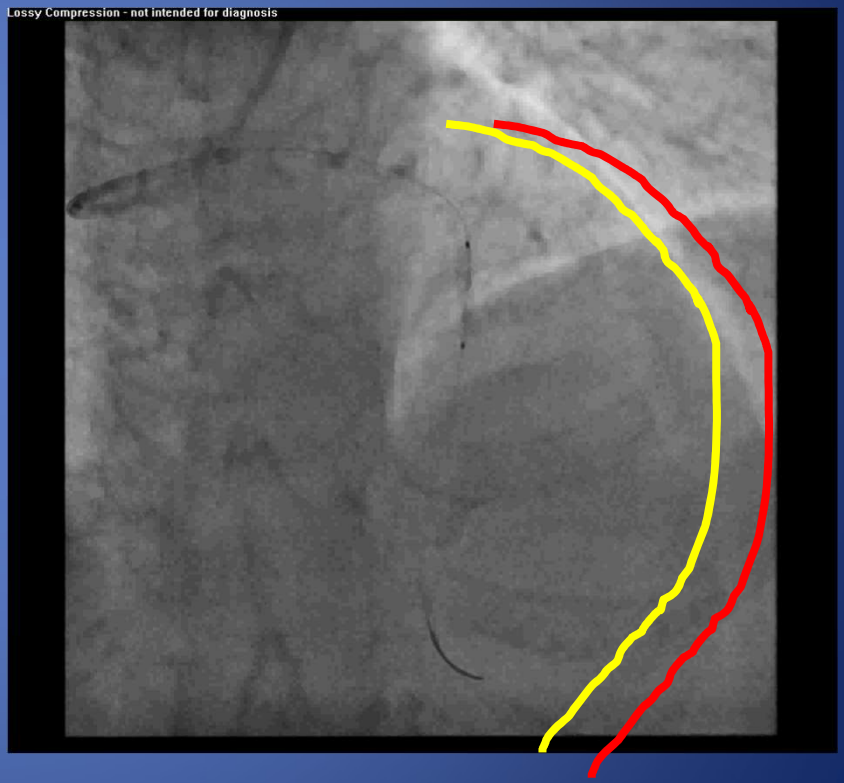
PE collect between Parietal Pericardium and Visceral Pericardium



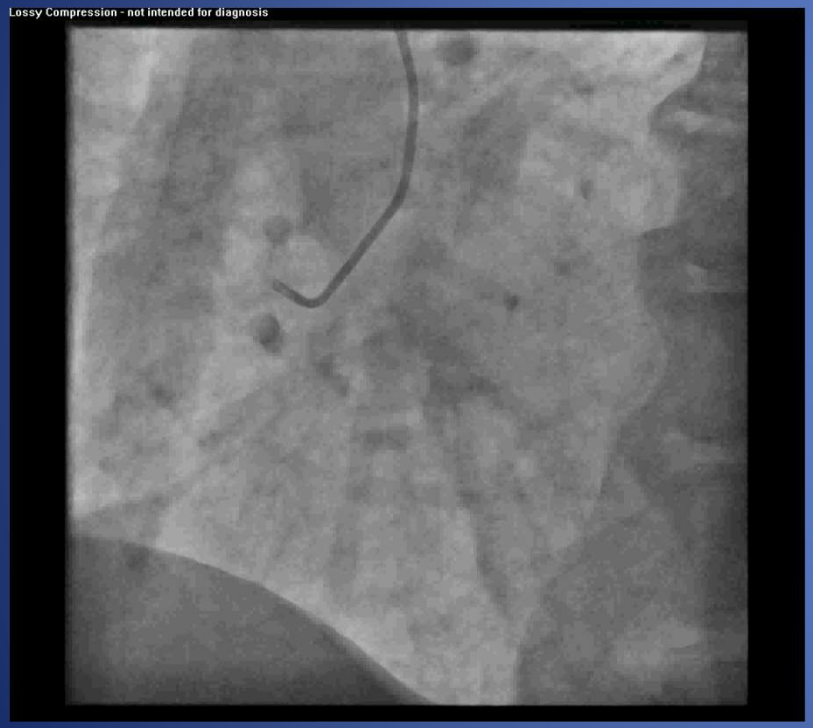
Normal –
Edge of arteries reach heart shadow
heart shadow: Moving



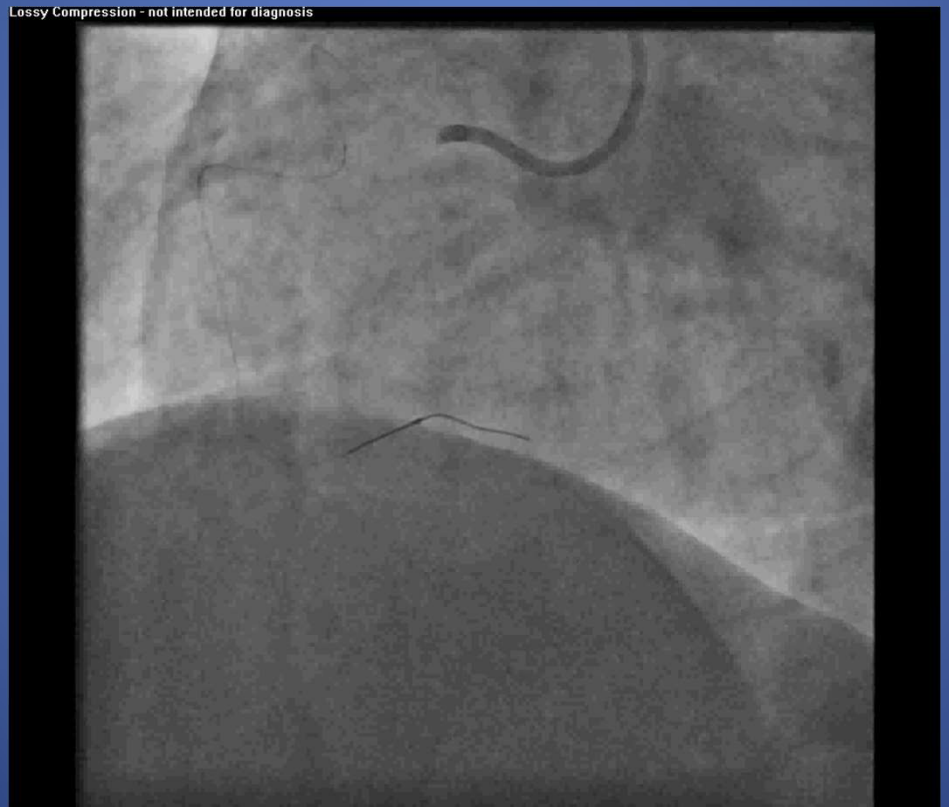
Pericardial effusion – not moving



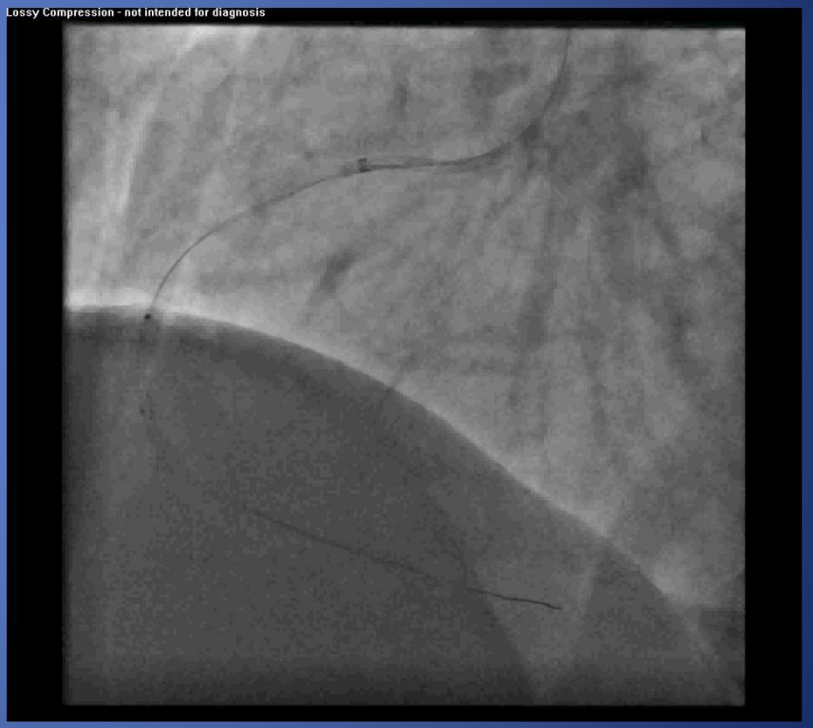
Case 17. 63/M, stable angina, cc LCx and PLV disease, PCI to LCx done



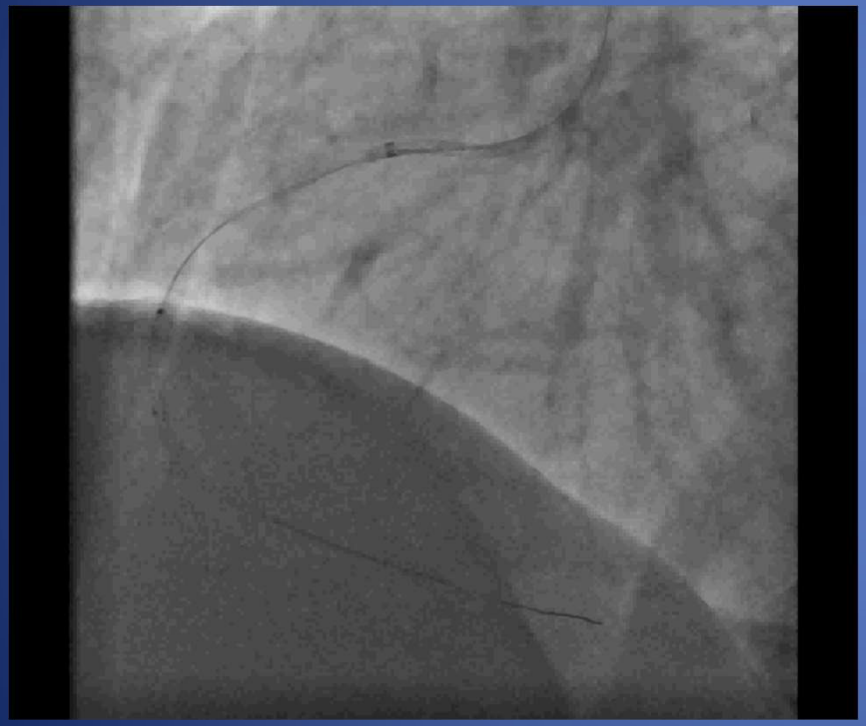
PCI to PLV branch, finecross MC + sion black, Buddy wire – Ironman



c/o: chest pain, hypotension, bradycardia

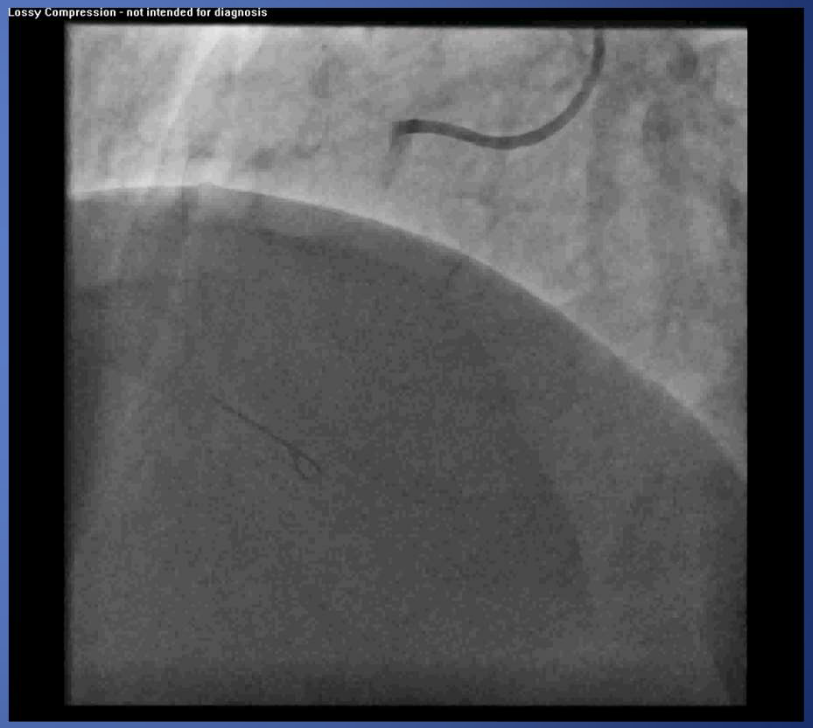


What will you do?



- A. Remove the guidewire
- B. IC nitrocine
- C. IVUS
- D. ballooning and stenting

Repeat angiogram after removing the buddy wire



Accordion effect

- Pseudo-complication of PCI
- Due to straightening and shortening of tortuous vessels with stiff guidewires during PCI → can cause severe ischaemia
- No specific treatment is needed

Tips for PCI in tortuous vessels

- Not uncommon to have pseudo-lesions after wiring
- Have a mental picture of the extent of diseased segment before wiring → avoid unnecessary stenting

Case 18. F/74, PCI to LAD, any complications?

Presented with haemopericardium

Distal guidewire perforation

- can be subtle and difficult to recognize → look for it!
- Good quality wire-out final shot
- Multiple views
- Compared with baseline angiogram (angiogram before wiring)
- MC tip injection in case of doubt

Summary

- Pitfalls in coronary angiogram interpretation
  - Lumen-o-gram /Anomalous LCx origin
  - Accordion effect / Coronary artery spasm
- Don’t miss ostial lesions of major vessels
  - Adequate reflux of contrast back into aorta
  - Extra/multiple views (e.g. AP caudal for LM bifurcation, AP cranial for dRCA bifurcation)
- IVUS/OCT/functional study in case of doubt