

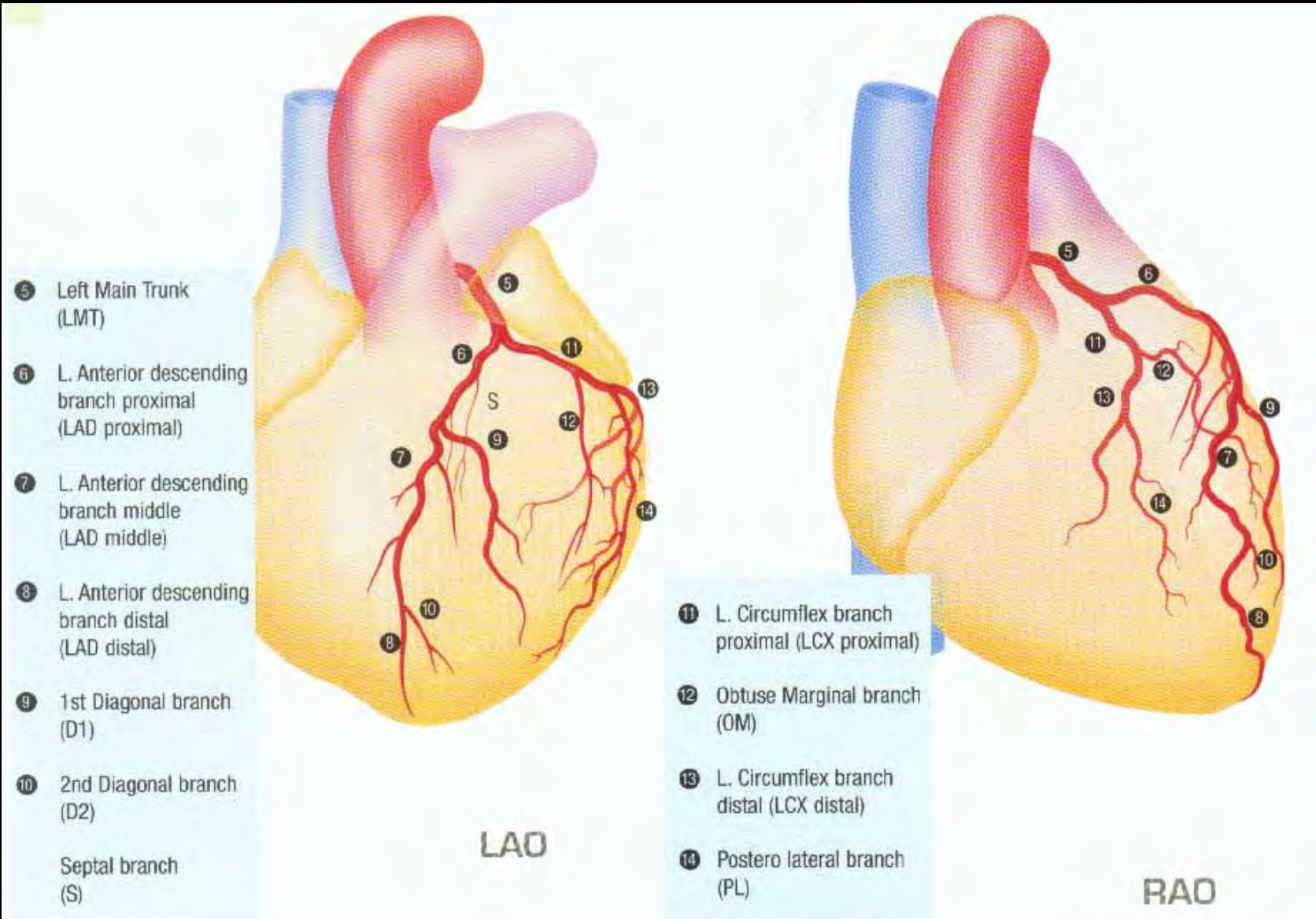
CORONARY ANGIOGRAPHY TRAINING



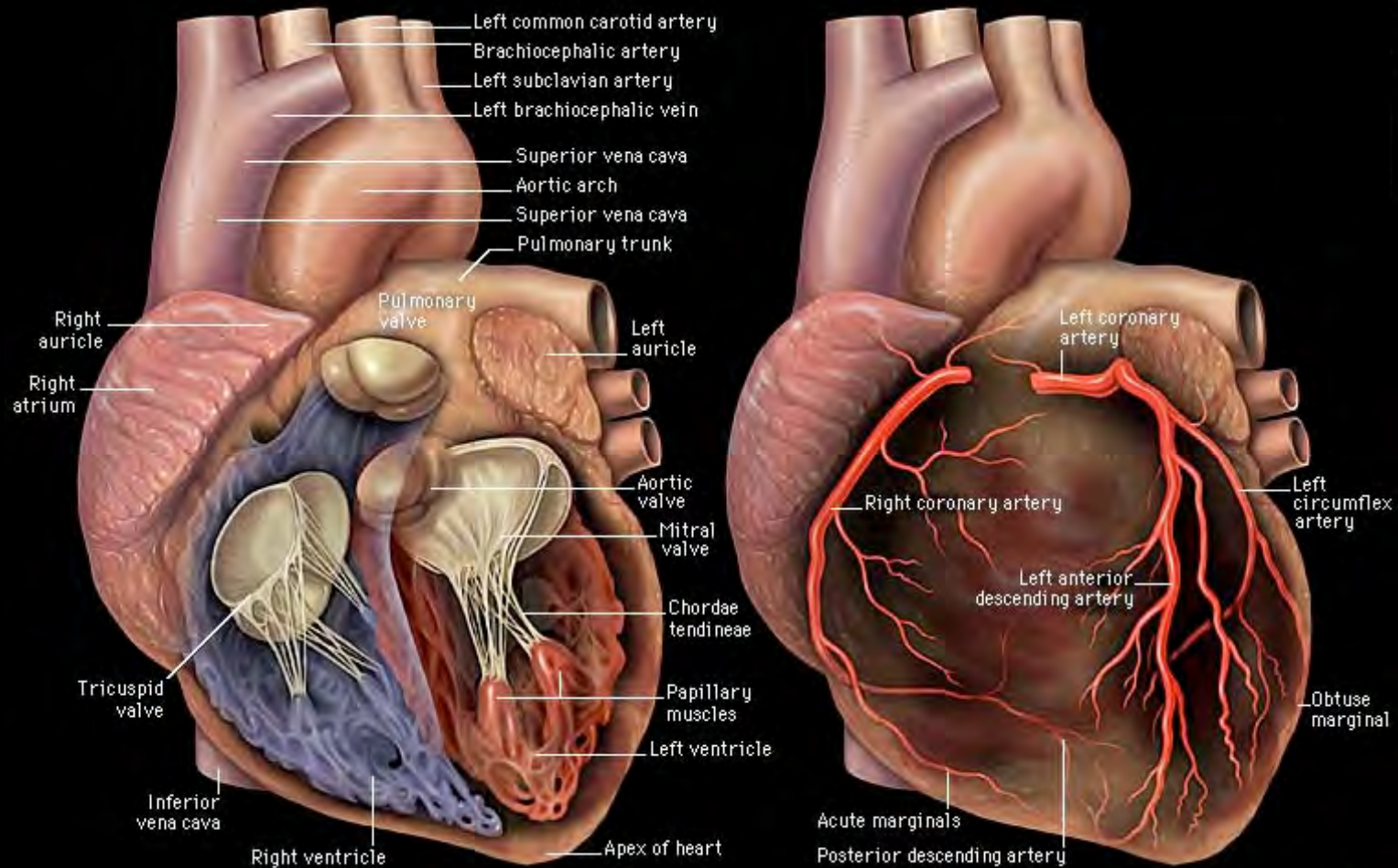
Ran Kornowski, MD
Rabin Medical Center



Left Coronary Artery

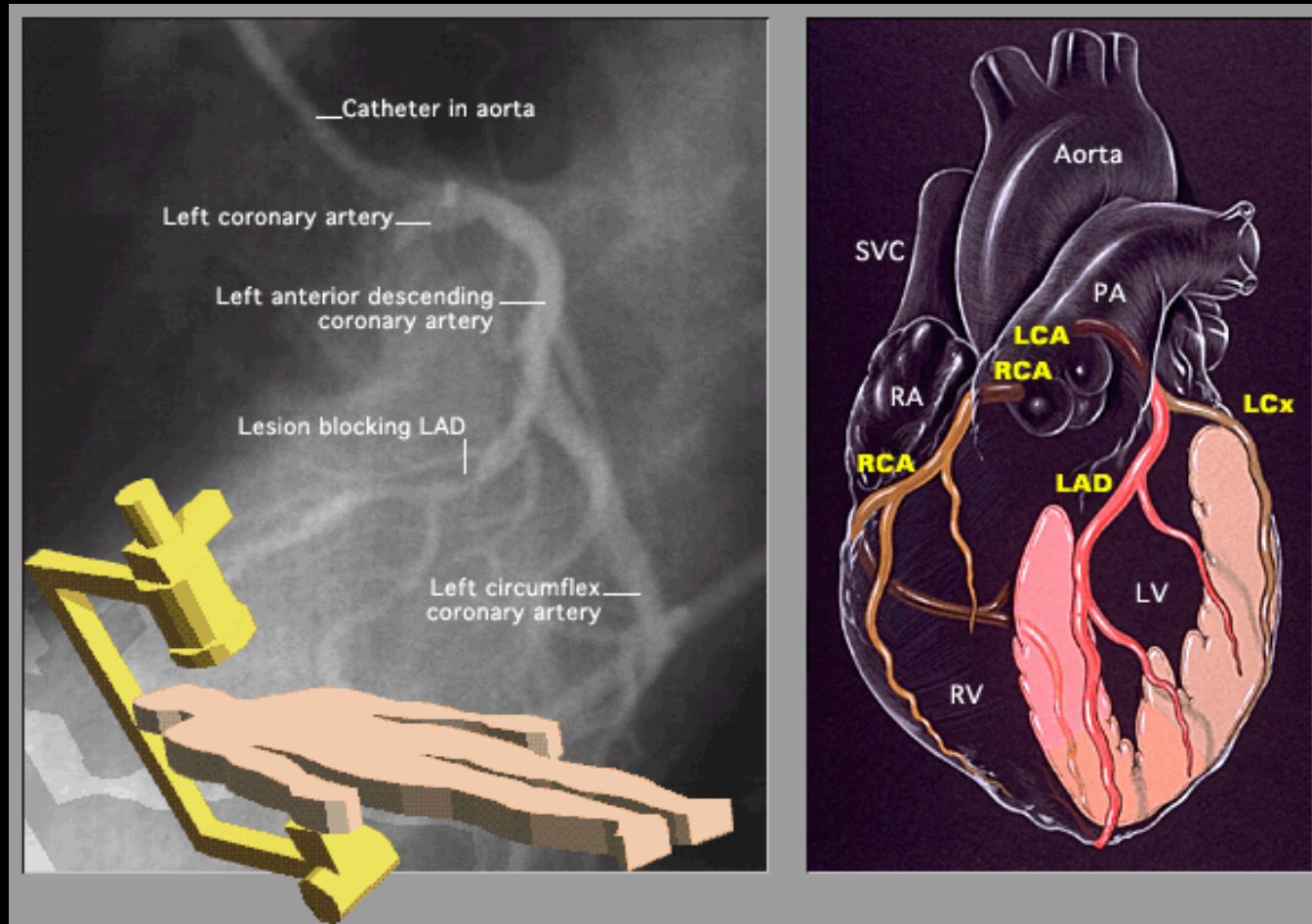


Cardiac Valves and Coronary Arteries

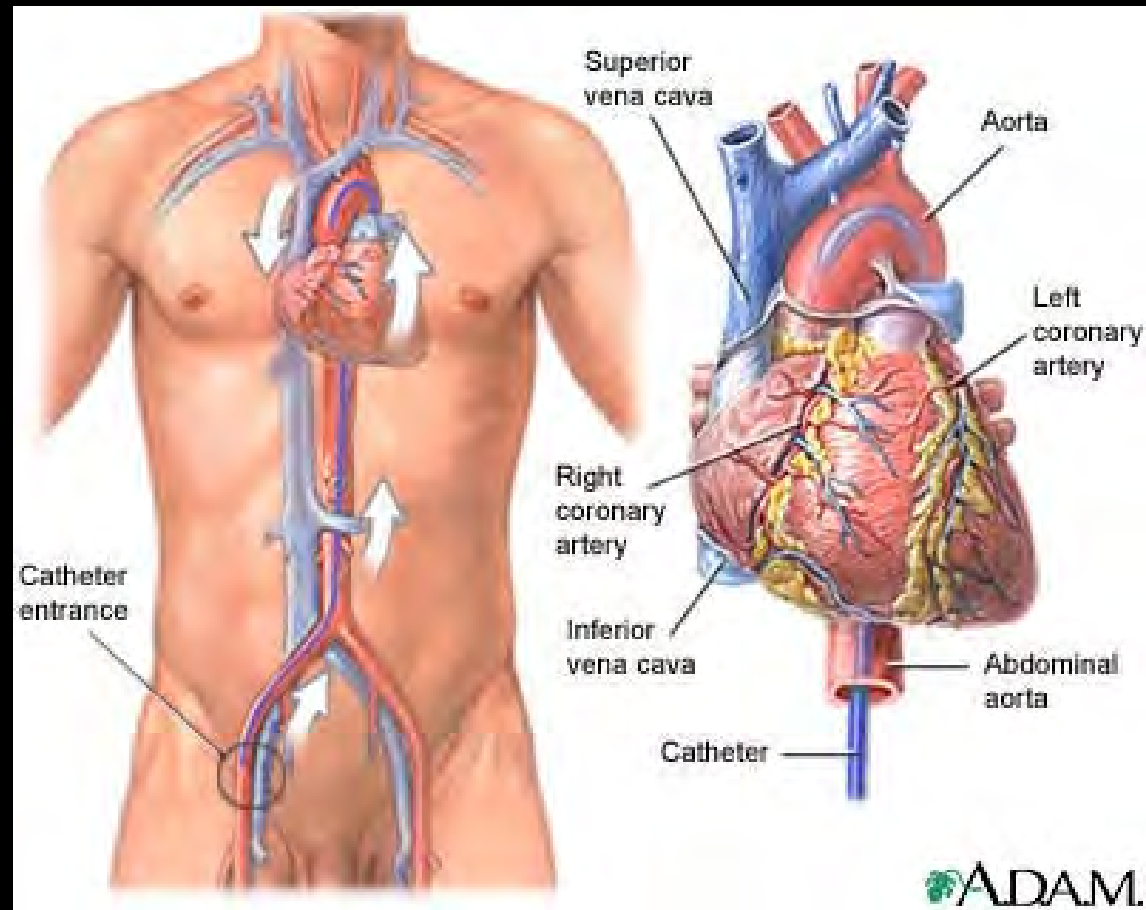


Patrick J. Lynch, 1999

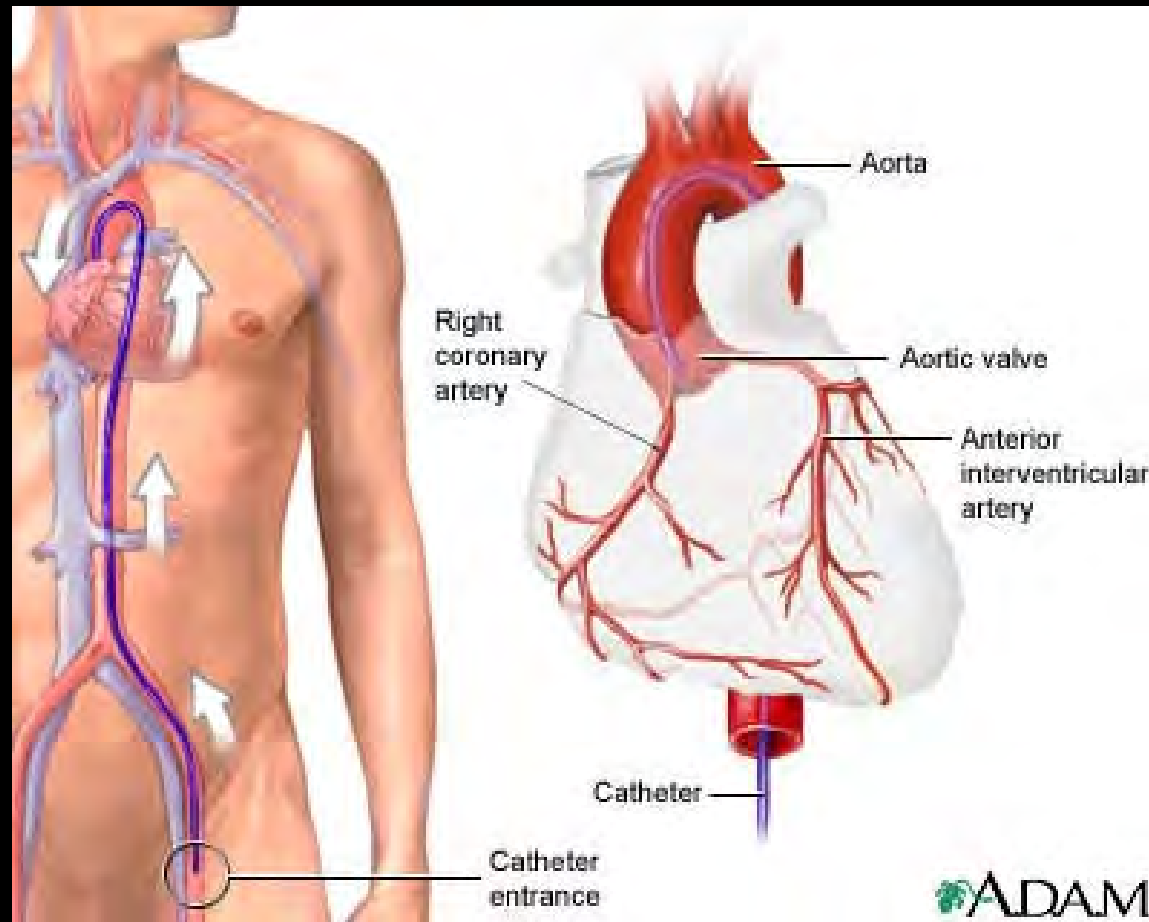
Coronary Angiography



Coronary Catheterization

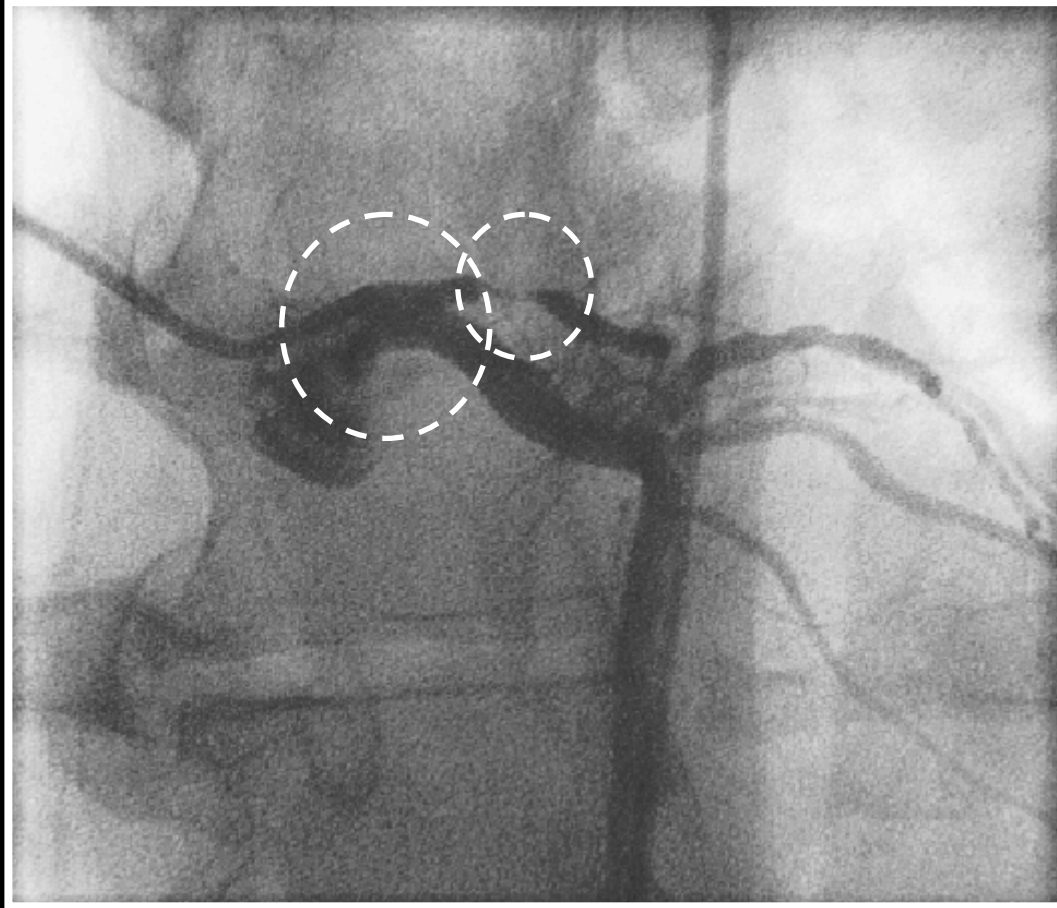


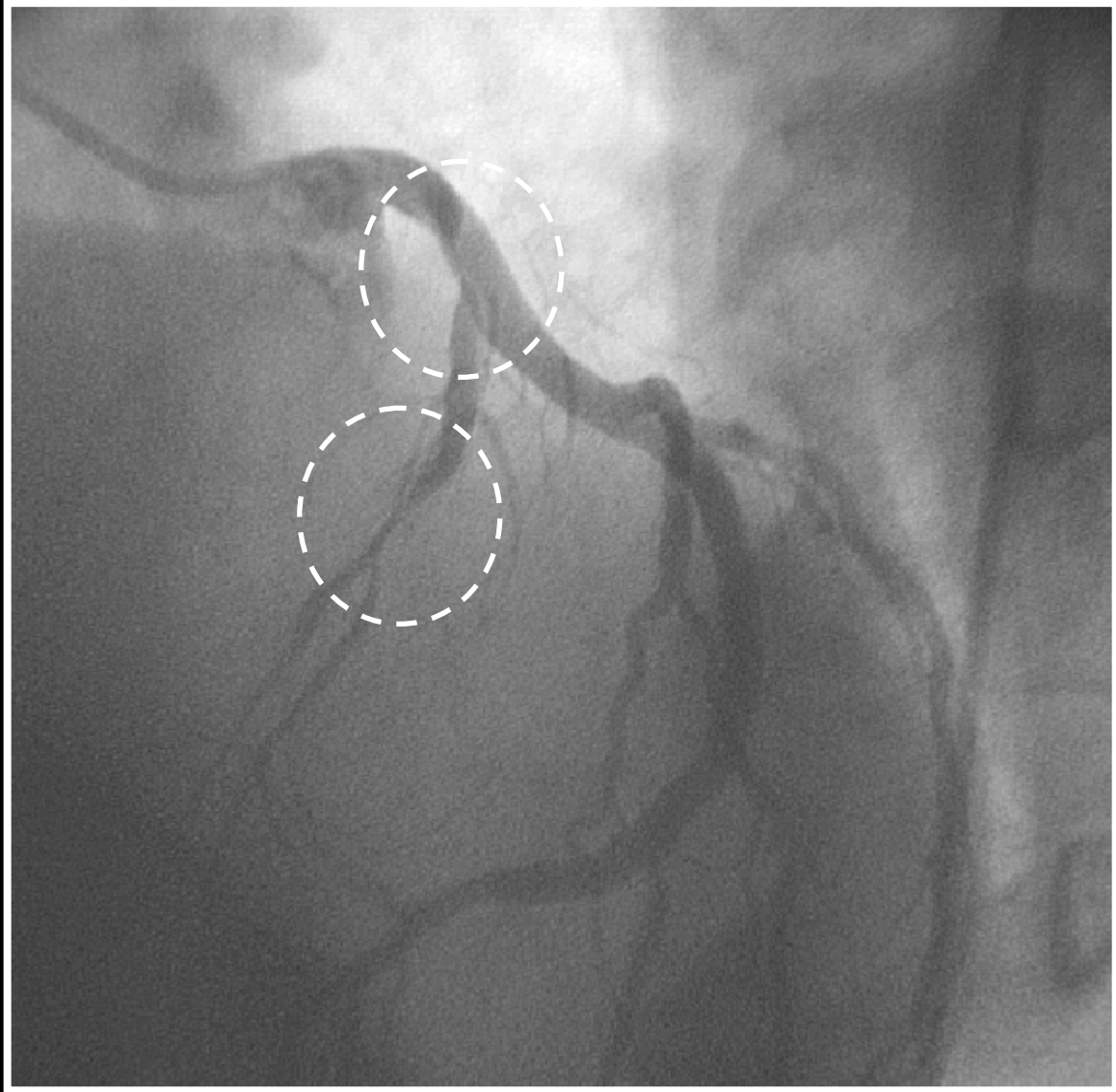
Coronary Catheterization

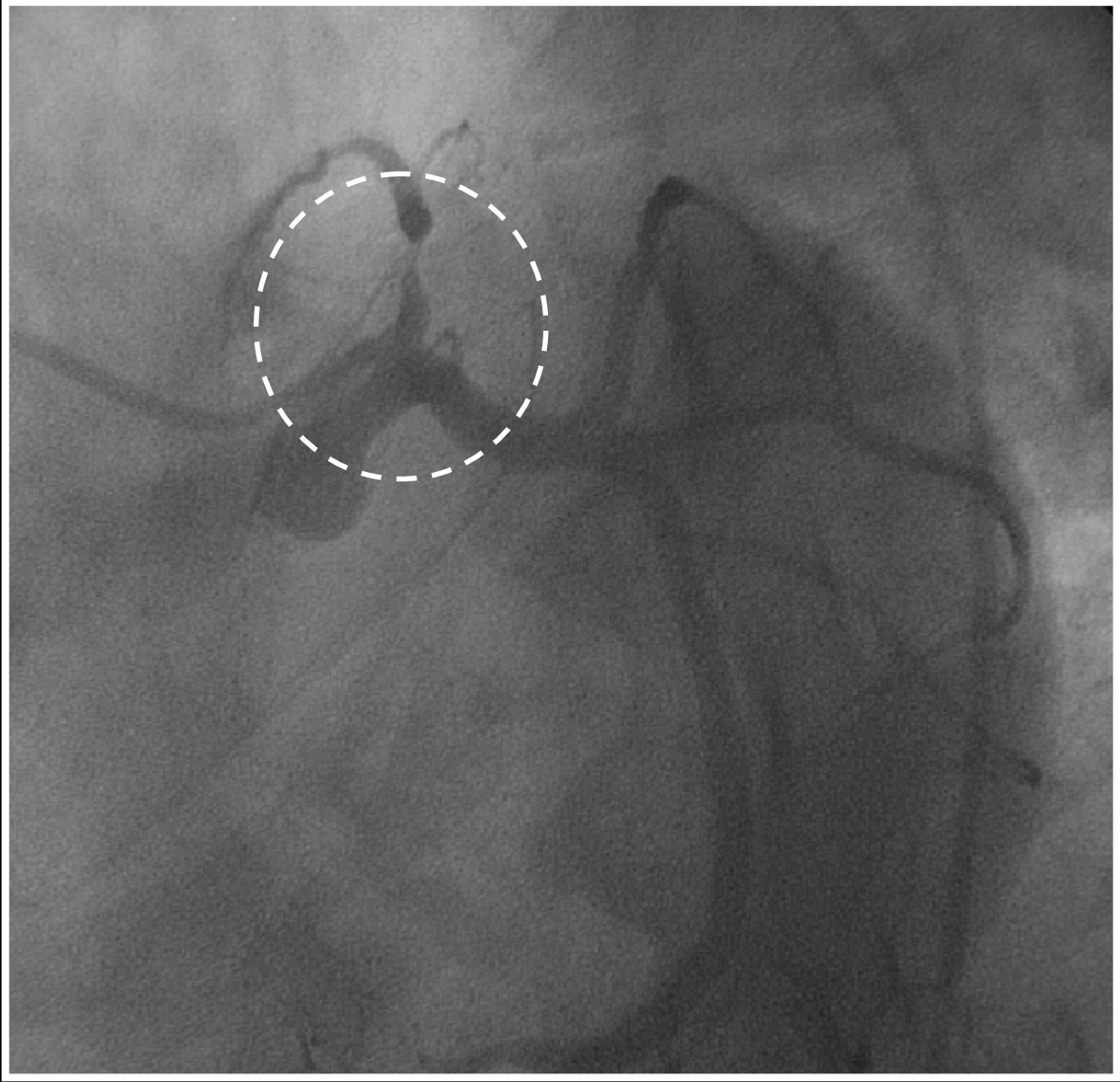


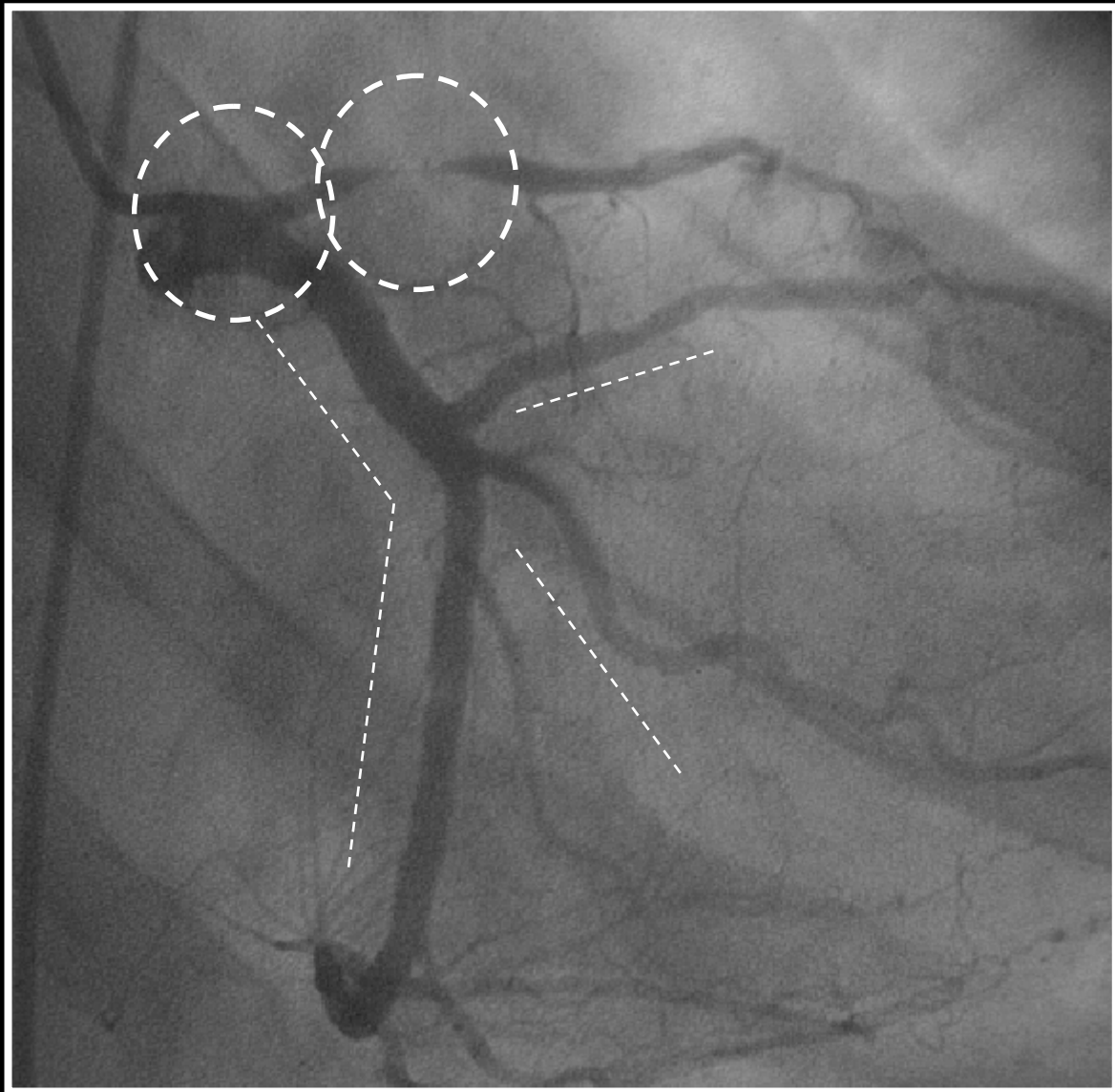
CASE #1

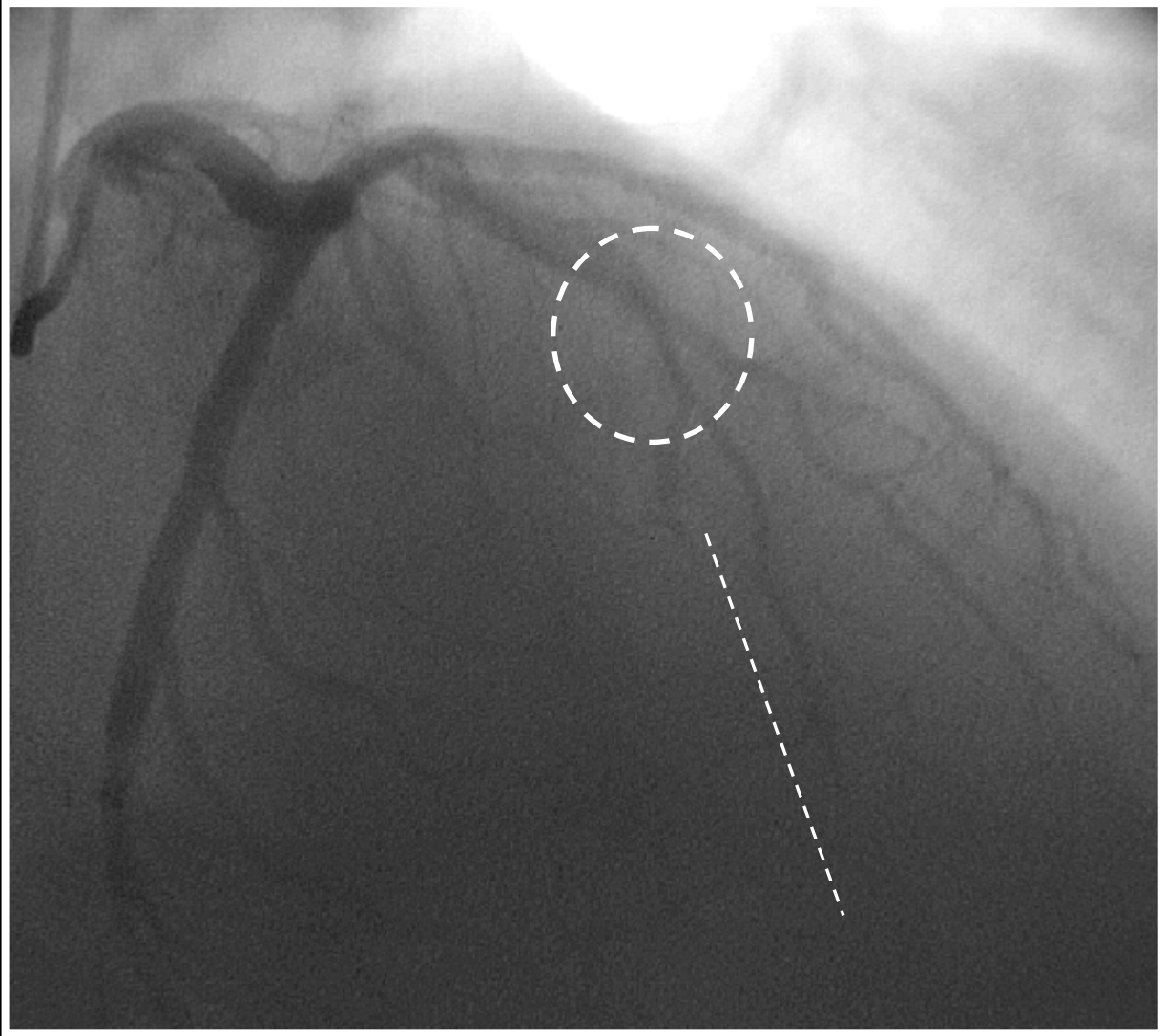
- 46 y/o male
- Smoker
- +Family history for CAD
- HTN x 10 yrs
- Angina pectoris x 2 mos
- +SPECT (Anterior wall ischemia)
- EKG: NSR

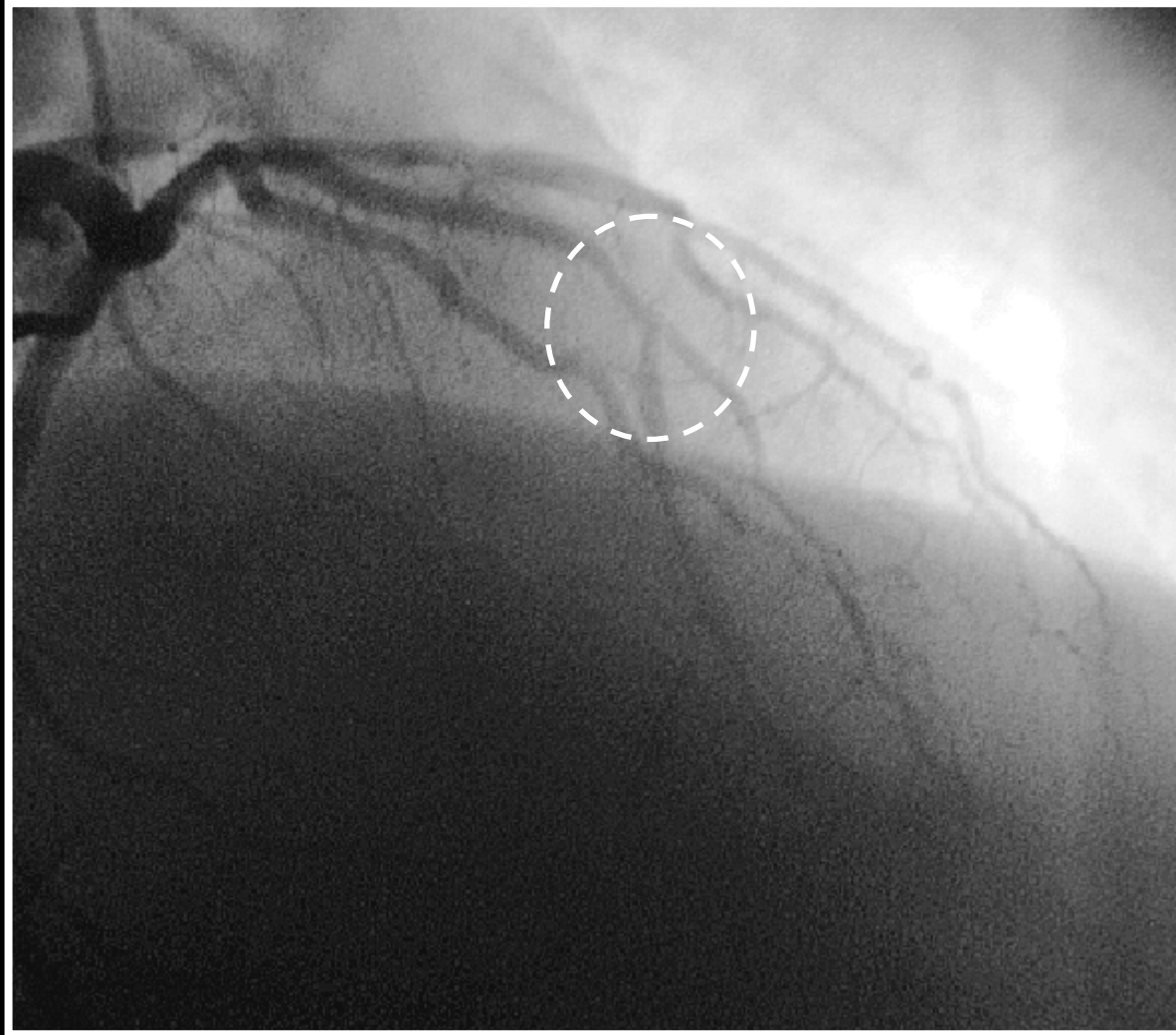


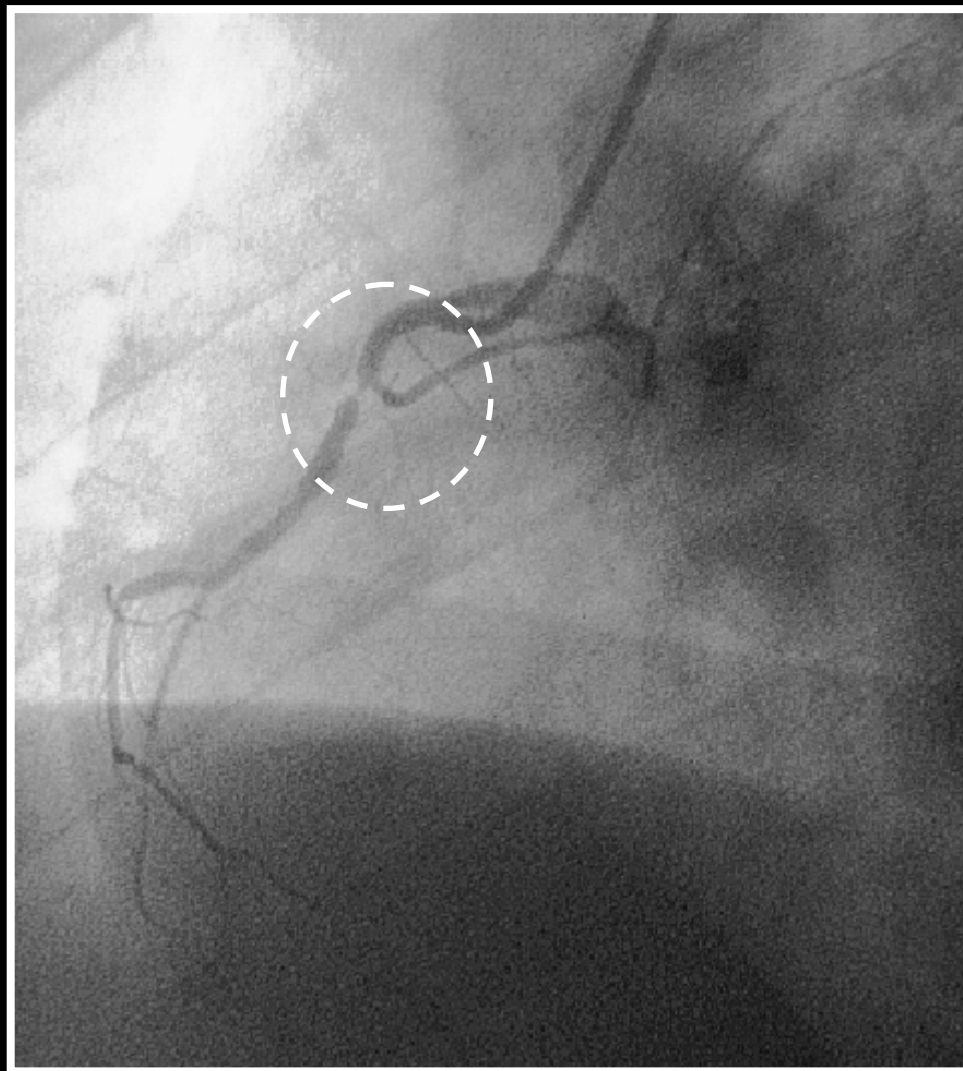


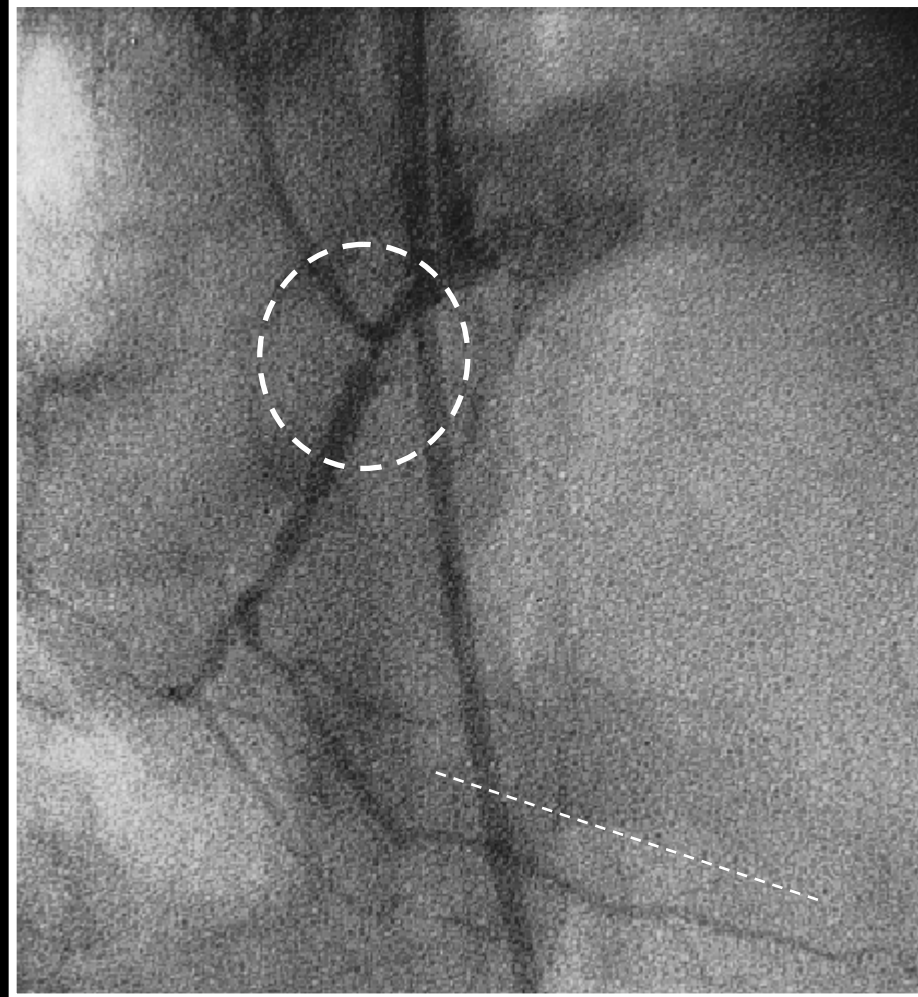




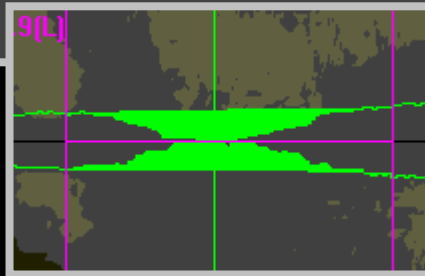
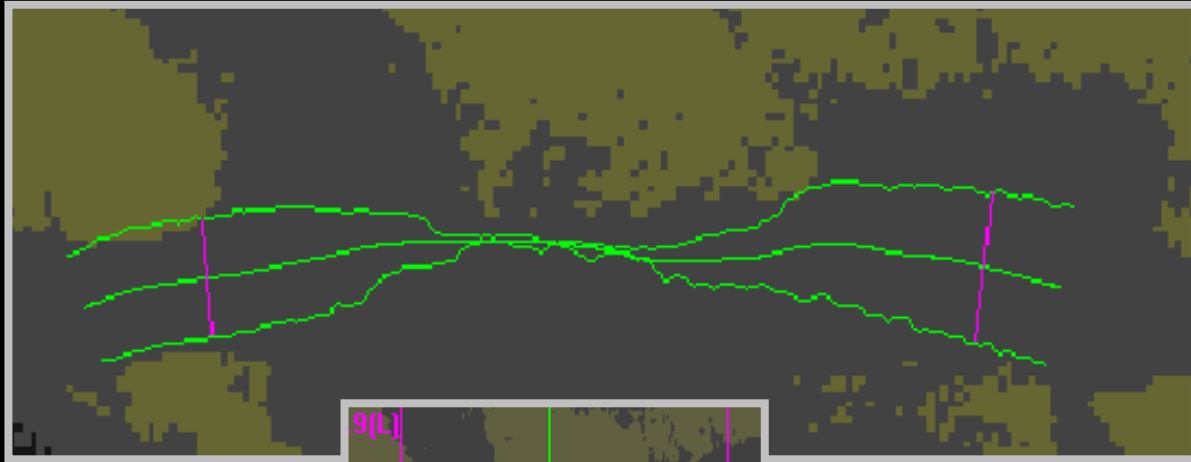






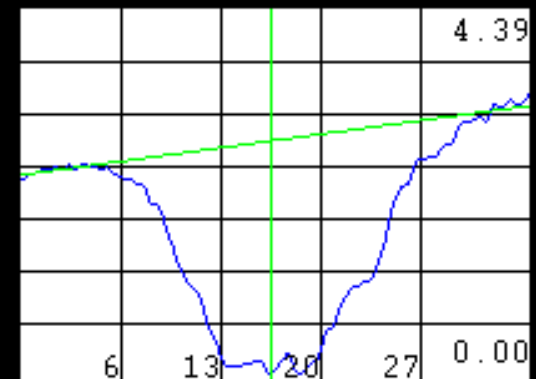


QCA ANALYSIS



Analysis Results

Stenosis(%)	96.5
Minimal Diameter(mm)	0.10
Reference Diameter(mm)	2.83
Maximal Diameter(mm)	3.39
Vessel Length(mm)	22.7
Obstruction Length(mm)	17.9



CORONARY ATHEROSCLEROSIS



OLD ACC/AHA LESION TYPE CRITERIA

TYPE A Lesion

- Discrete
- Readily accessible
- Non angulated, <45 degrees bend
- Smooth contour

TYPE B Lesion

- Tubular (10-20 mm length)
- Eccentric
- Moderate tortuosity
- Moderately angulated (>45-<90 degrees bend)

TYPE C Lesion

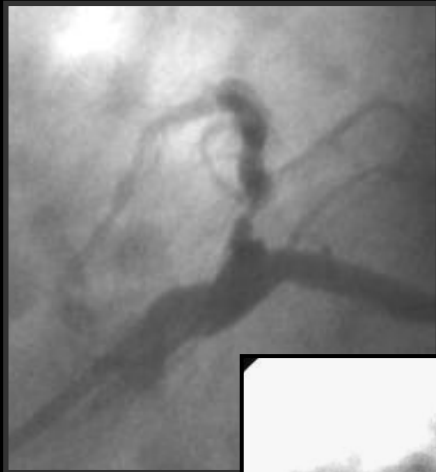
- Diffuse(>20 mm length)
- Eccentric
- Excessive tortuosity of prox. segment
- Extremely angulated (>90 degrees)

- Little or no calcium
- Less than totally occluded
- No ostial location
- No major sidebranch involvement
- Absence of thrombus

- Irregular contour
- Moderate/heavy calcification
- Total occlusion <3 months old
- Bifurcation lesion with significant SB
- Some thrombus present

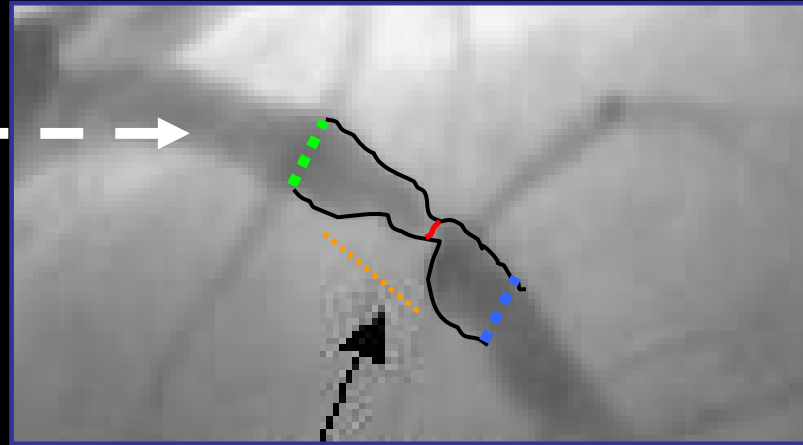
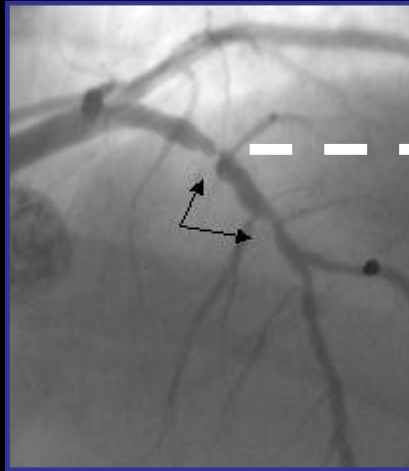
- Extreme calcification
- Total occlusion >3 months old
- Degenerated SVG with friable thrombus

Lesion Description



- **Target Vessel/Lesion Location**
 - LM/LAD/RCA/LCX/VG/IMA
 - Ostial/Prox/Mid/Distal
- **Lesion Characteristics**
 - Restenotic (stent/non-stent)
 - Eccentric/concentric
 - Bifurcation
 - Tortuous (bend>45%)
 - Calcified
 - Ulcerated
 - Ectatic/Aneurysm
 - Type A/B₁/B₂/C
 - Thrombotic
 - TIMI 0/1/2/3
- **Procedural Complications**
 - Dissection ≥ Type C
 - Abrupt closure
 - No Reflow
- **Quantitative Measurements**
 - Prox./Dist./Ave. ref. diameter (mm)
 - Lesion length (mm)
 - Pre-procedure MLD (mm)
 - Final post procedure MLD (mm)
 - Lesion minimal DS (%)
 - ✓ Pre-procedure (%)
 - ✓ Final Post stent (%)

QCA ANALYSIS



Prox. reference diameter (mm)

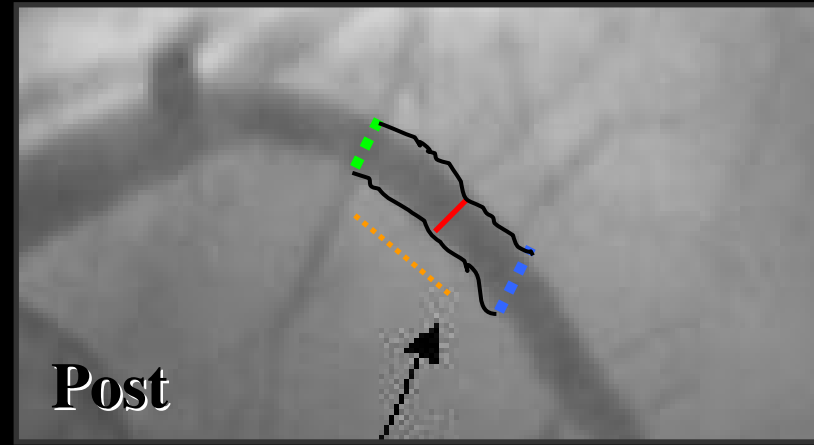
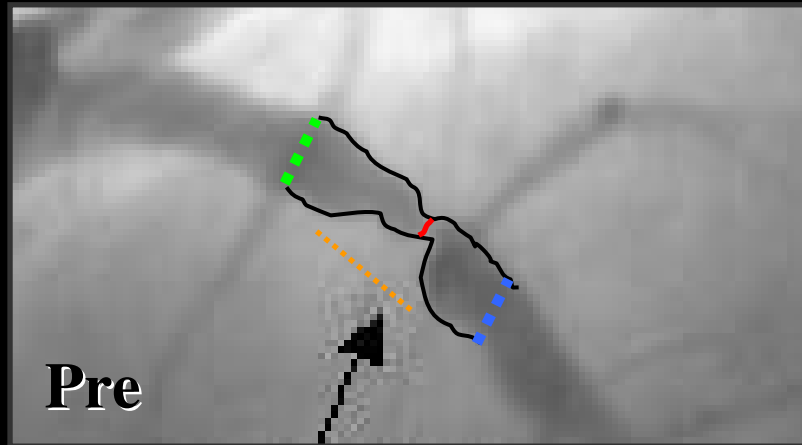
Minimal lumen diameter (mm)

Distal reference diameter (mm)

Lesion length (mm)

Lesion contour - edge detection

QCA ANALYSIS



Fundamental Terminology →

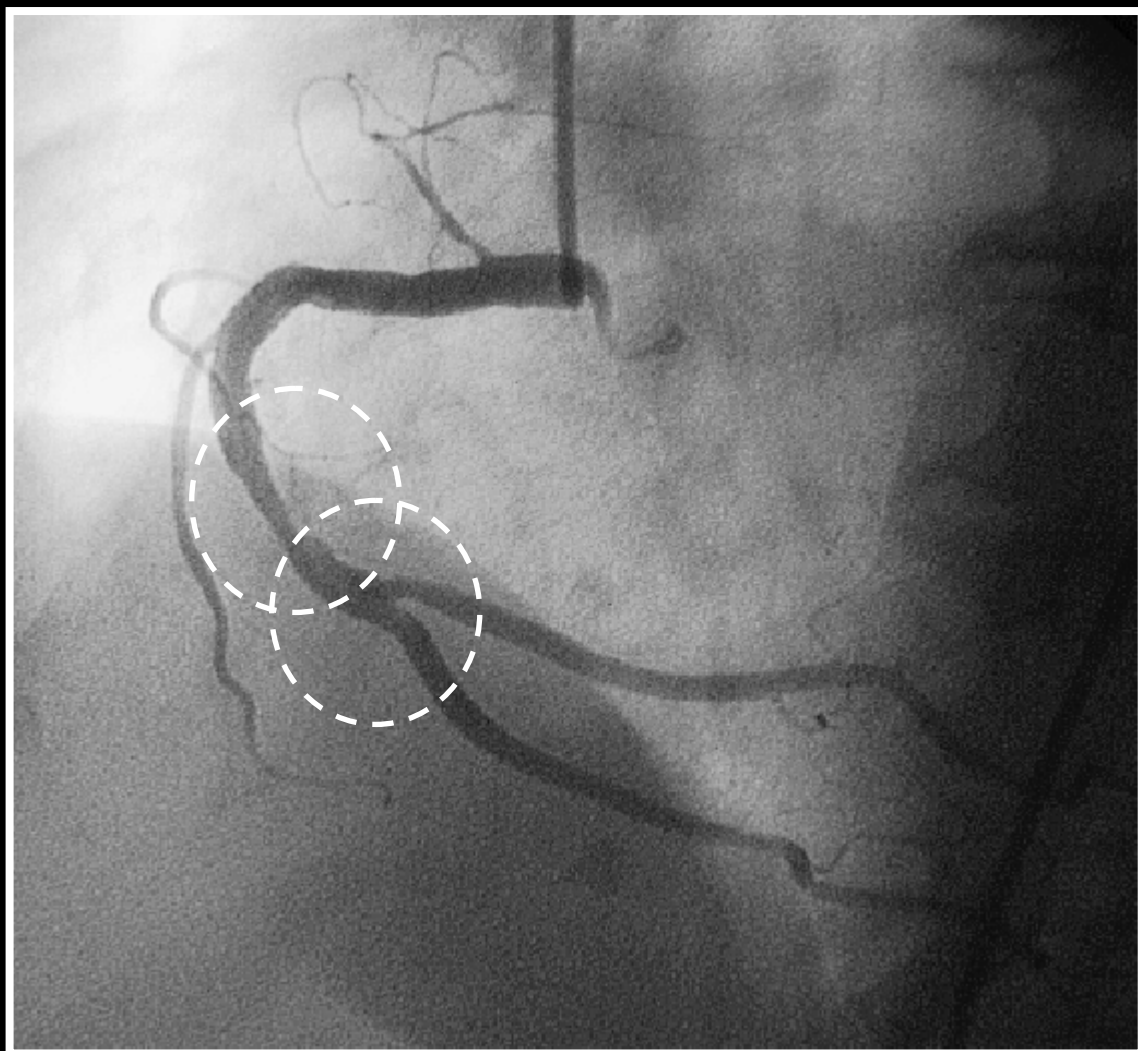
- Acute gain (mm)
- Late loss (mm)
- Net gain (acute gain-late loss) (mm)
- Loss Index = Net gain / Acute gain

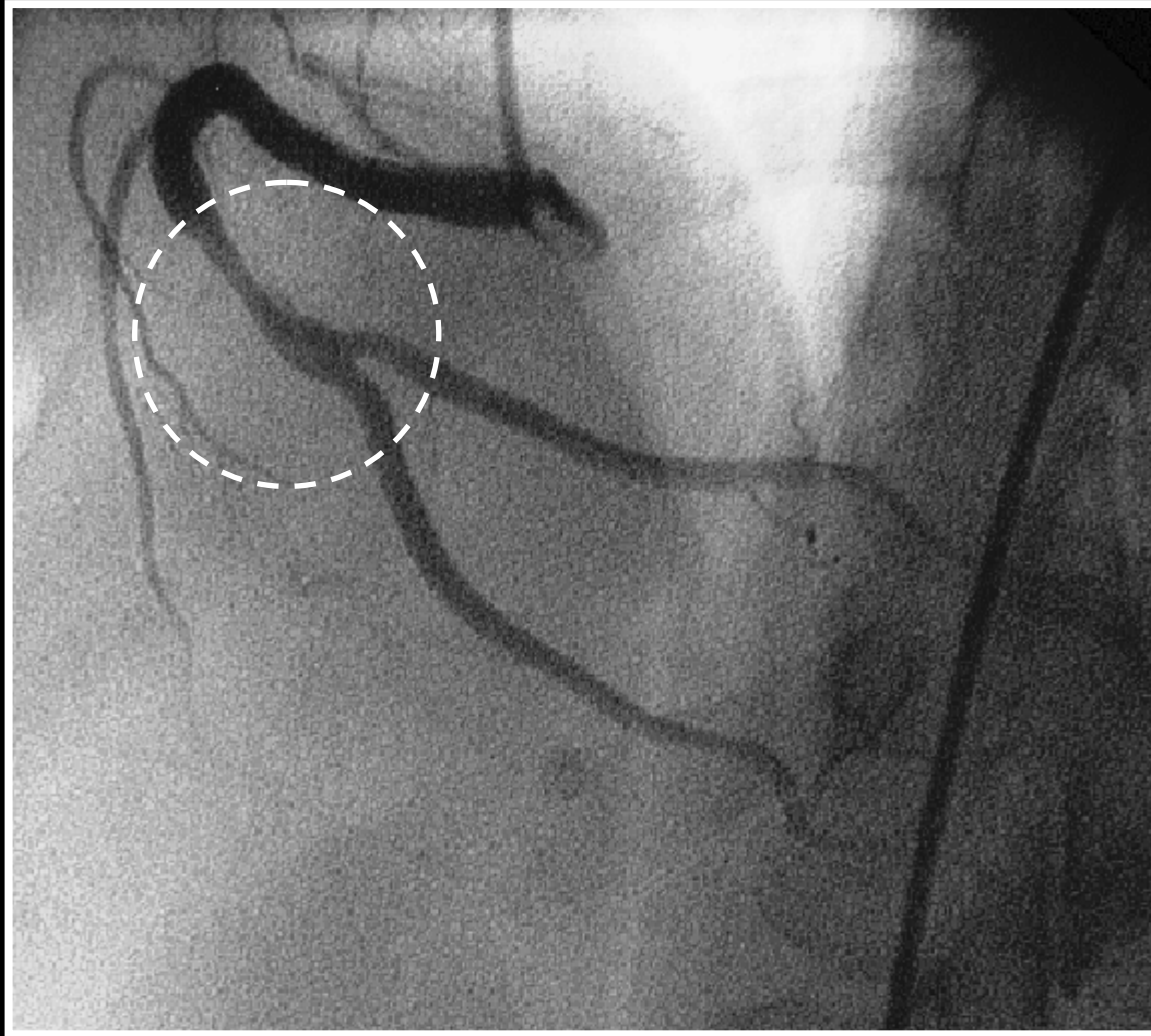
LESION SPECIFIC PTCA

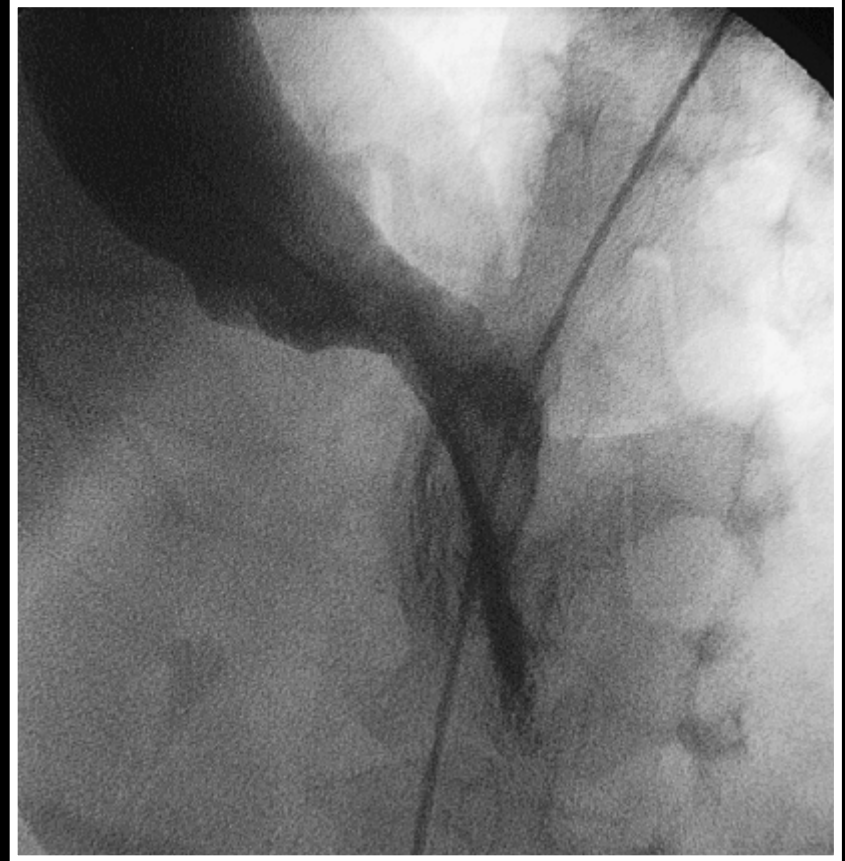
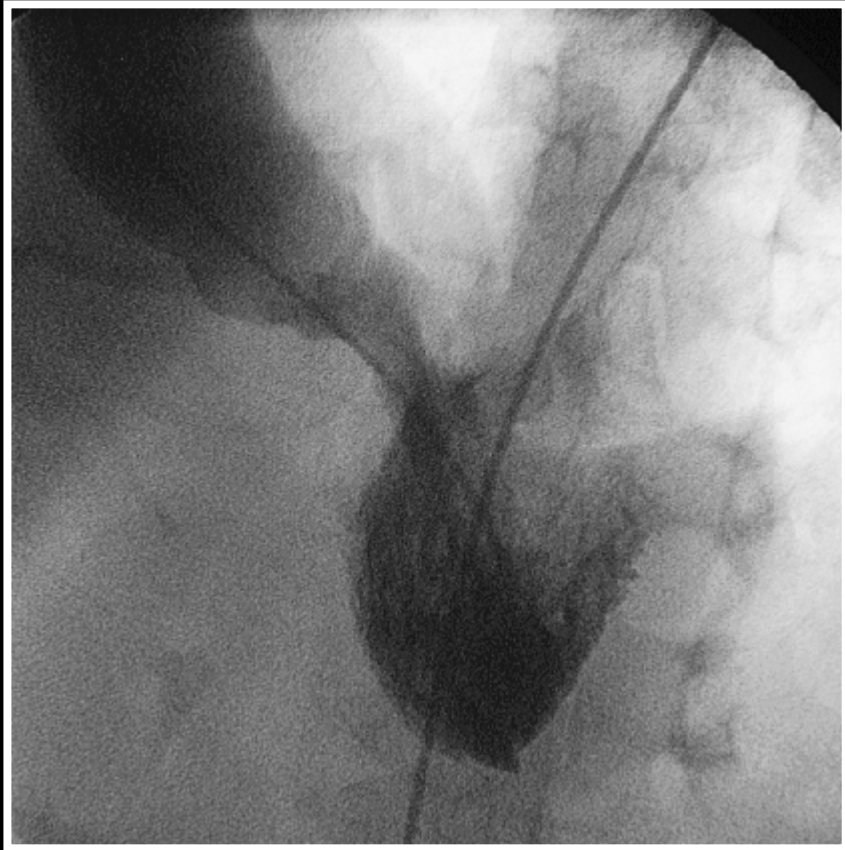
- **Native Coronary PCI**
 - **Small vessels**
 - **Long (diffuse) lesions**
 - **Calcified lesions**
 - **Bifurcation**
 - **Thrombus**
 - **Total occlusion**
- **Saphenous Vein Grafts**
- **In-Stent Restenosis**

CASE #2

- 72 y/o female
- +Family history for CAD
- HTN x 25 yrs
- Hypercholesterolemia
- Angina pectoris x 6 mos
- +SPECT (Inferior wall ischemia)
- EKG: NS+RBBB

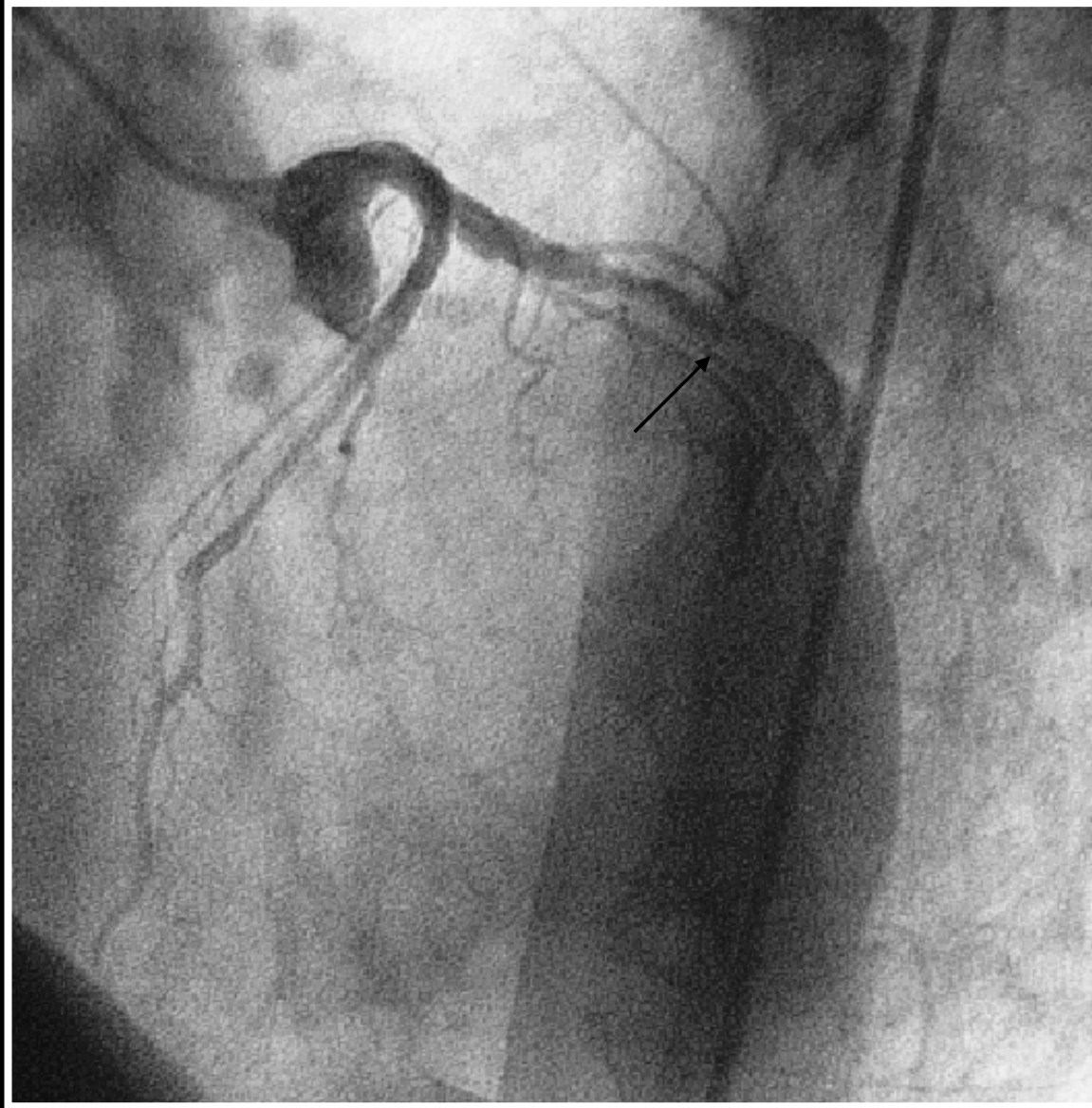


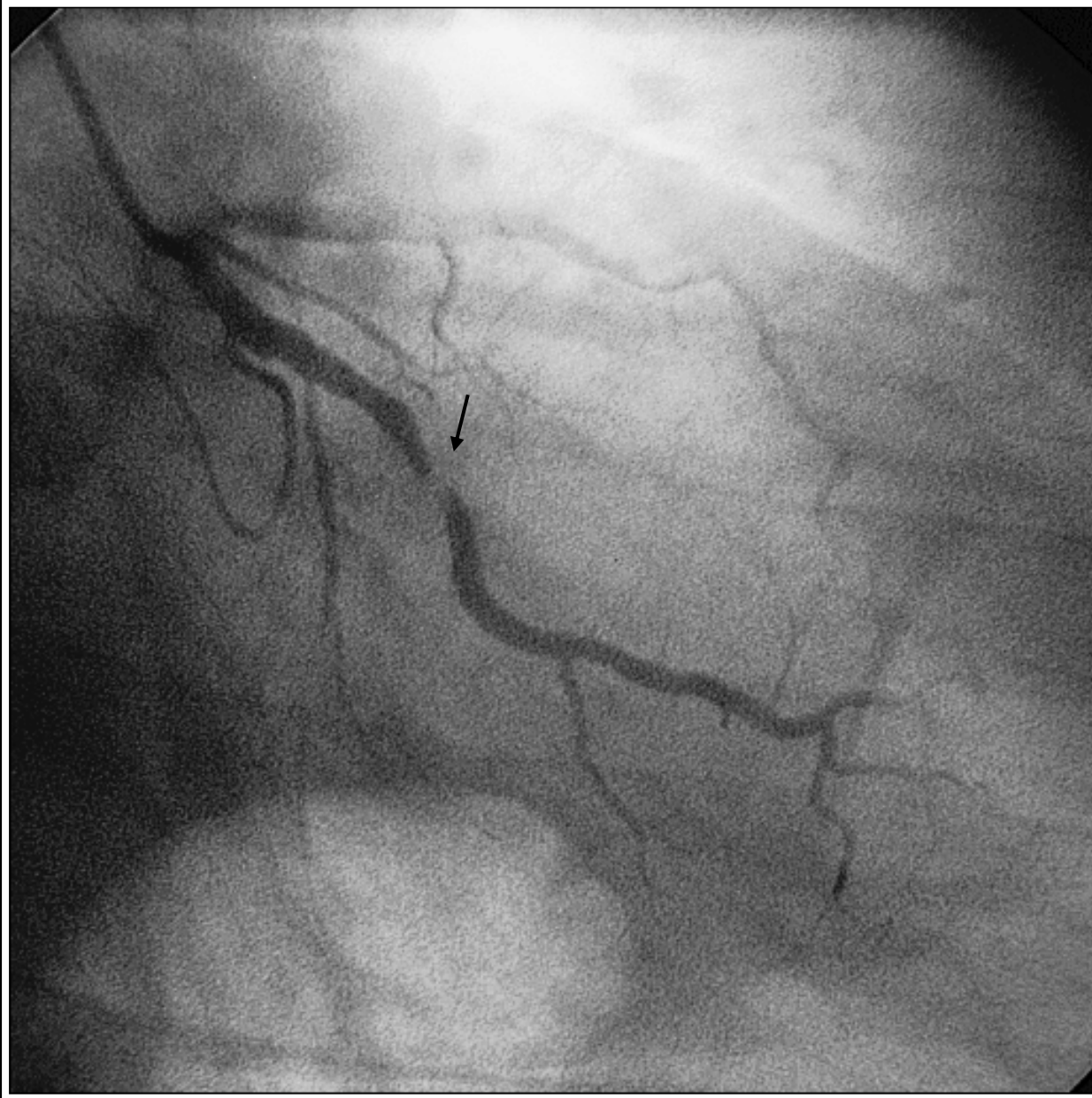


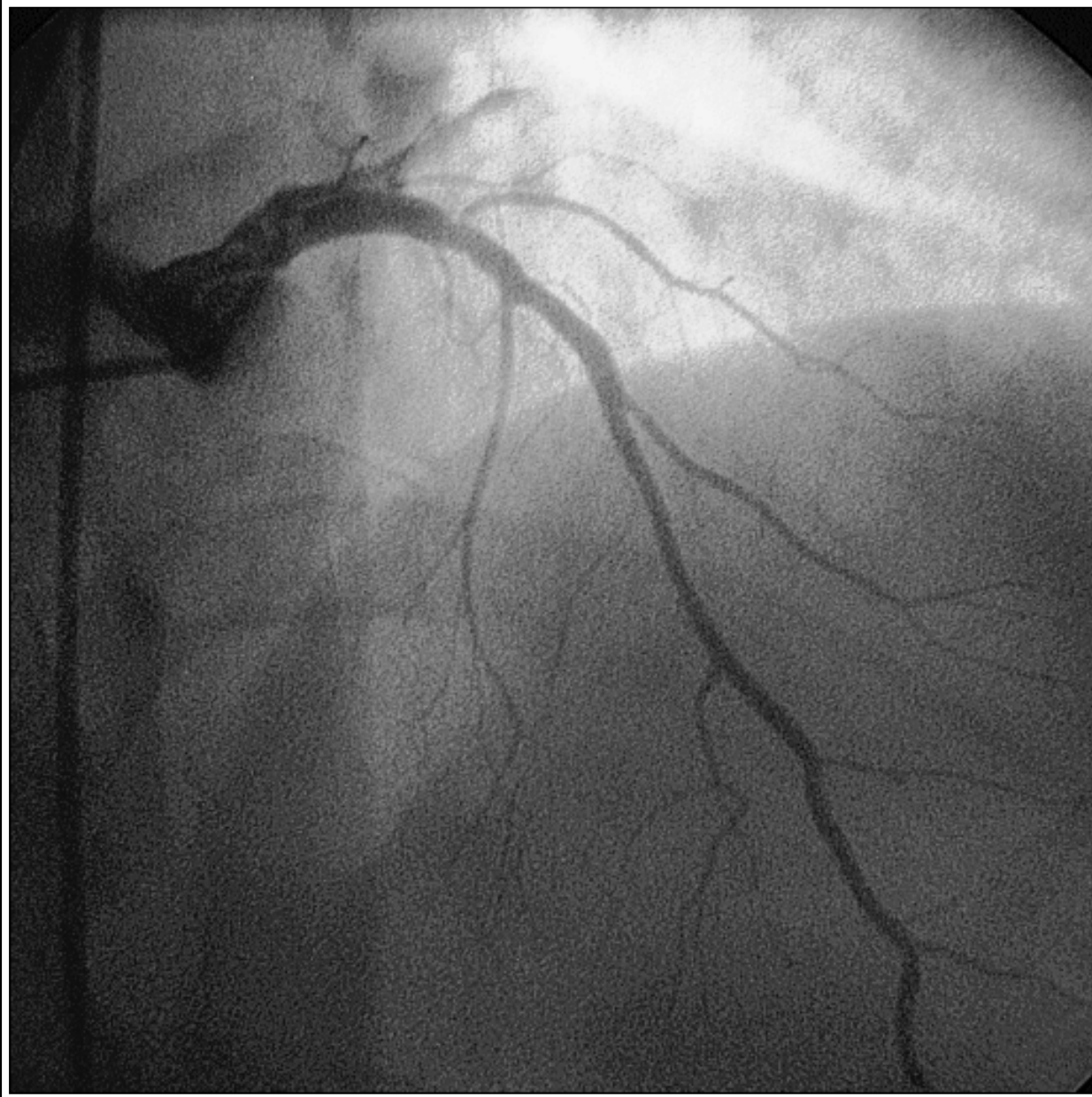


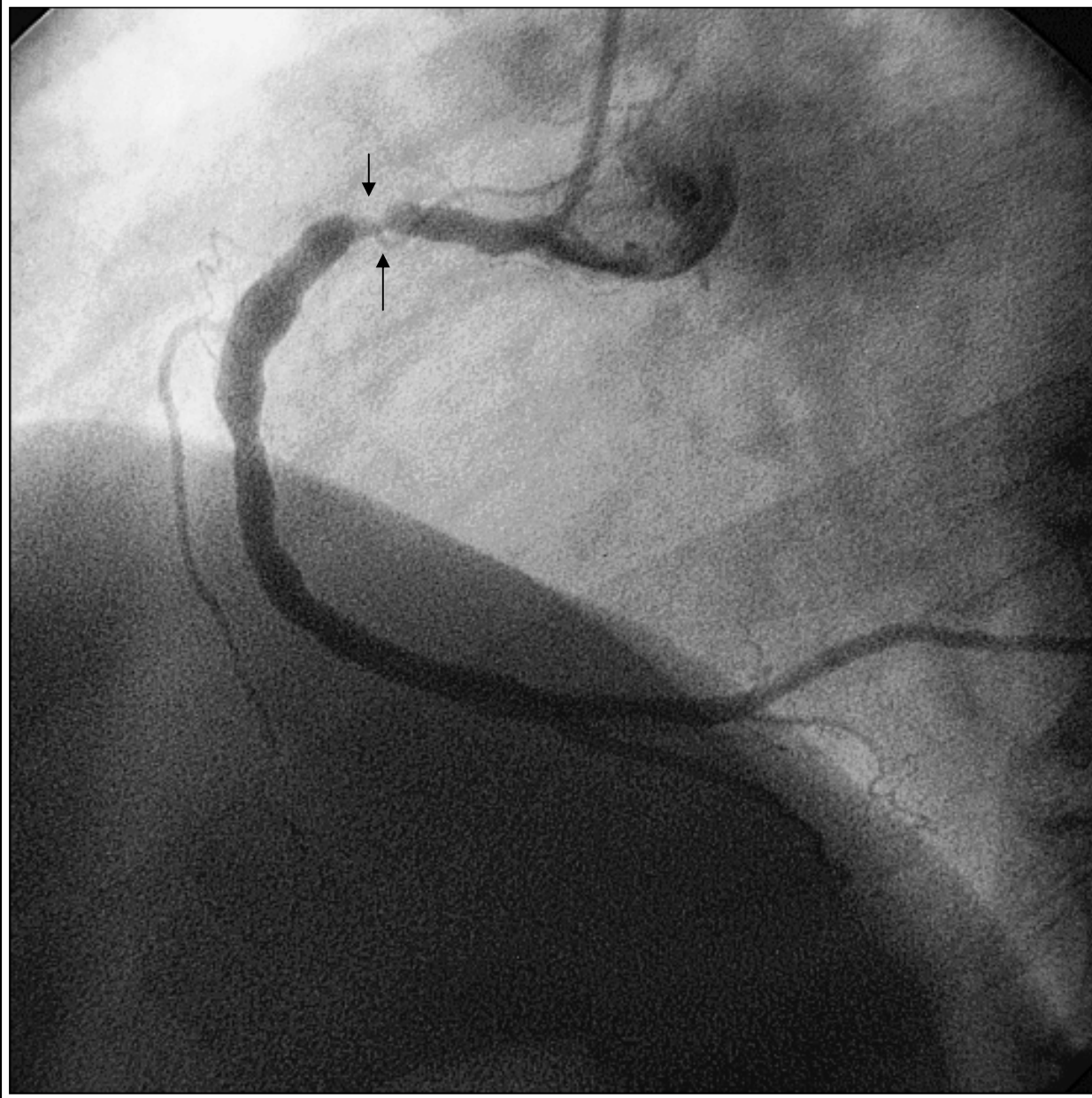
CASE #3

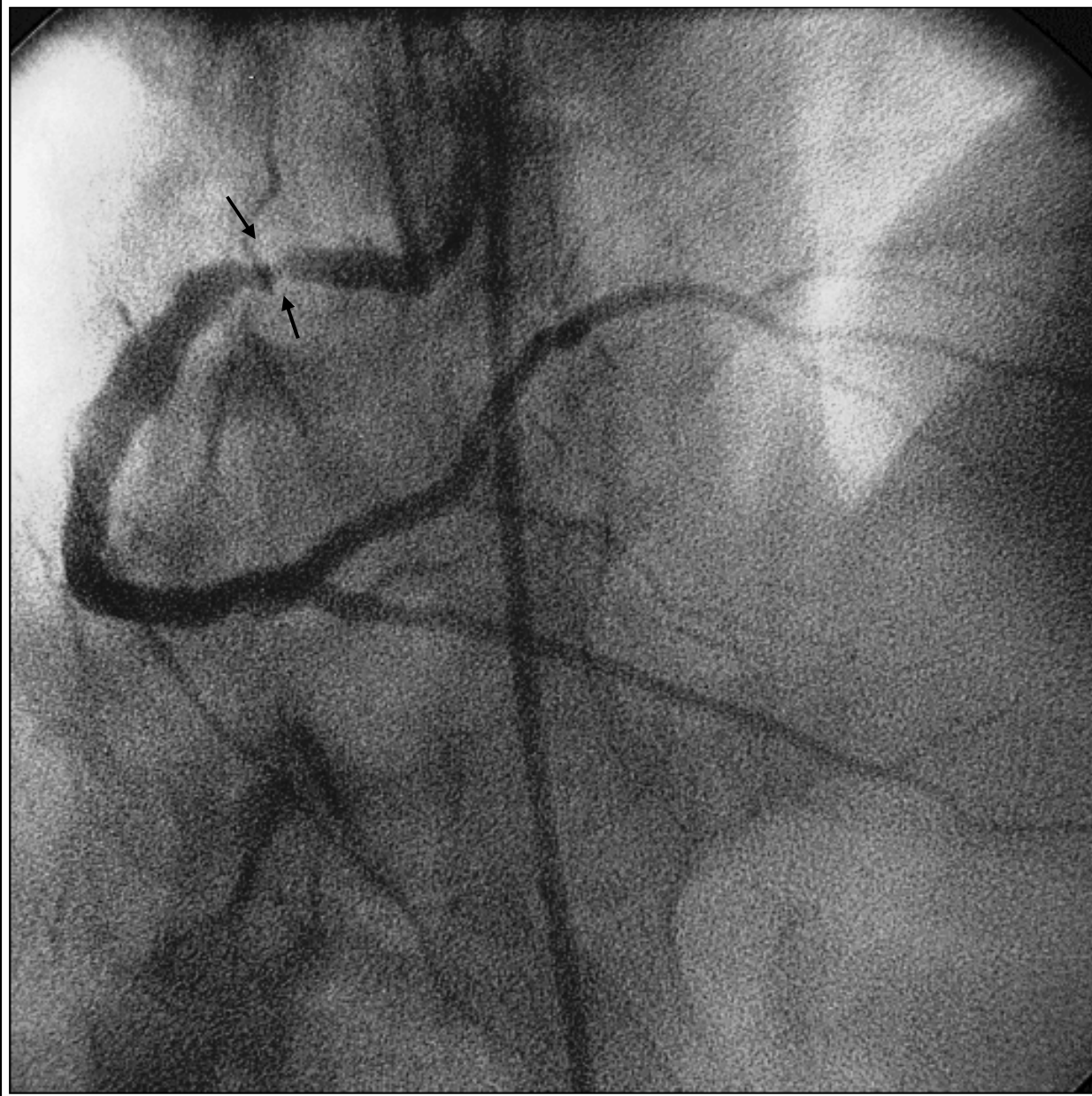
- 54 y/o male
- Heavy smoker
- Hypercholesterolemia
- Unstable angina pectoris x 2 wks
- EKG: NS+Lateral wall ischemia







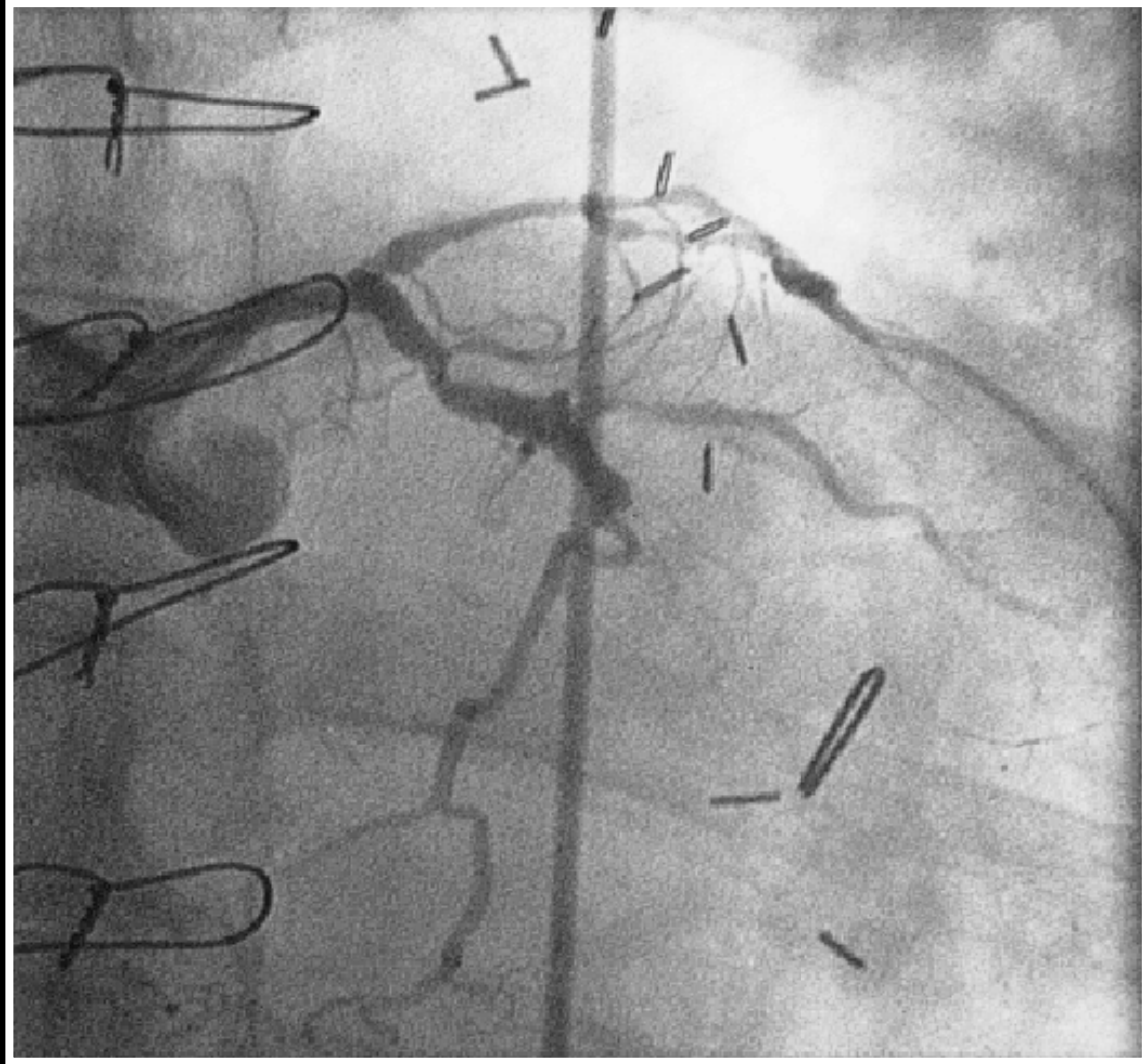


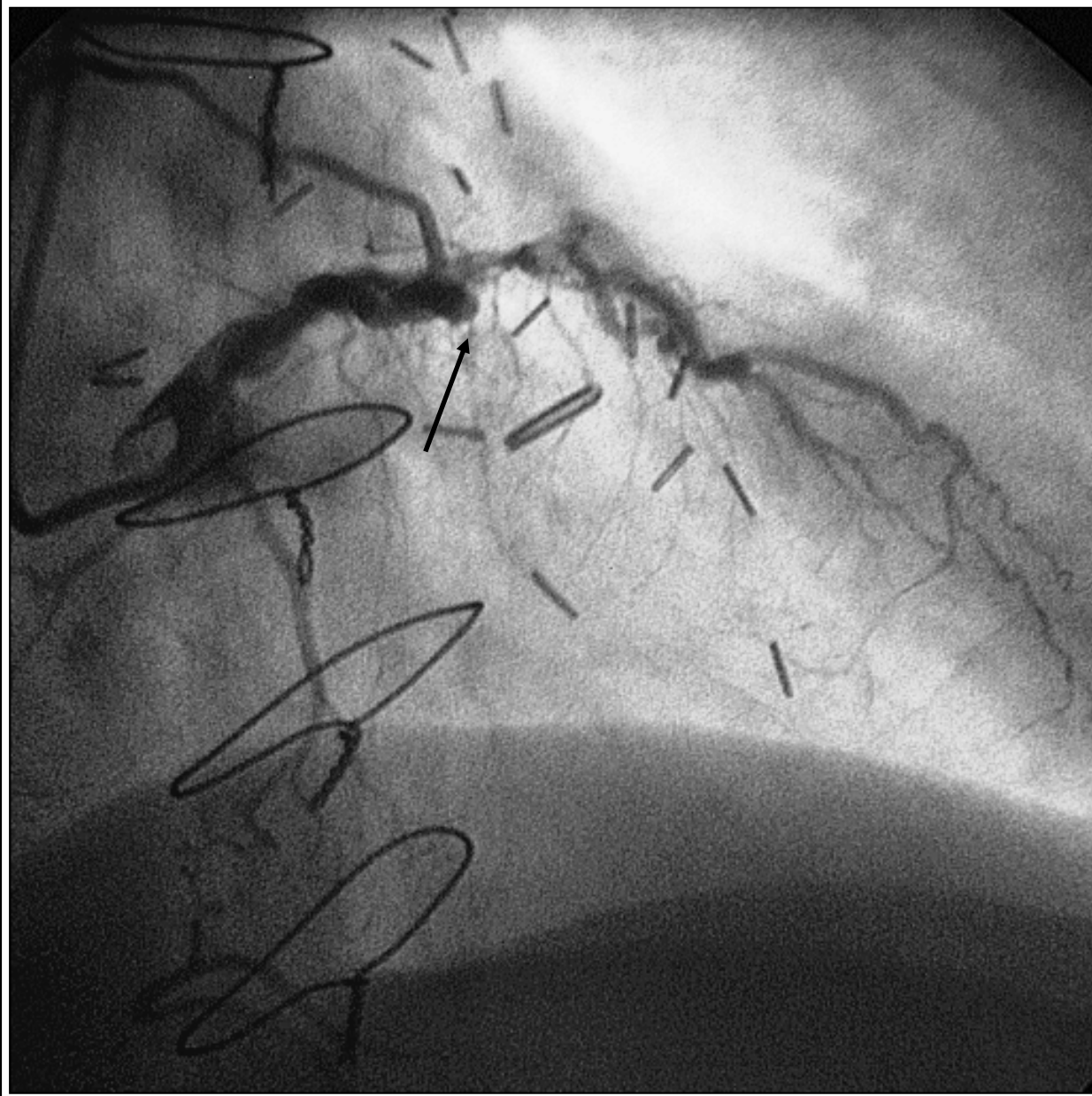


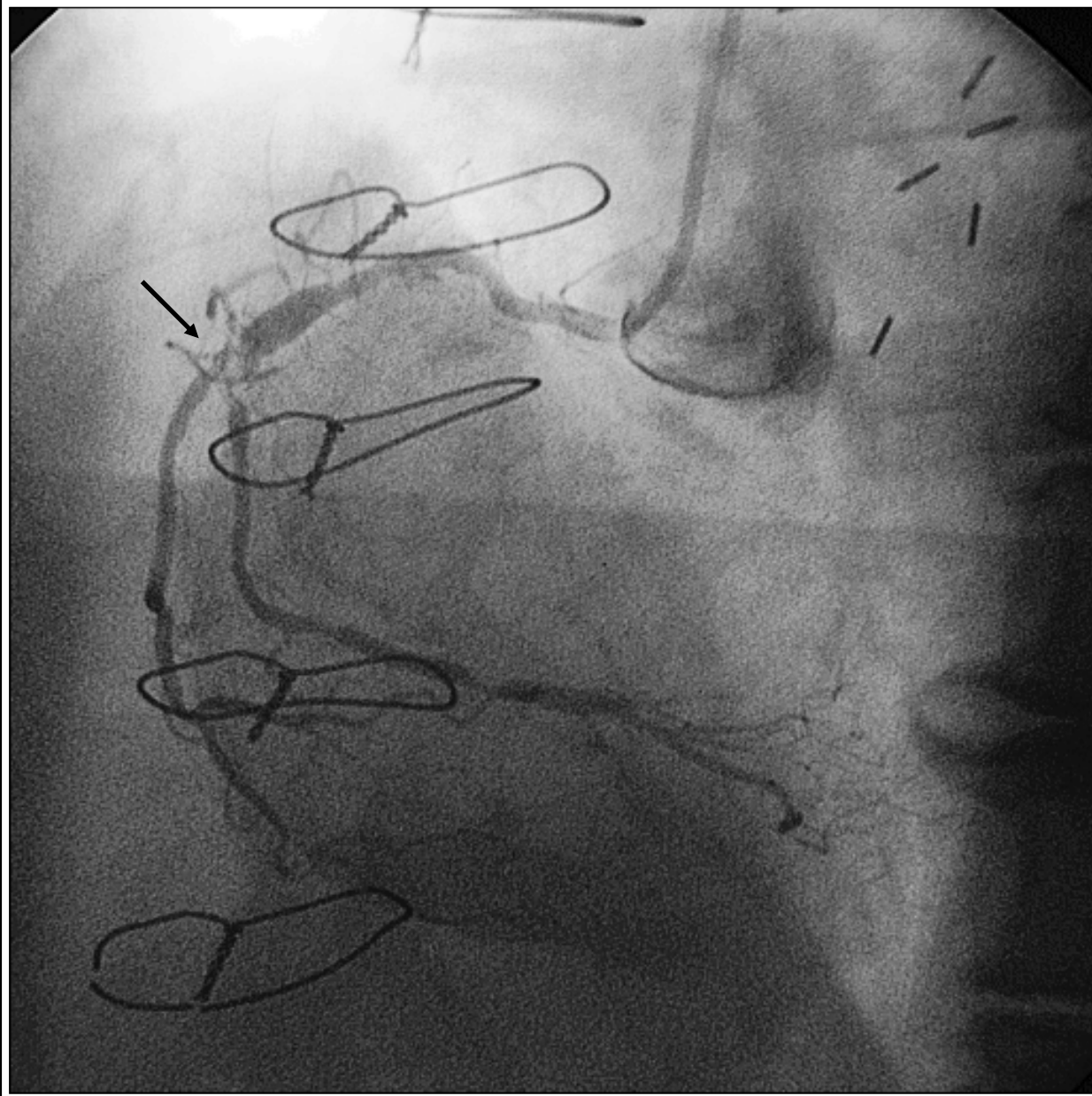


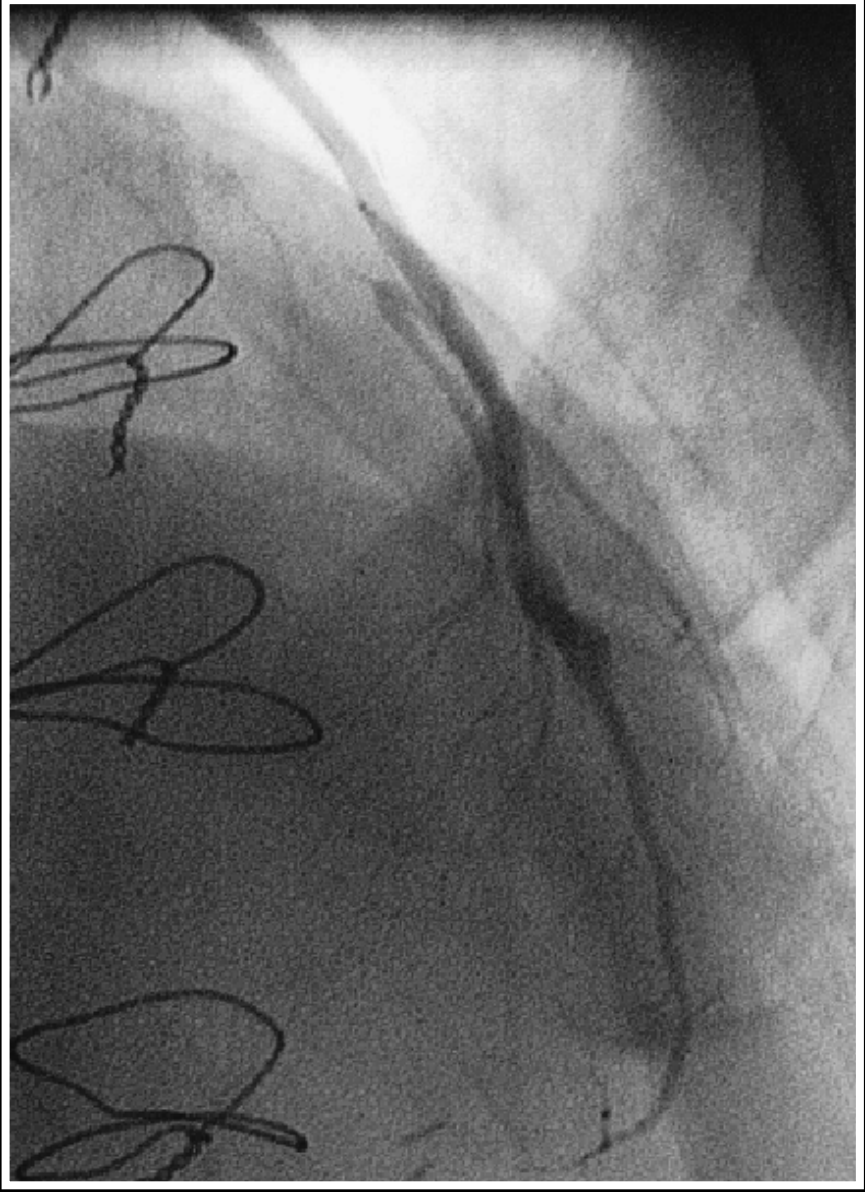
CASE #4

- 78 y/o male
- HTN
- Hypercholesterolemia
- Recurrent angina pectoris x 2 mos
- CABG –10 yrs
- SPECT: Extensive inf.-lat. ischemia
- EKG: NSR / Q-II-III-Vf

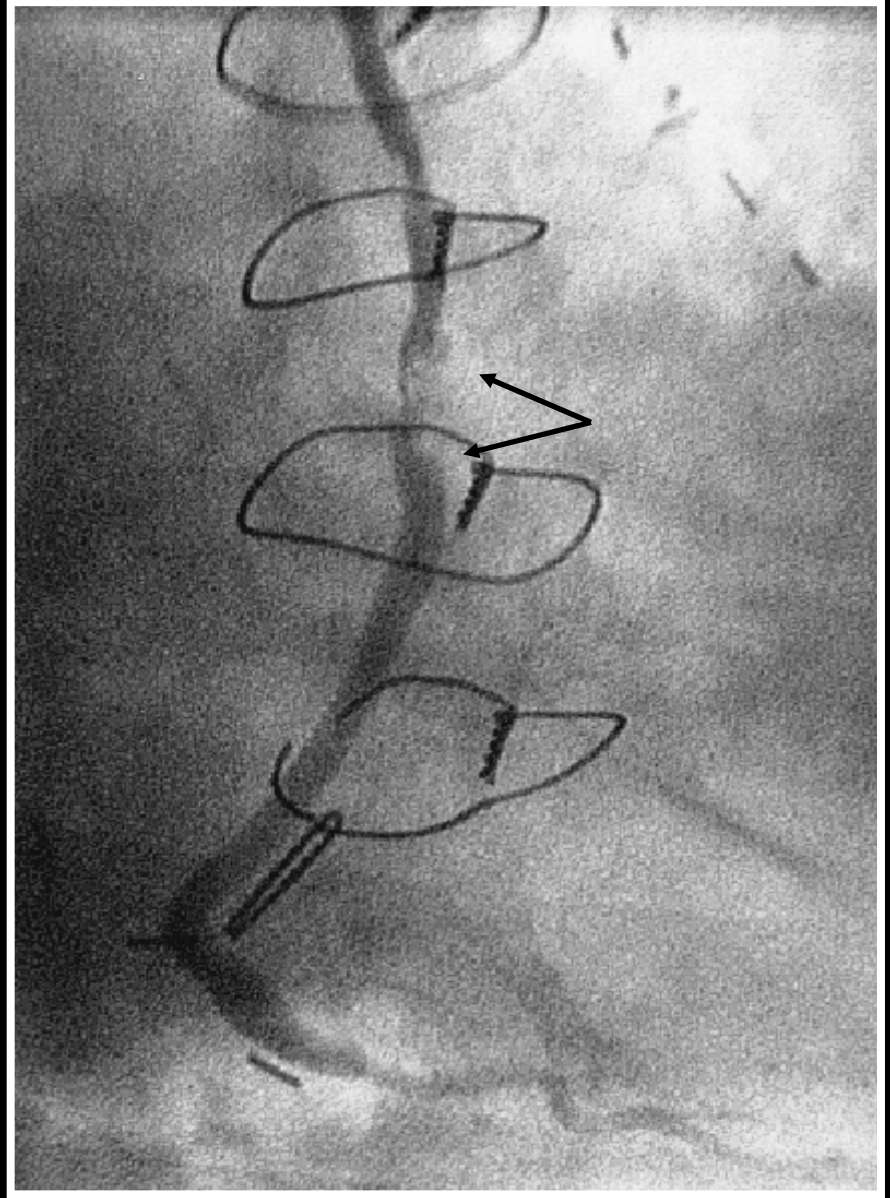
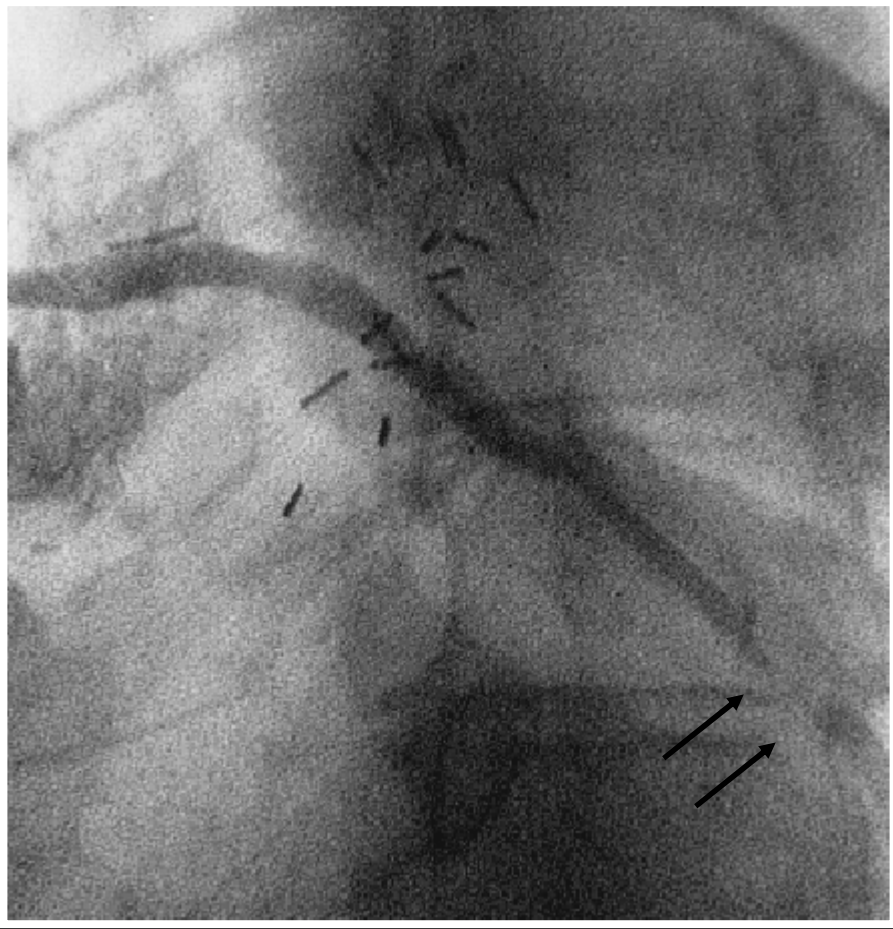


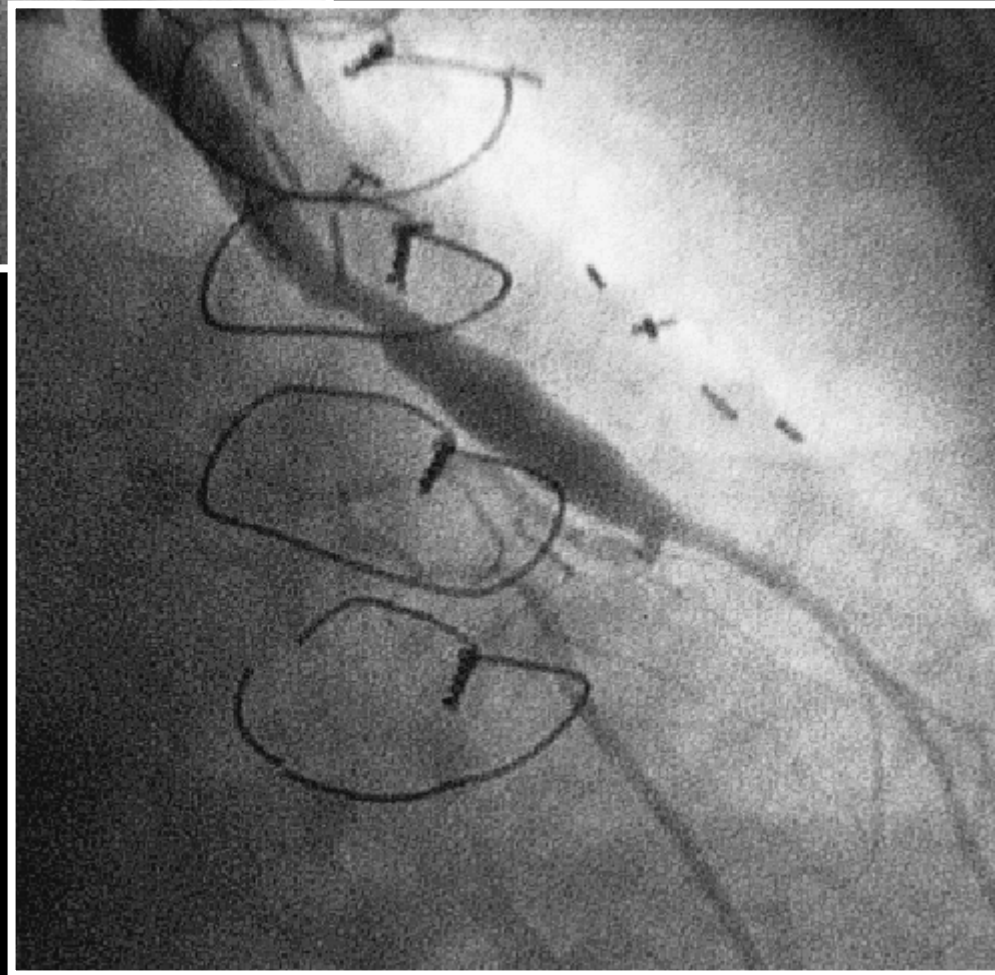
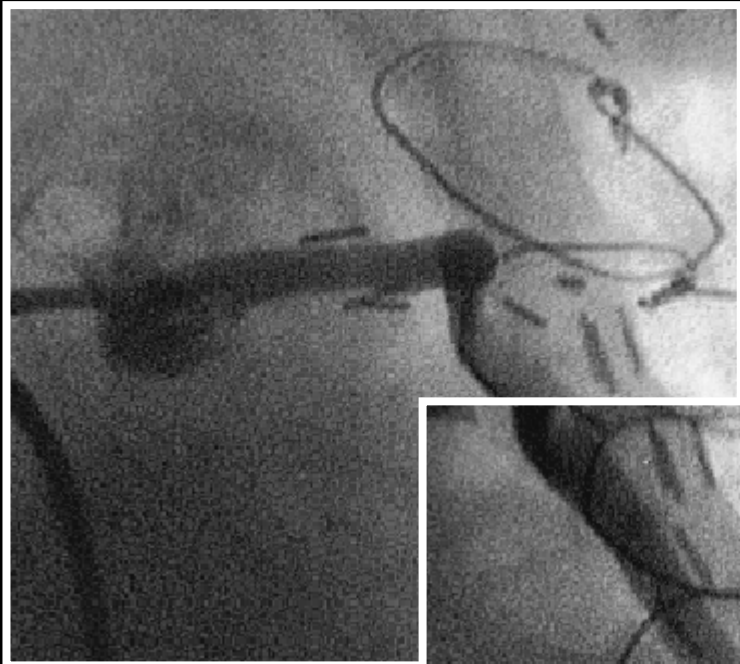


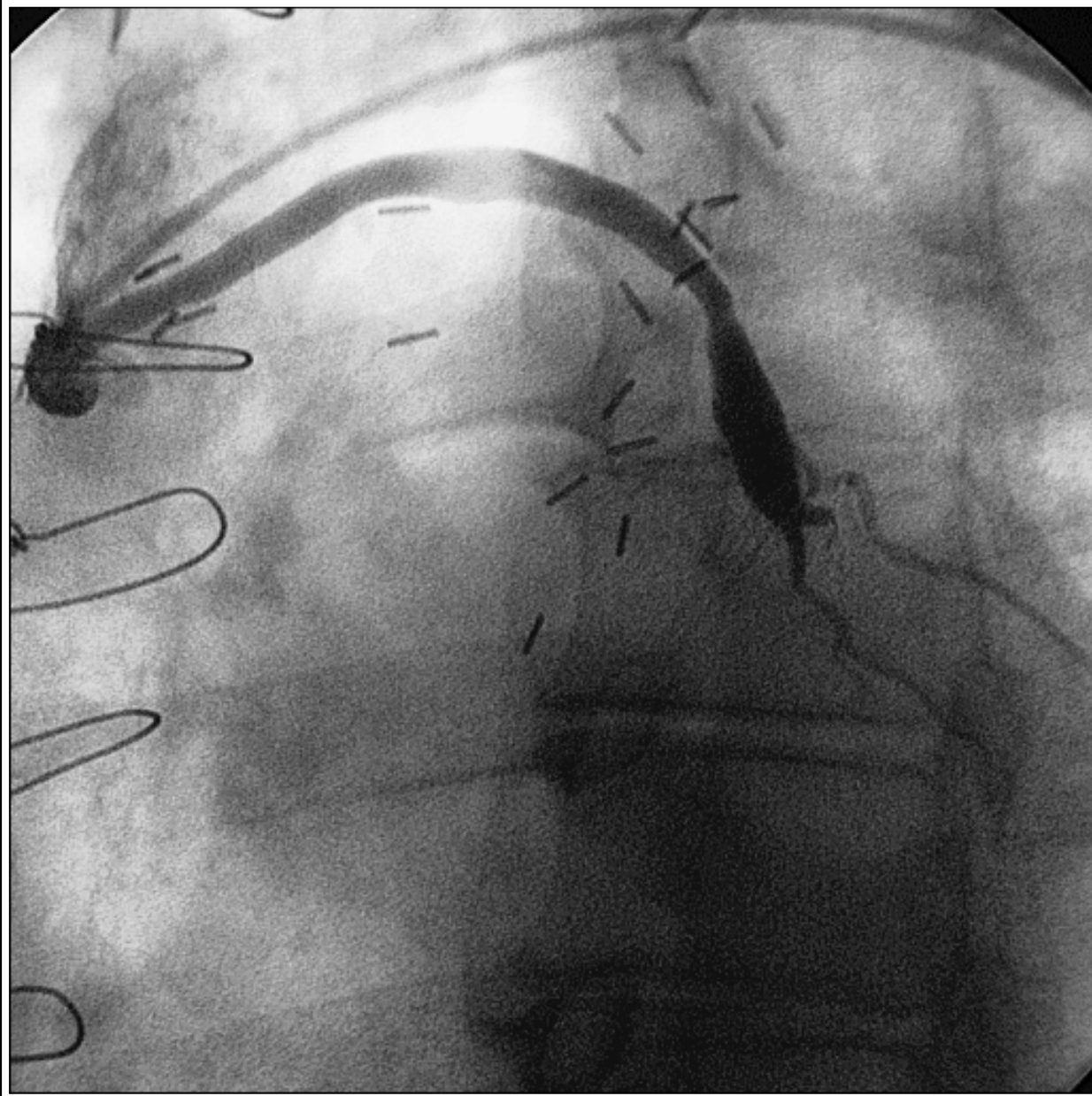


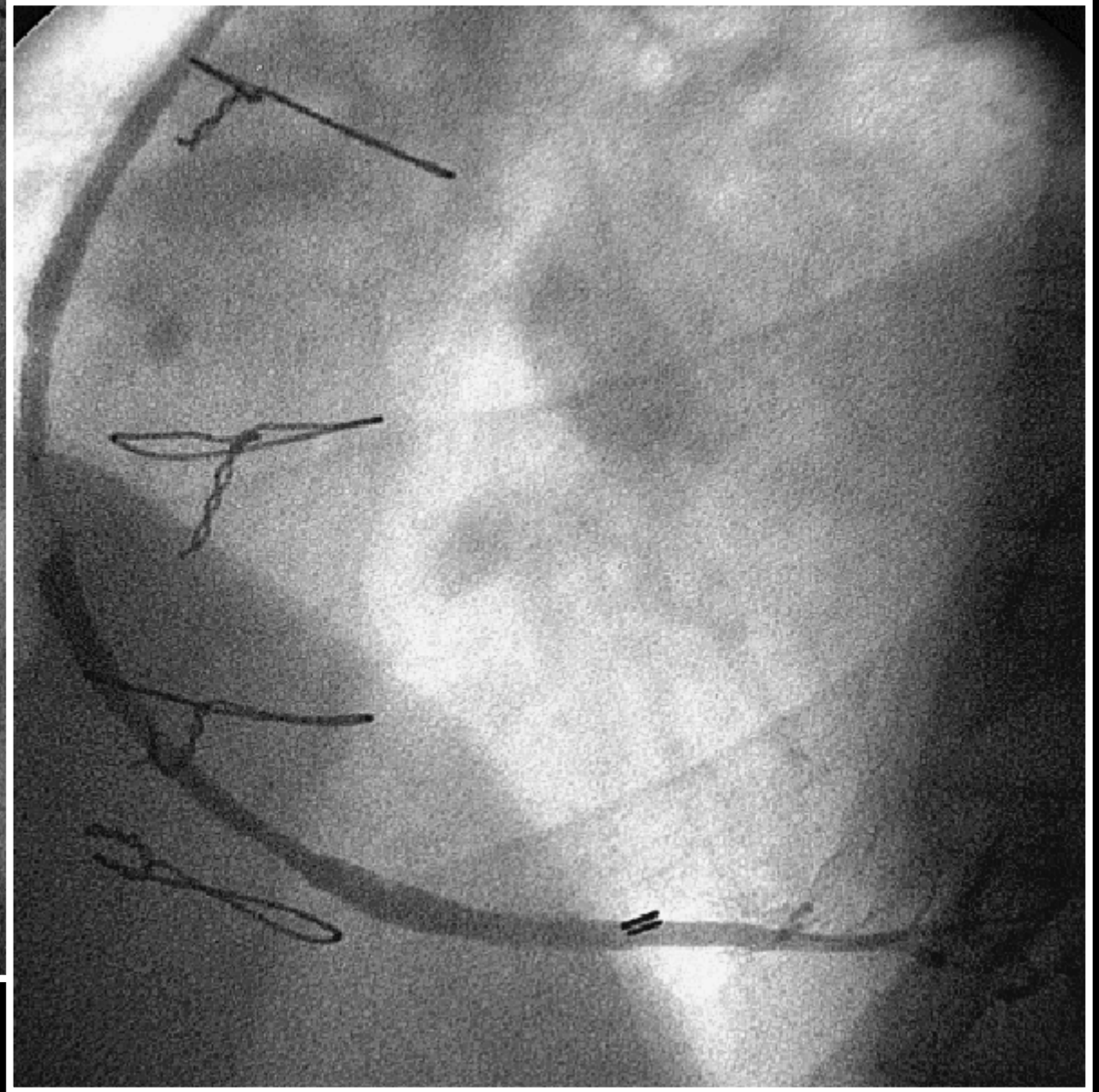
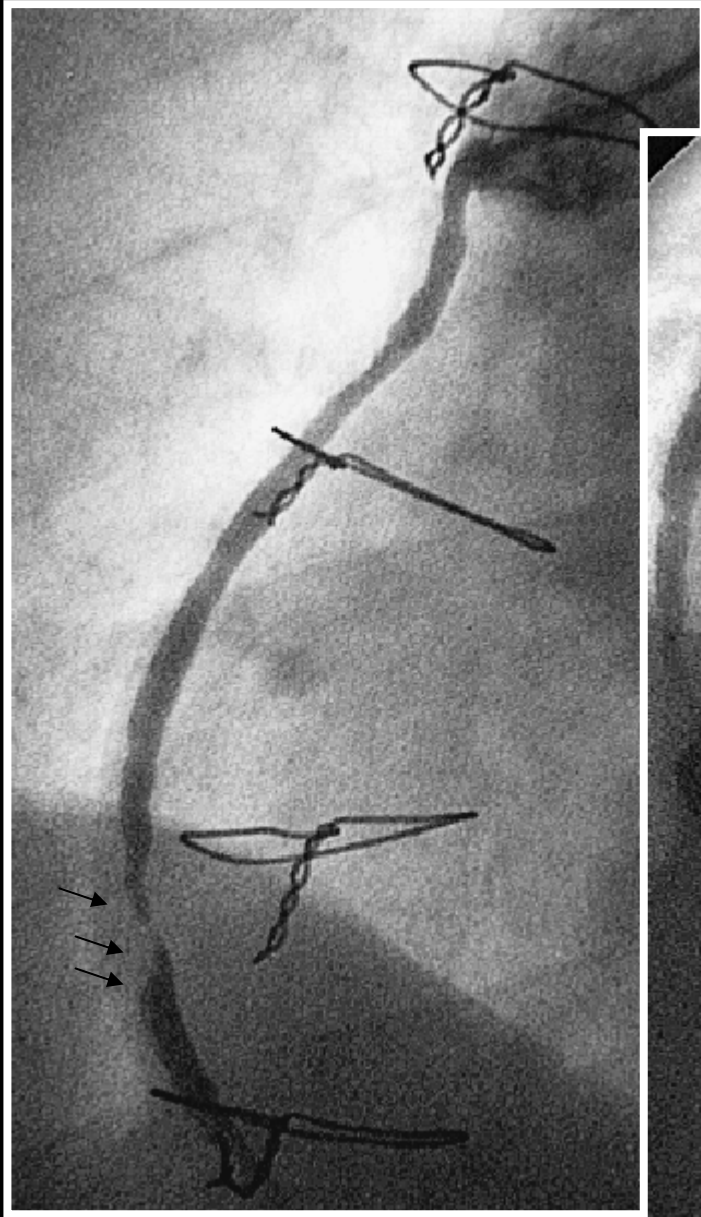






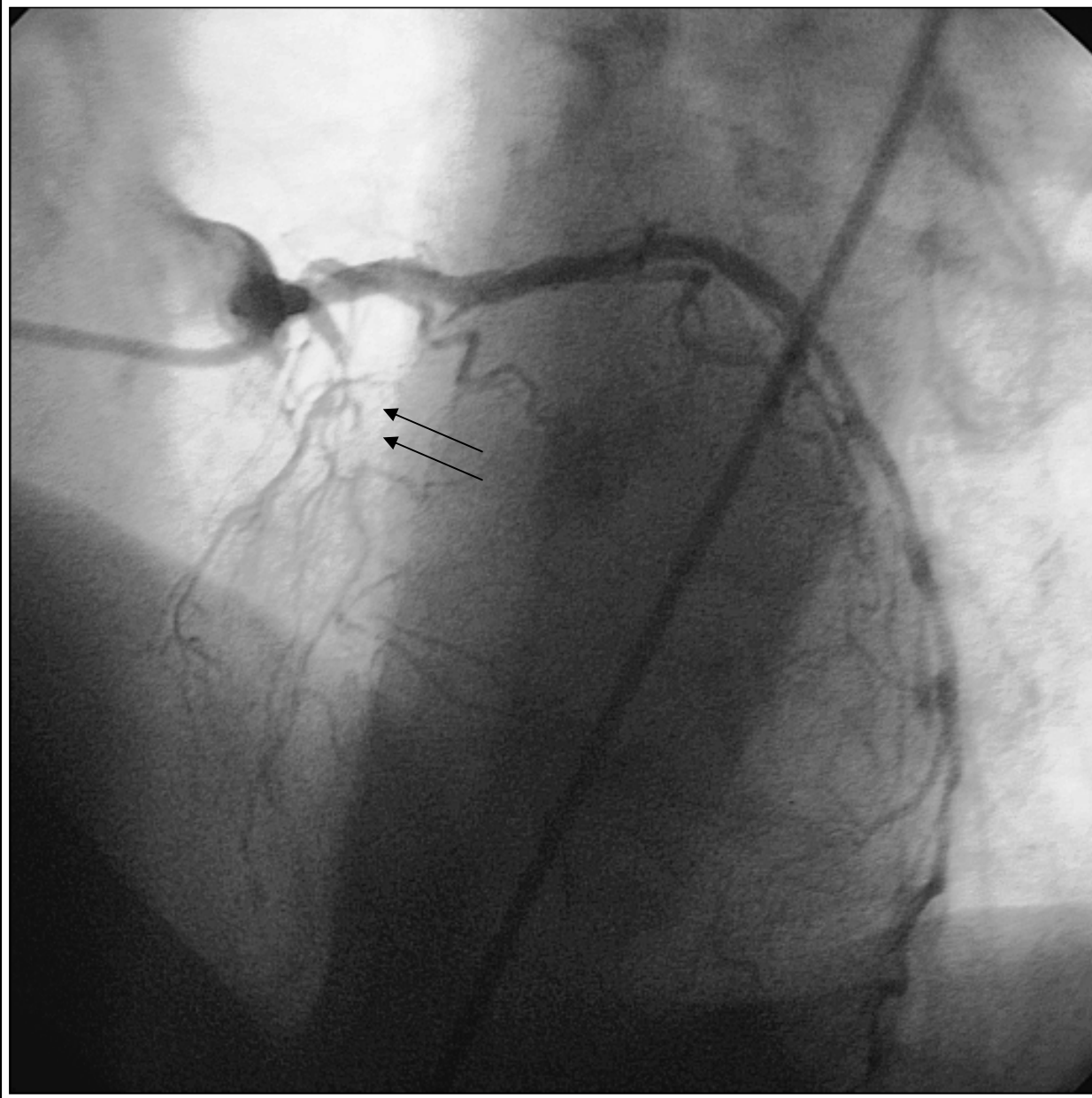


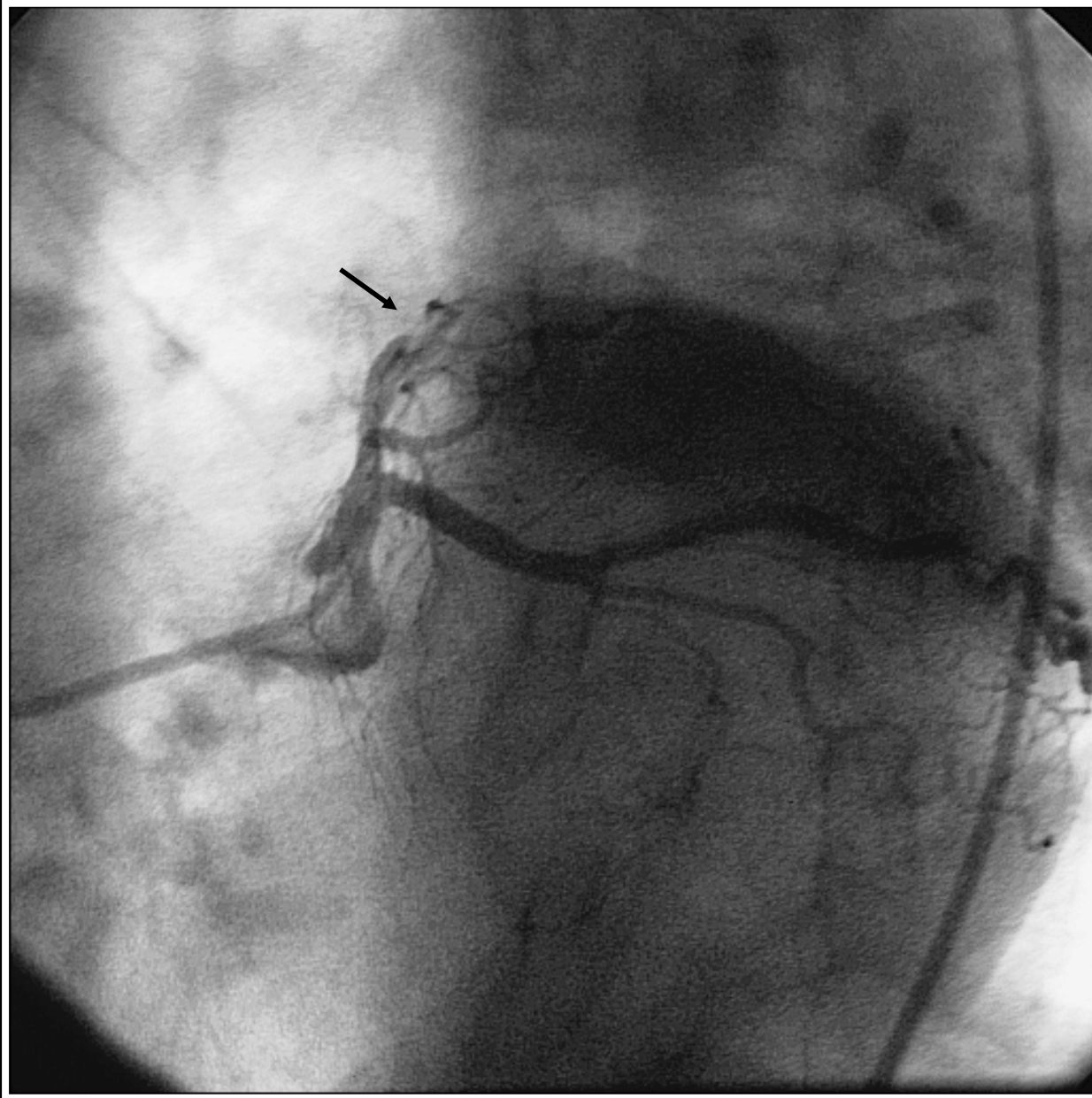


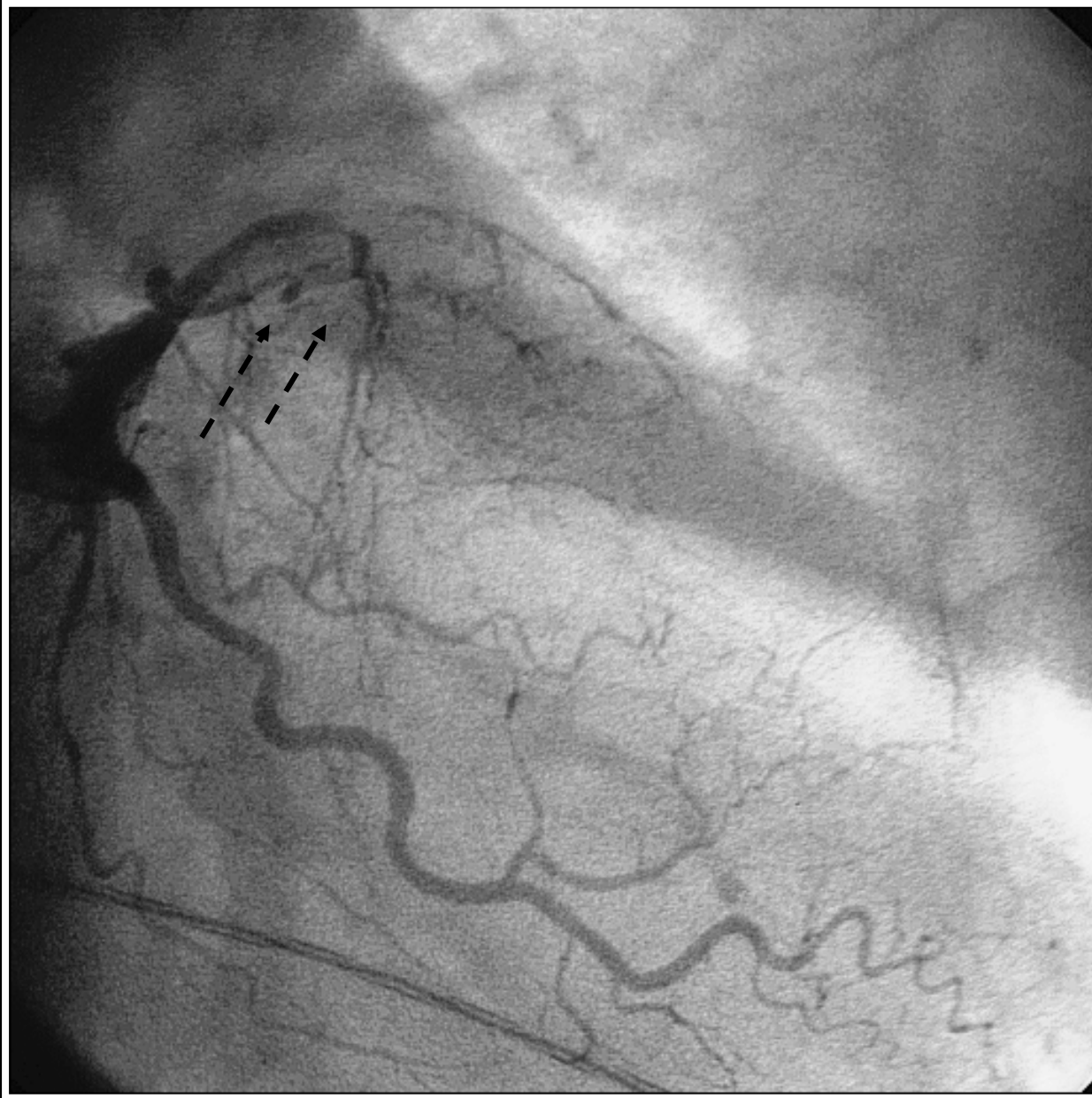


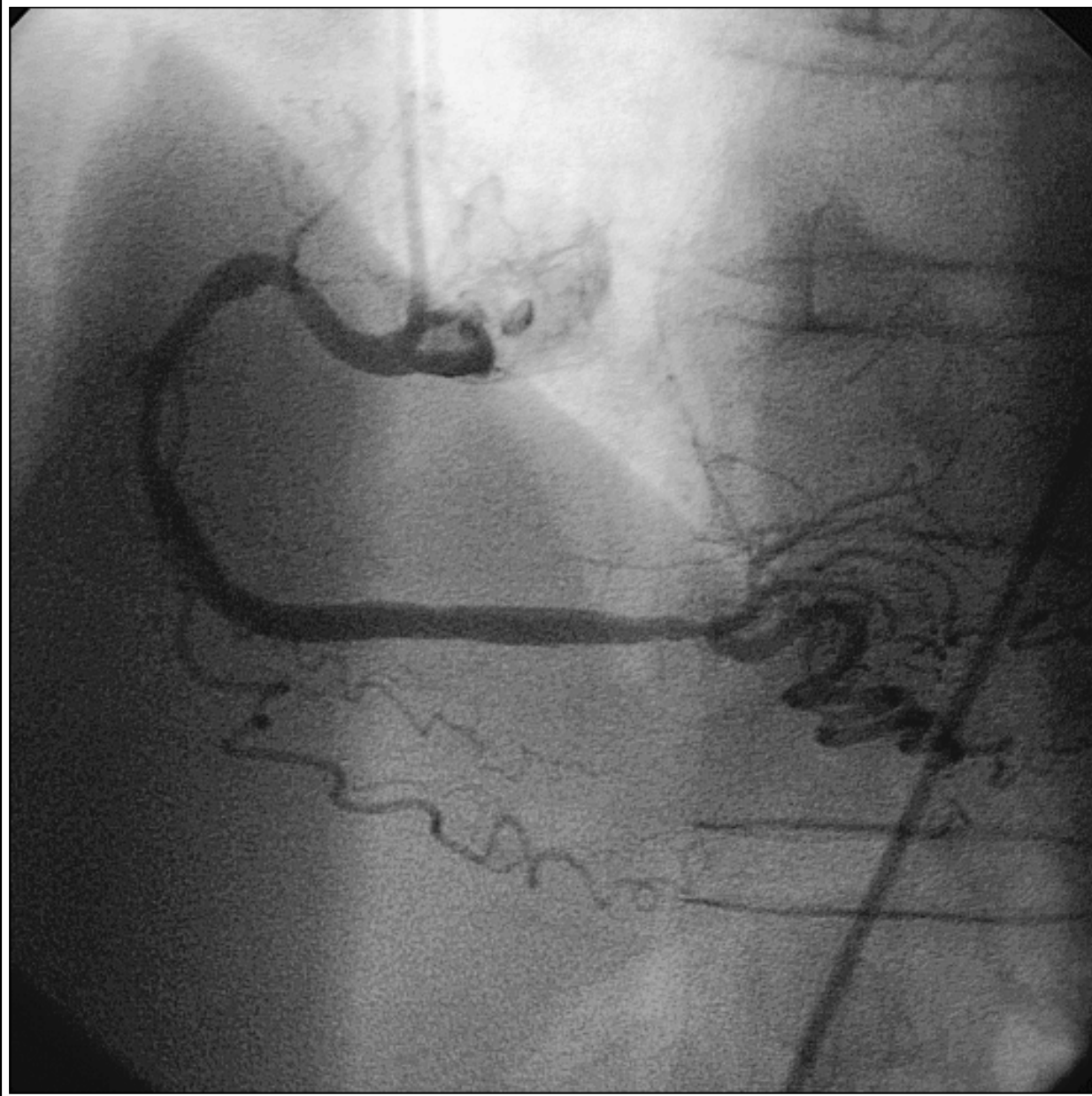
CASE #5

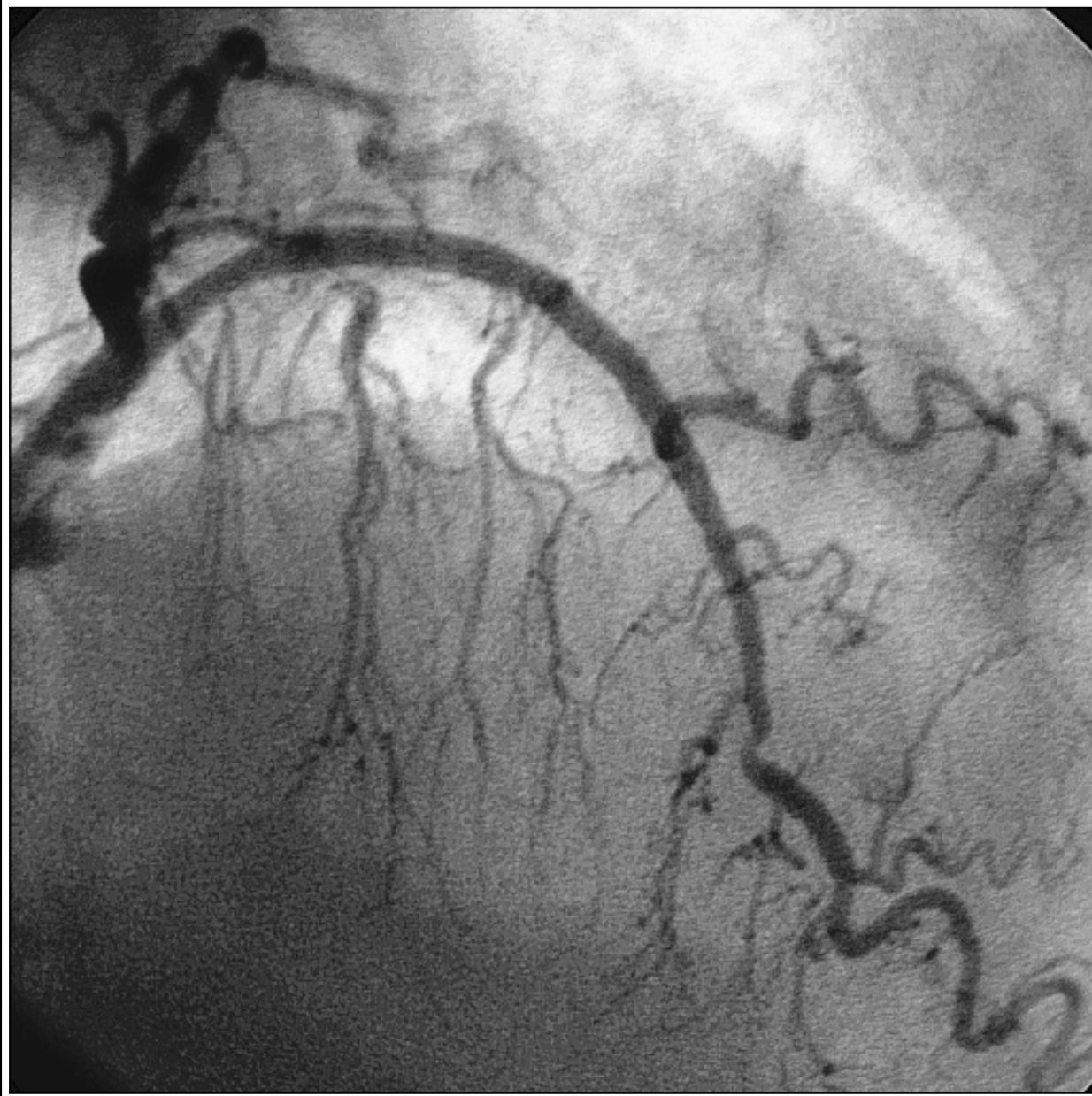
- 76 y/o female
- HTN
- DM
- Angina pectoris x 5 mos
- SPECT: Extensive anterior ischemia
- EKG: NSR, LAH





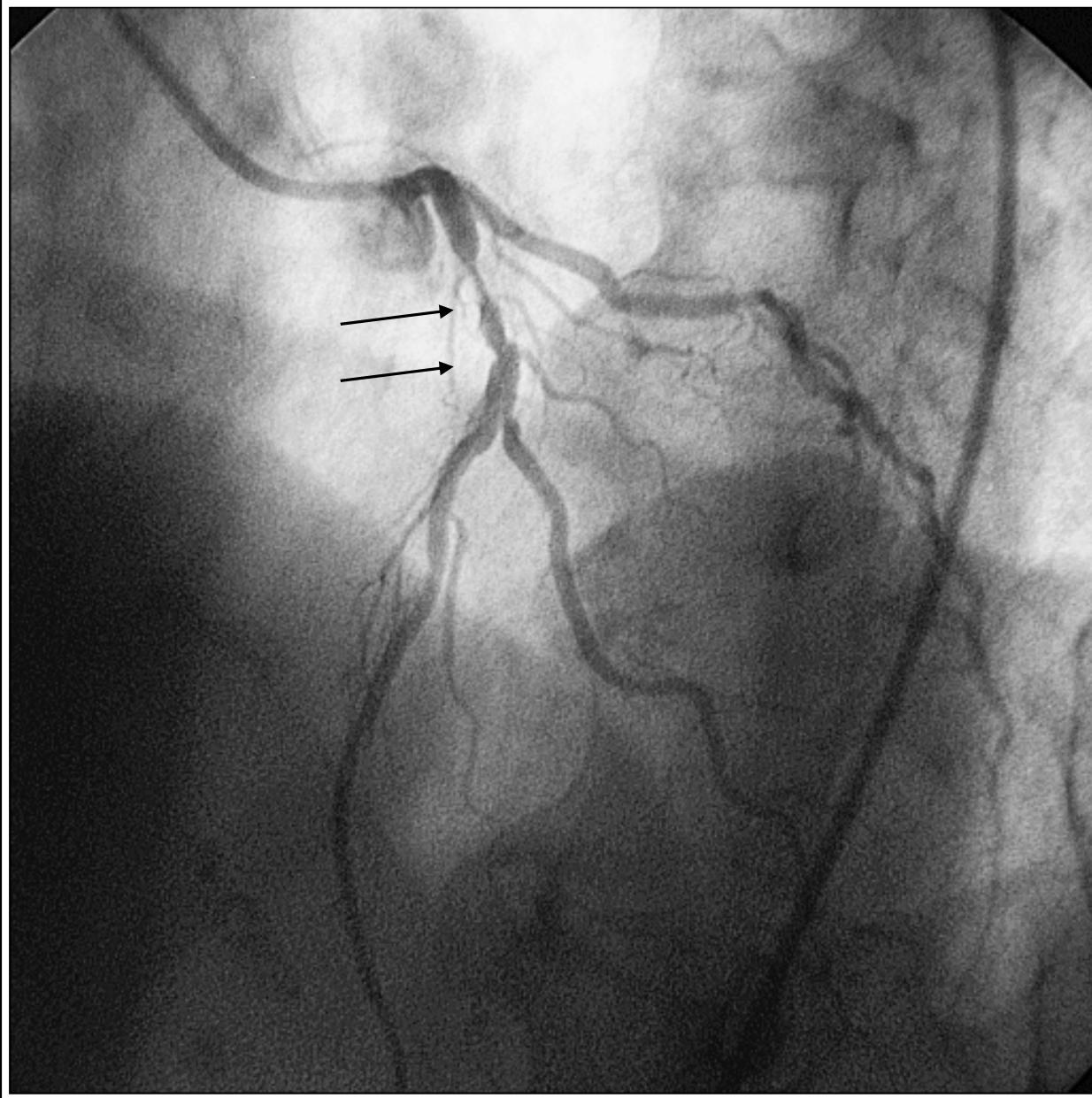


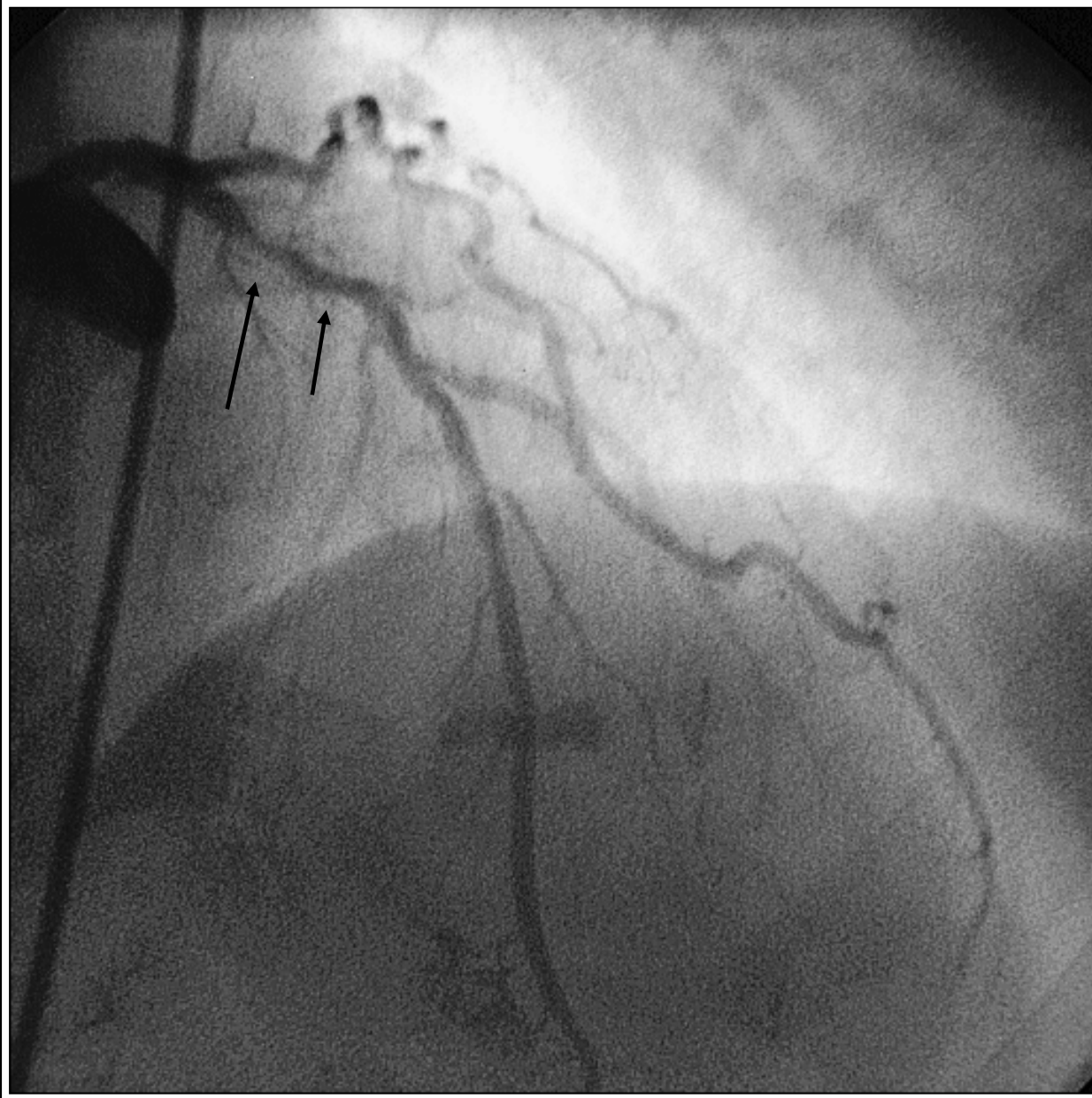


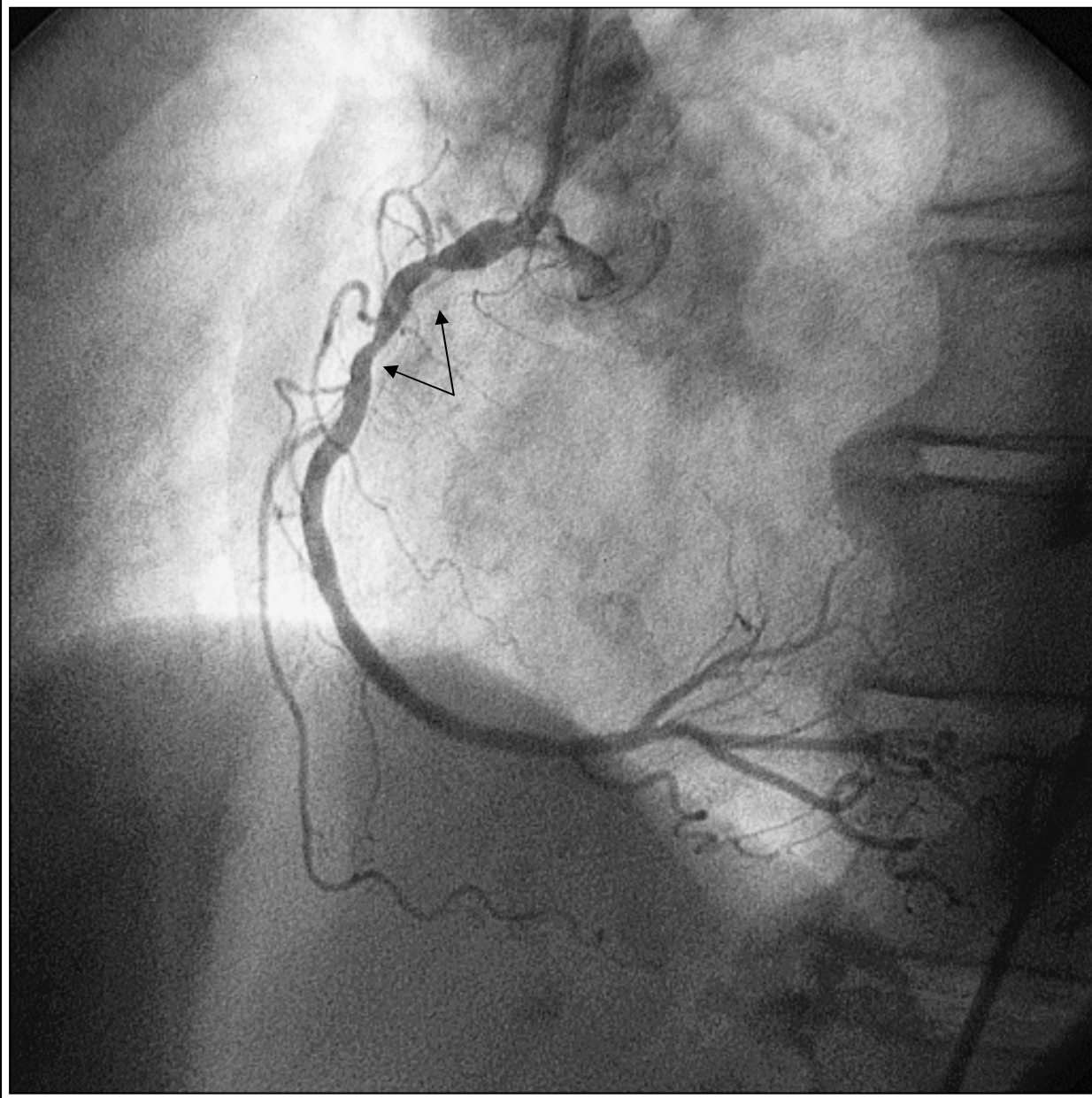


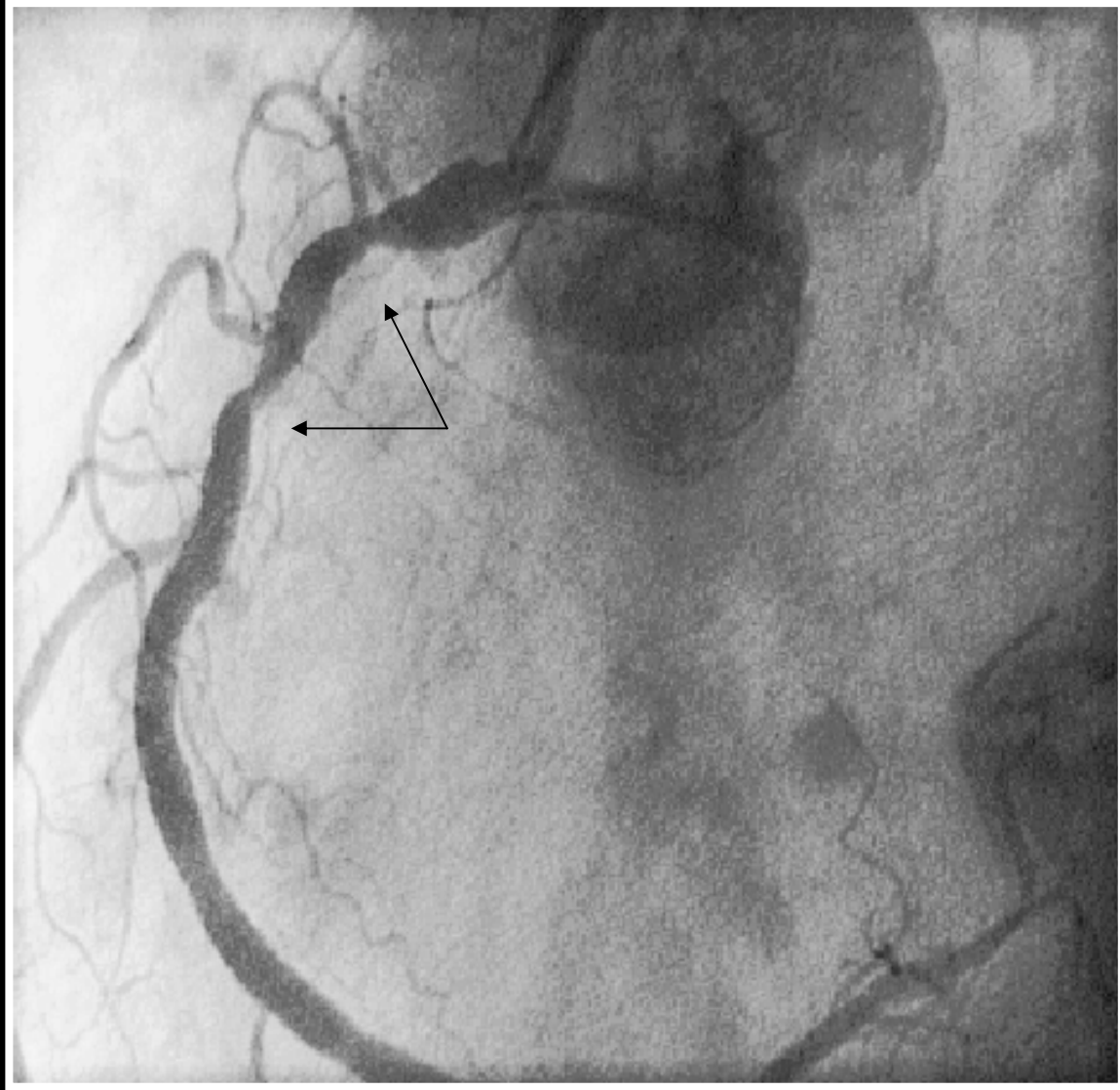
CASE #6

- 64 y/o female
- Smoker
- DM
- Angina pectoris x 3 mos
- +ETT/+SPECT (anterior+inferior)
- EKG: NSR



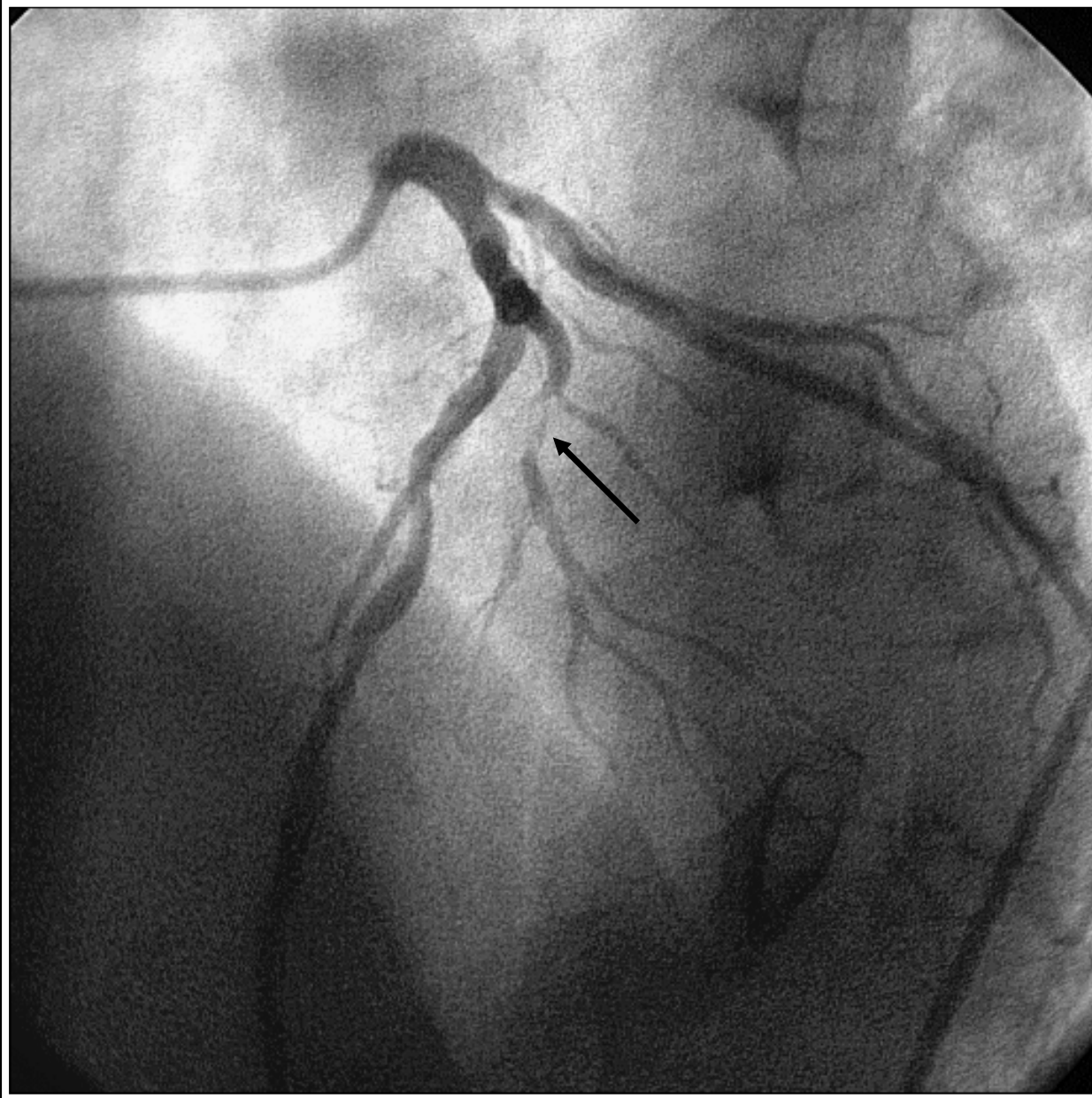


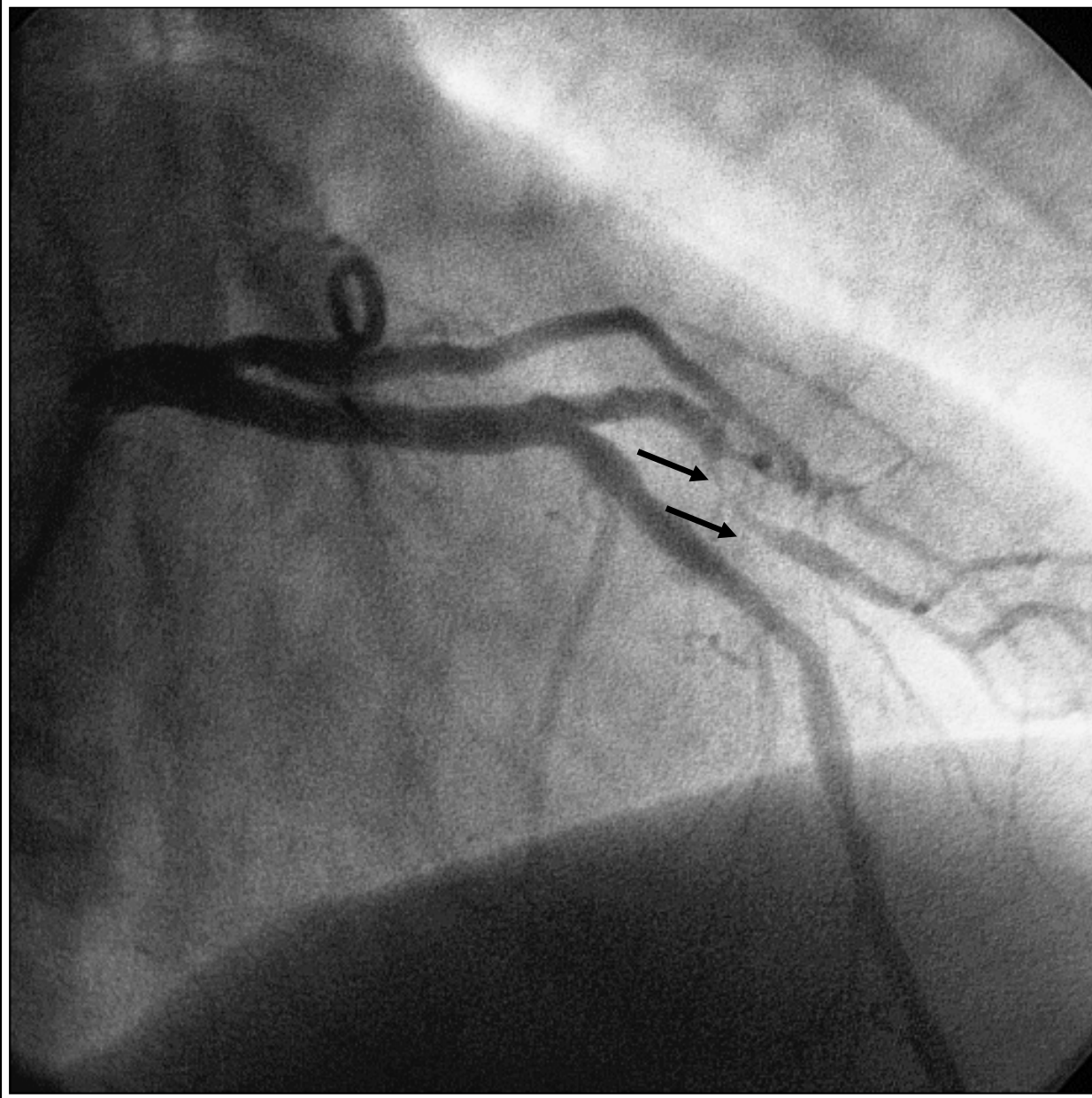


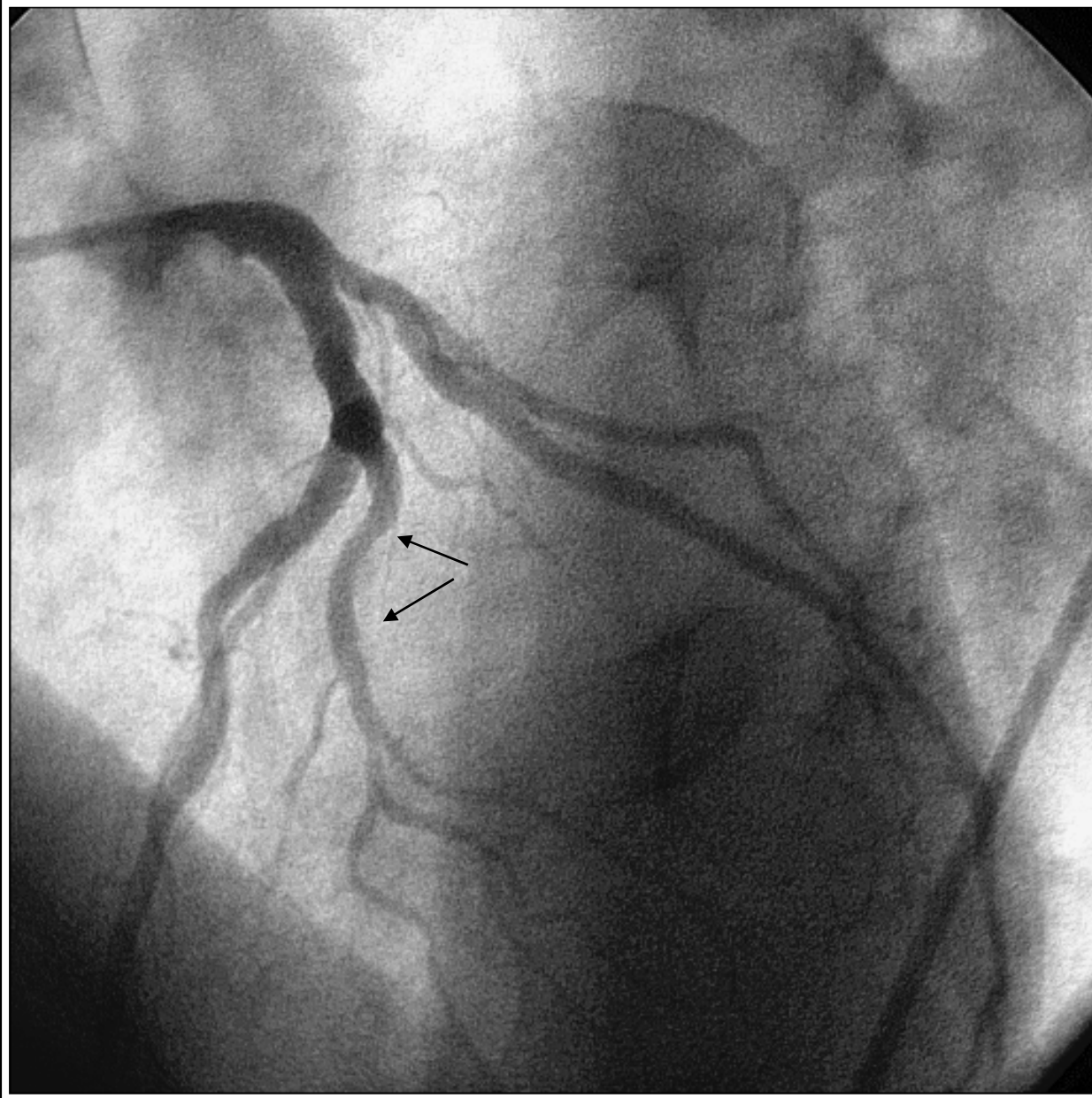


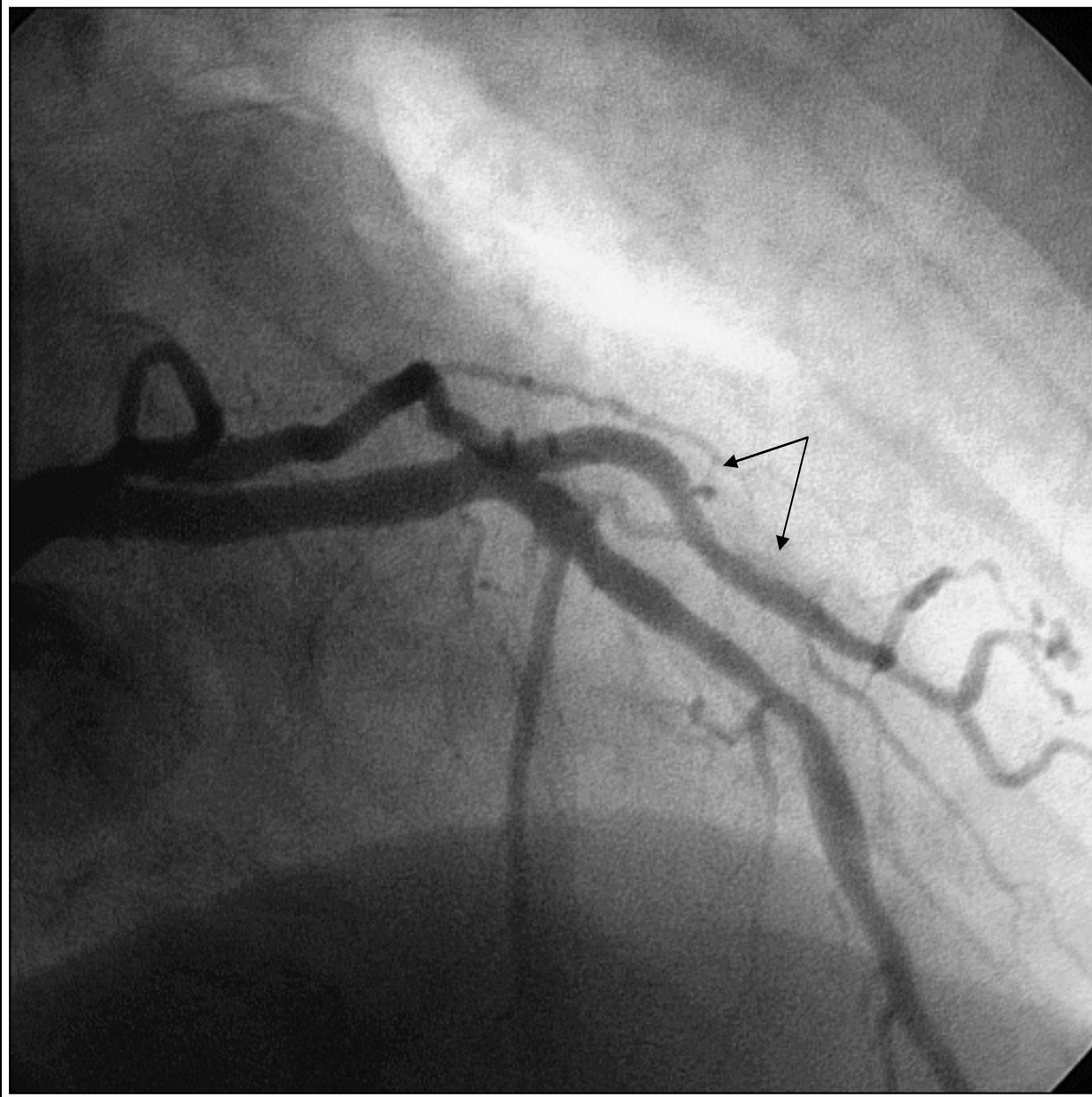
CASE #7

- 52 y/o male
- No risk factors
- Angina pectoris x 2 mos
- +ETT (ST depressions @6 min)
- EKG: NSR



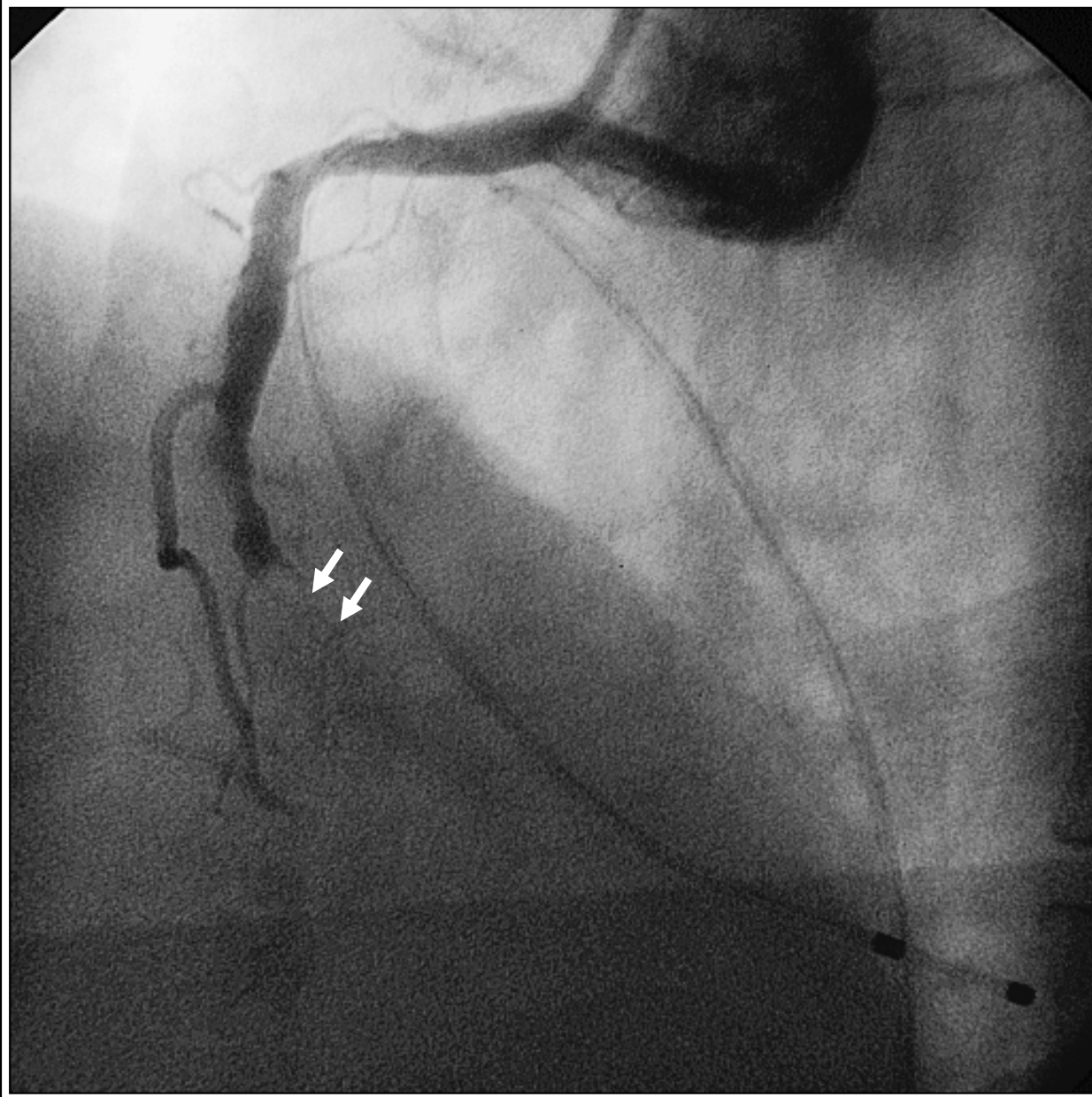


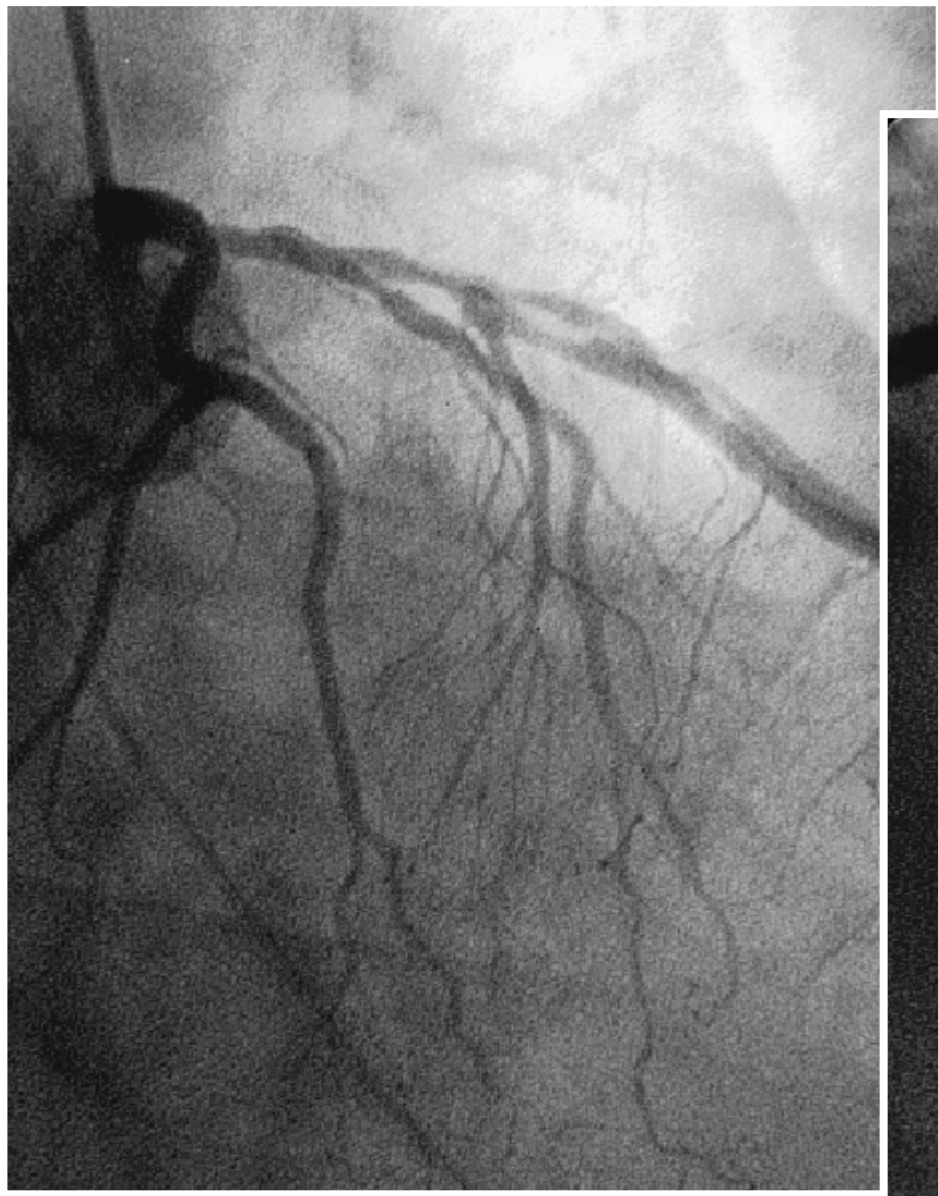


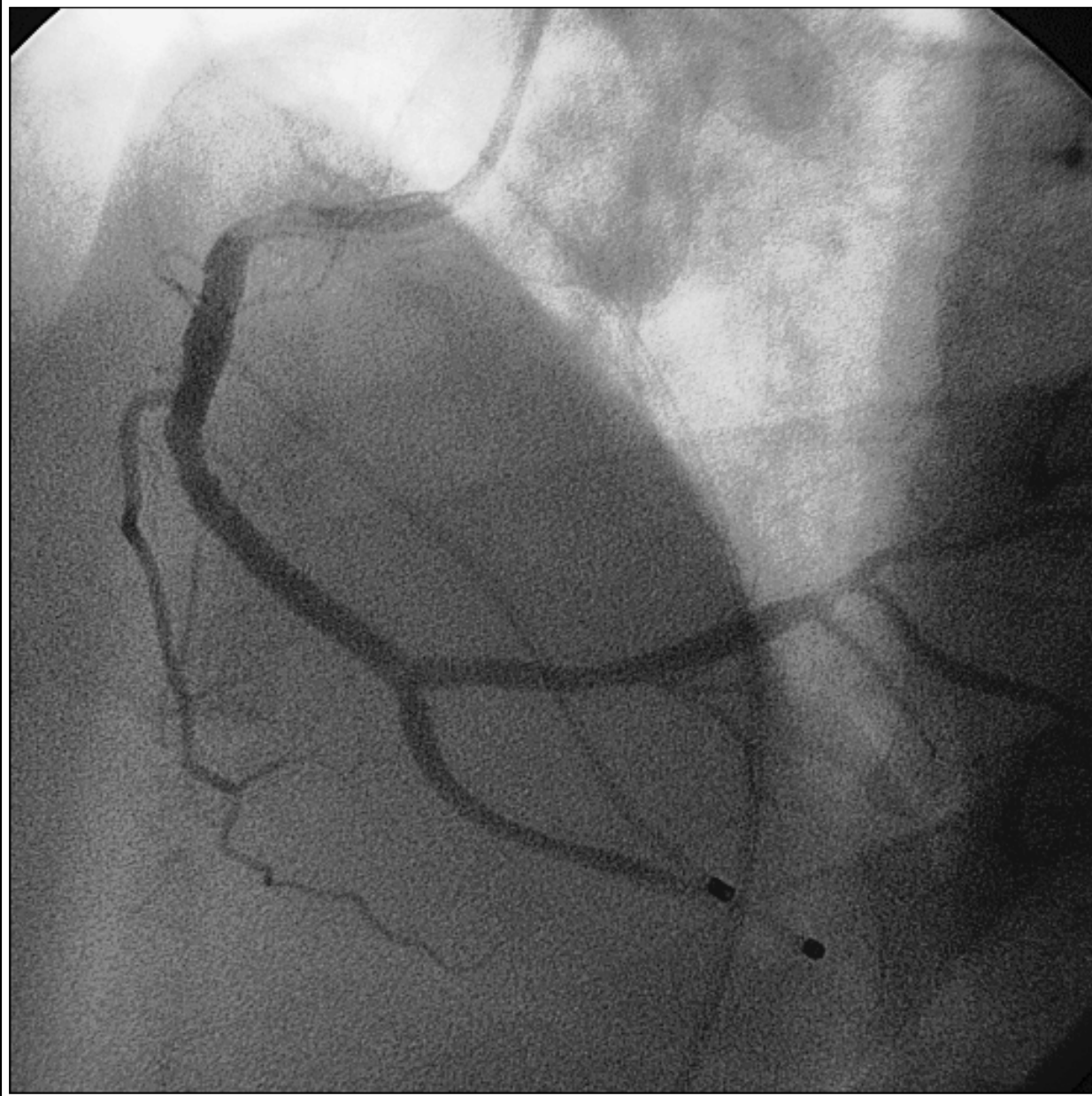


CASE #8

- 49 y/o male
- No risk factors
- Acute inferior MI
- EKG: Sinus / ST elevation II/III/Vf

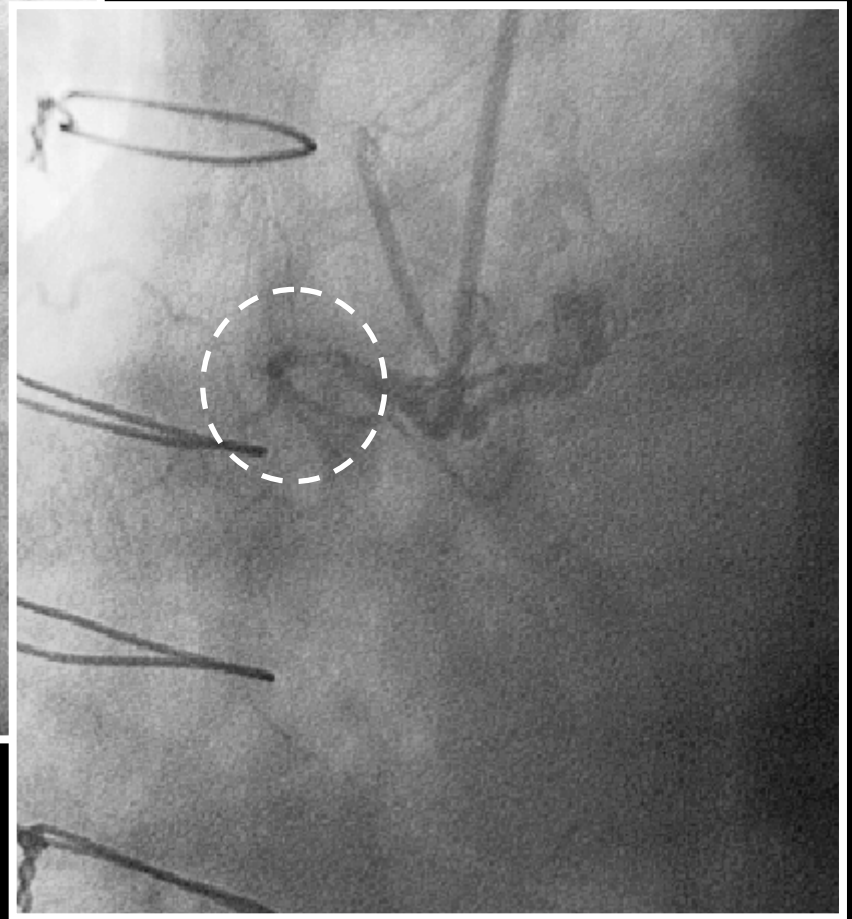
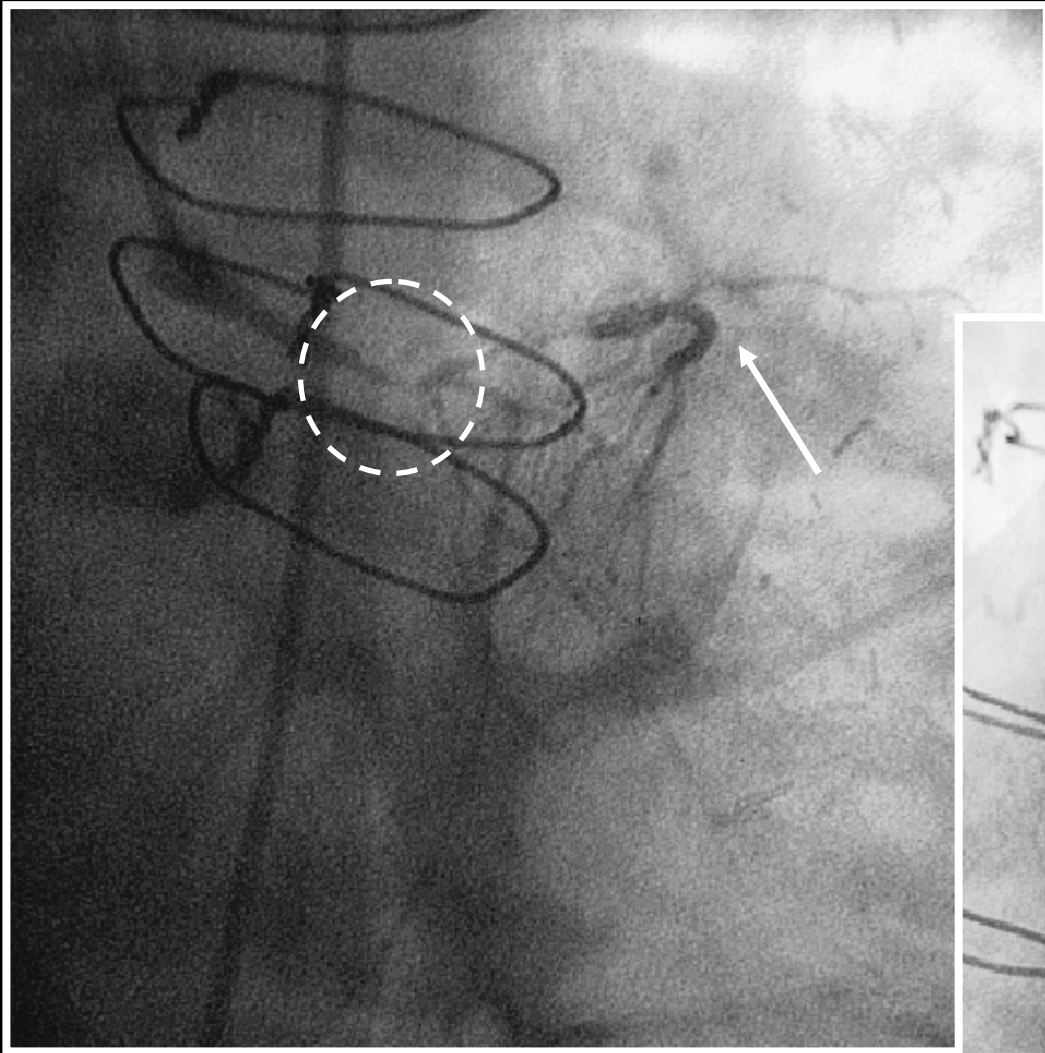


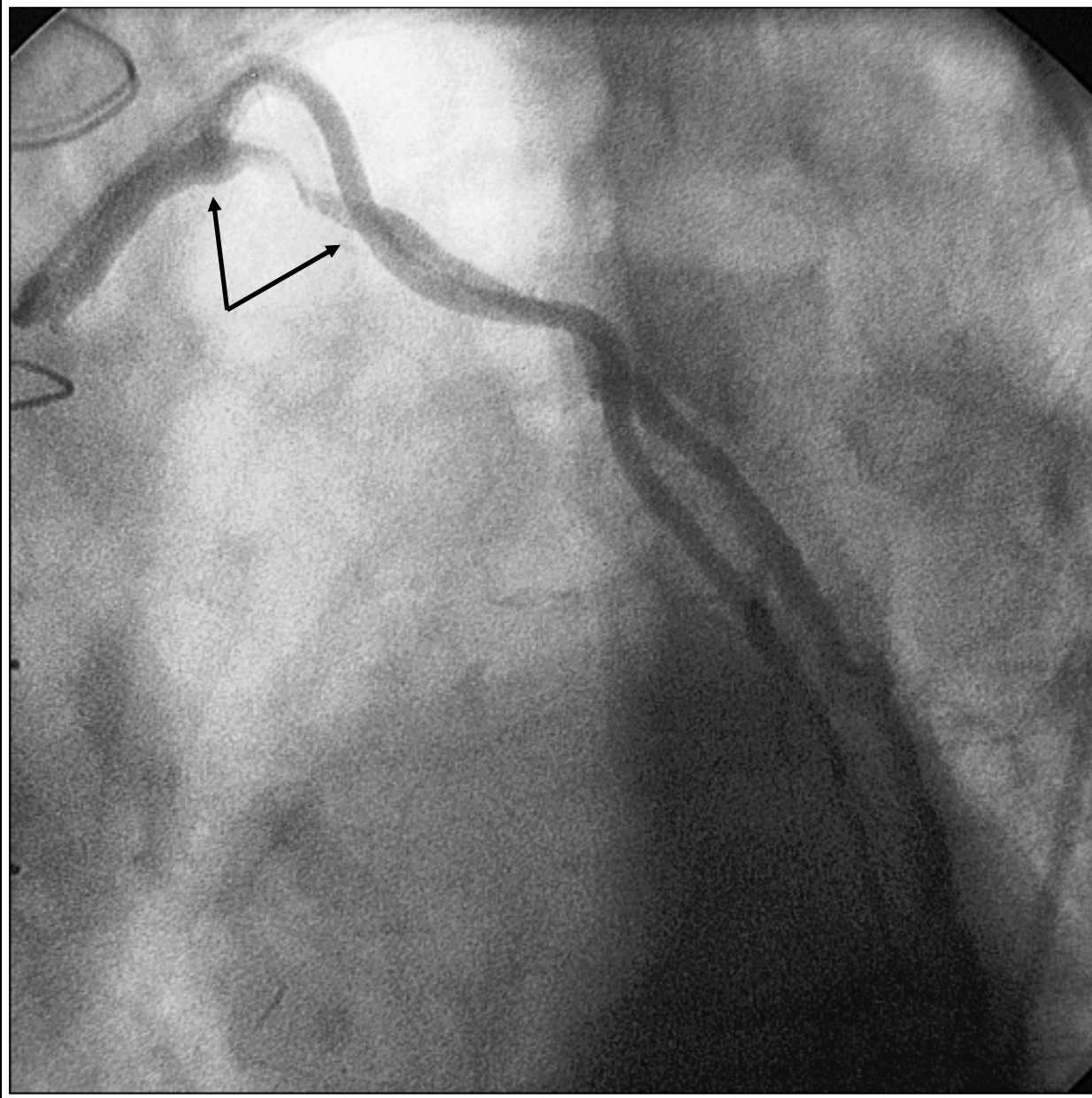


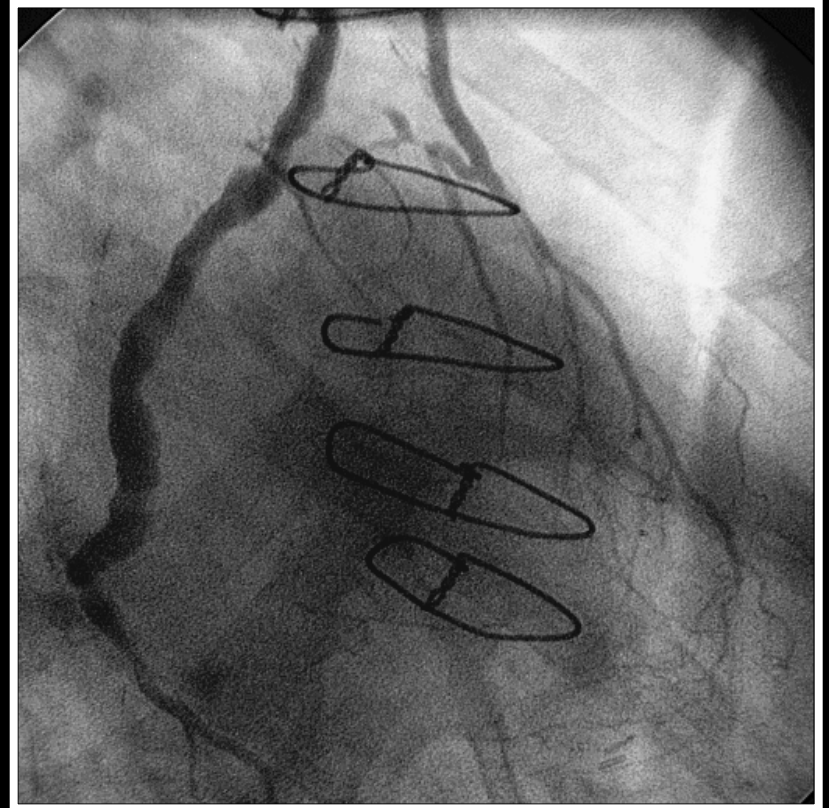
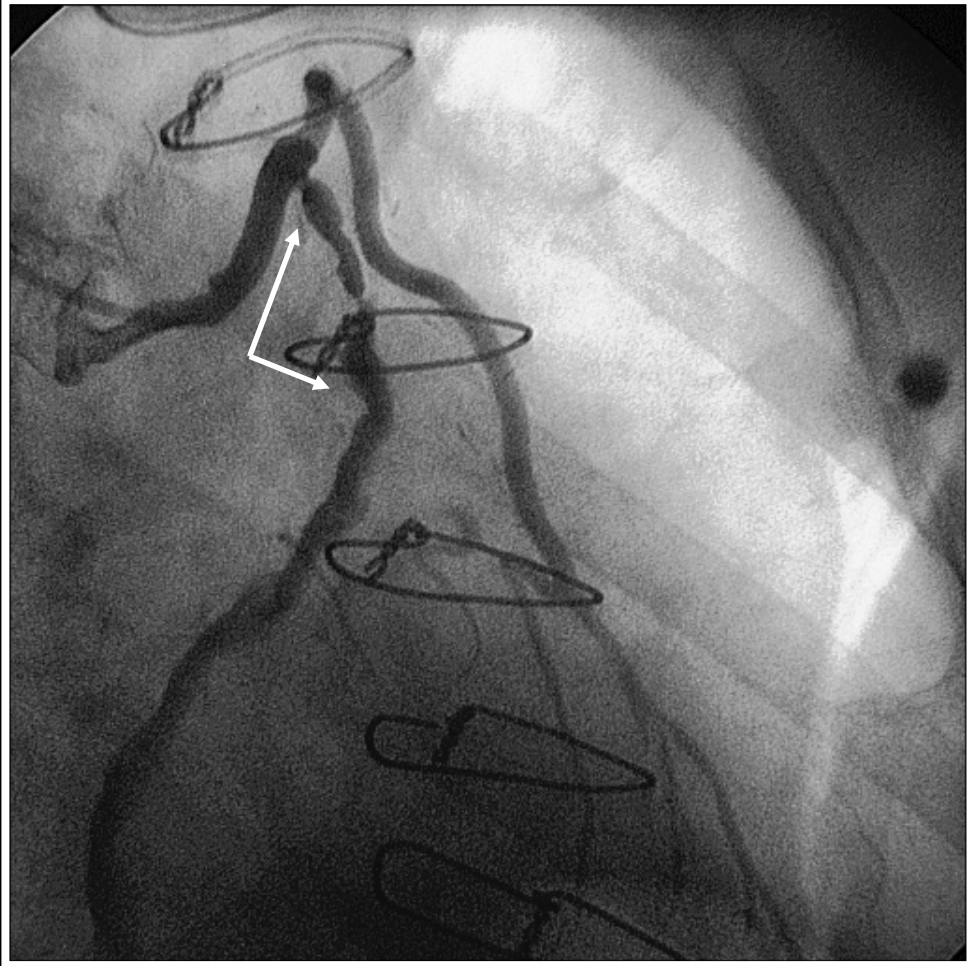


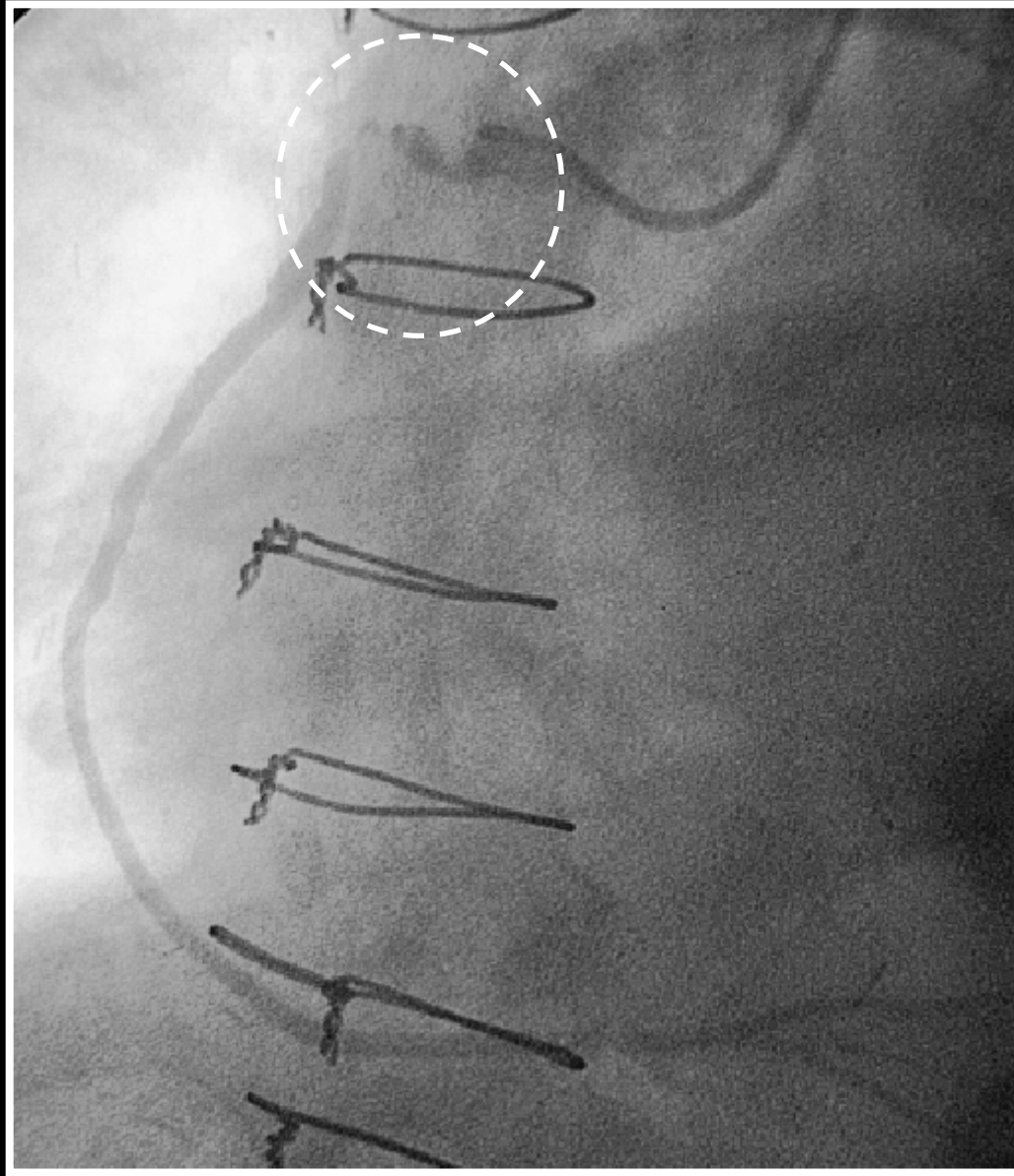
CASE #9

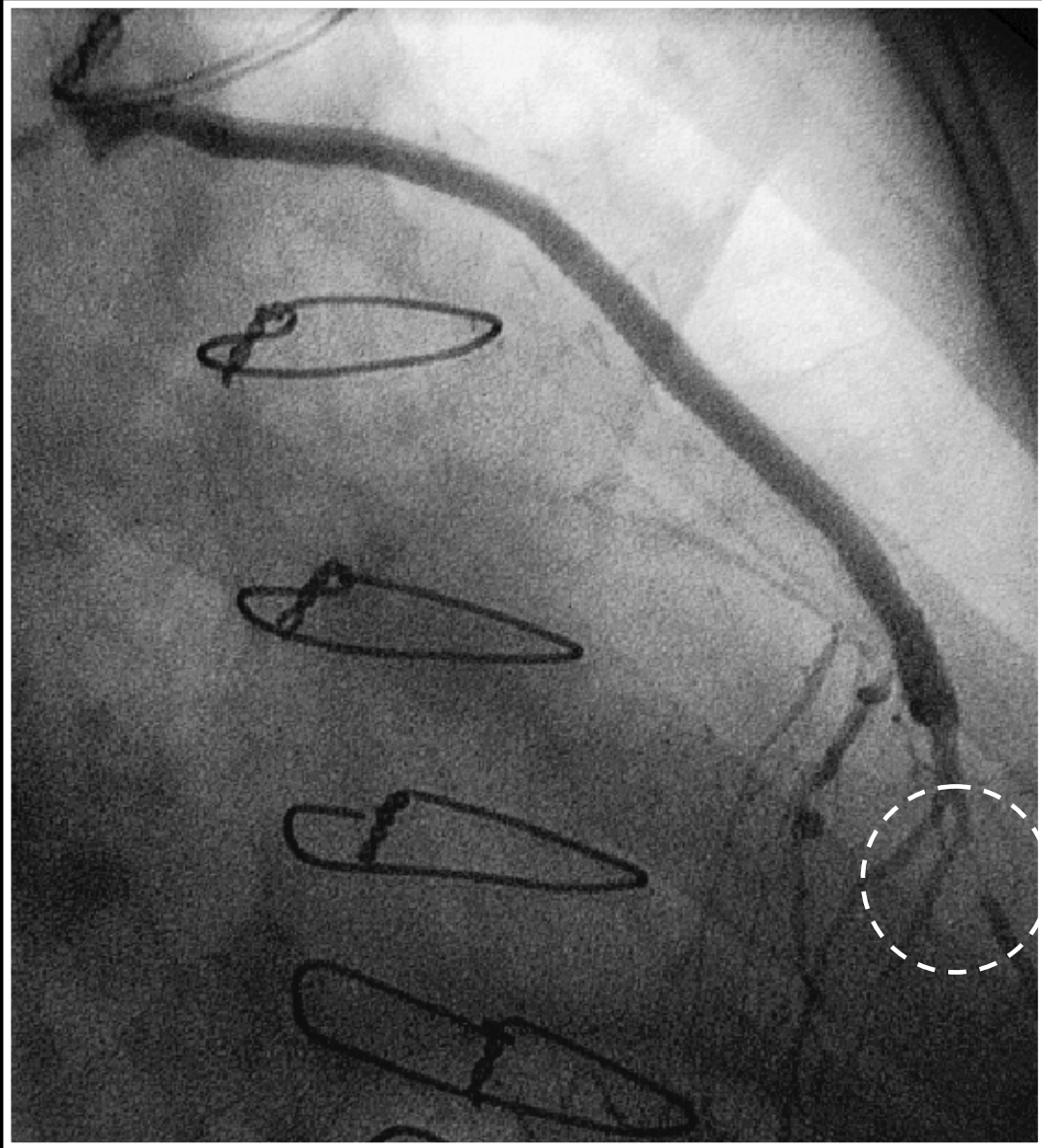
- 69 y/o male
- HTN
- Smoker
- DM
- Recurrent angina pectoris x 4 mos
- CABG –12 yrs
- SPECT: Extensive ant-inf.-lat. ischemia
- EKG: NSR / Q-III-V2-V3





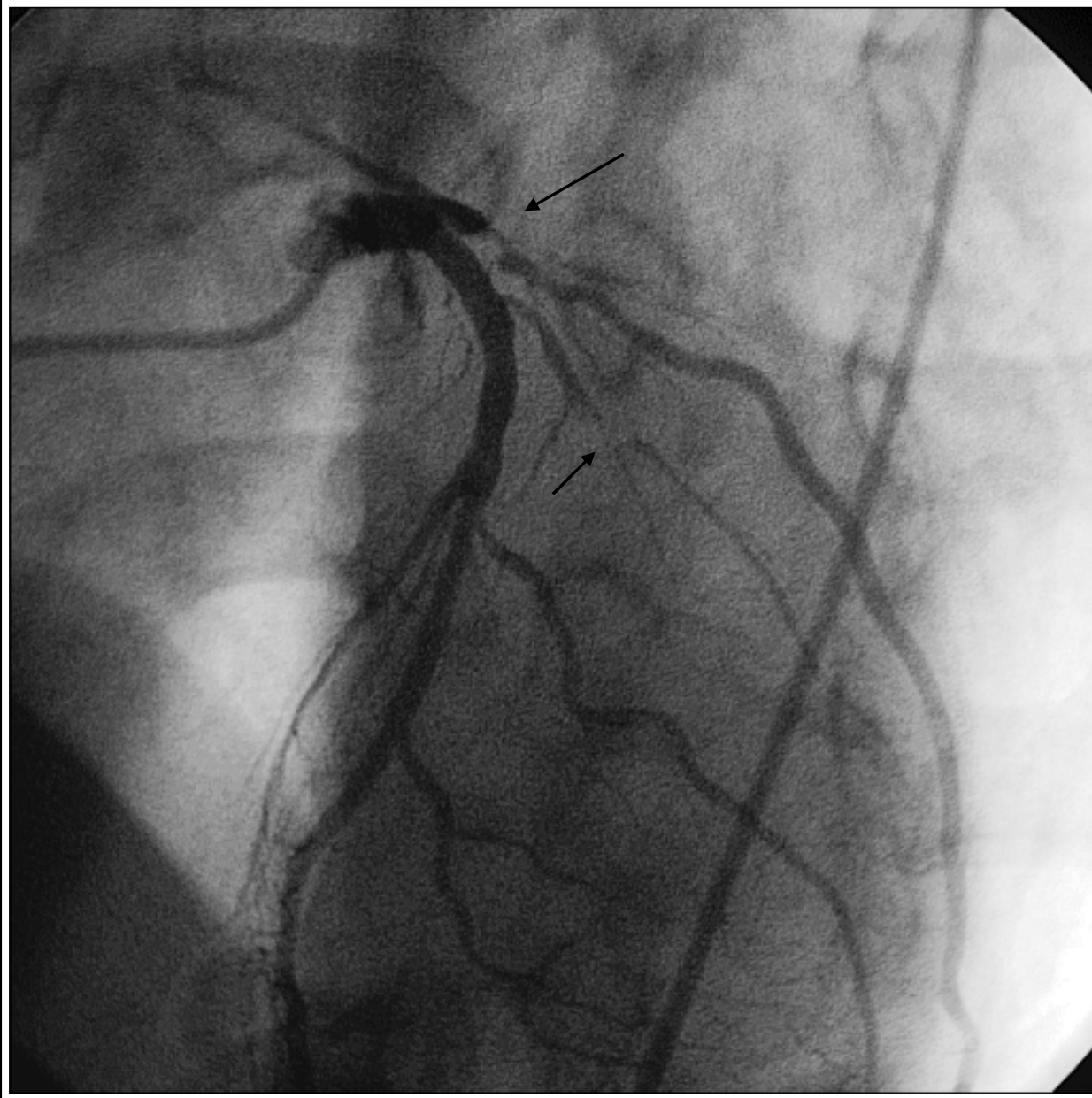


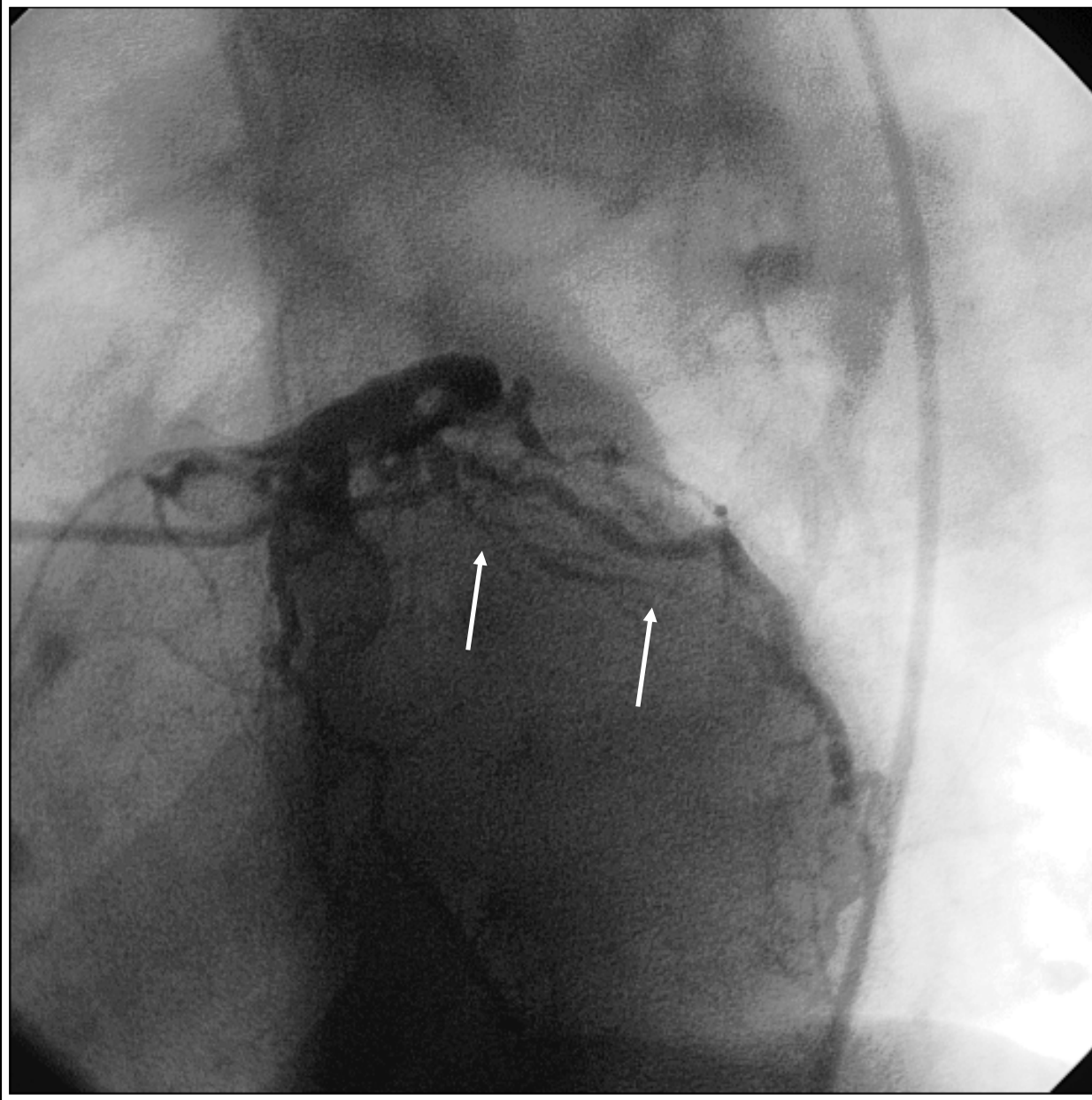


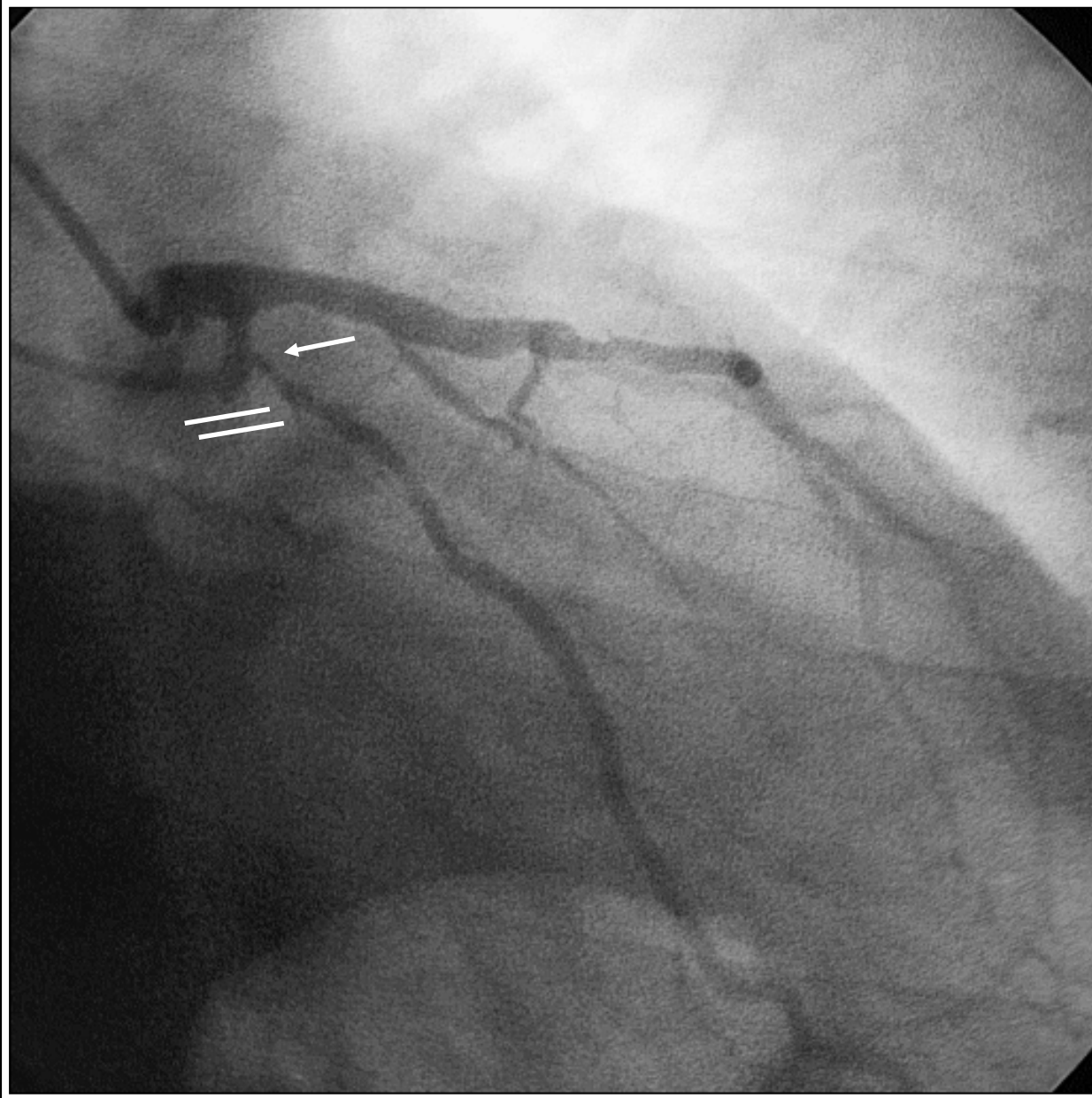


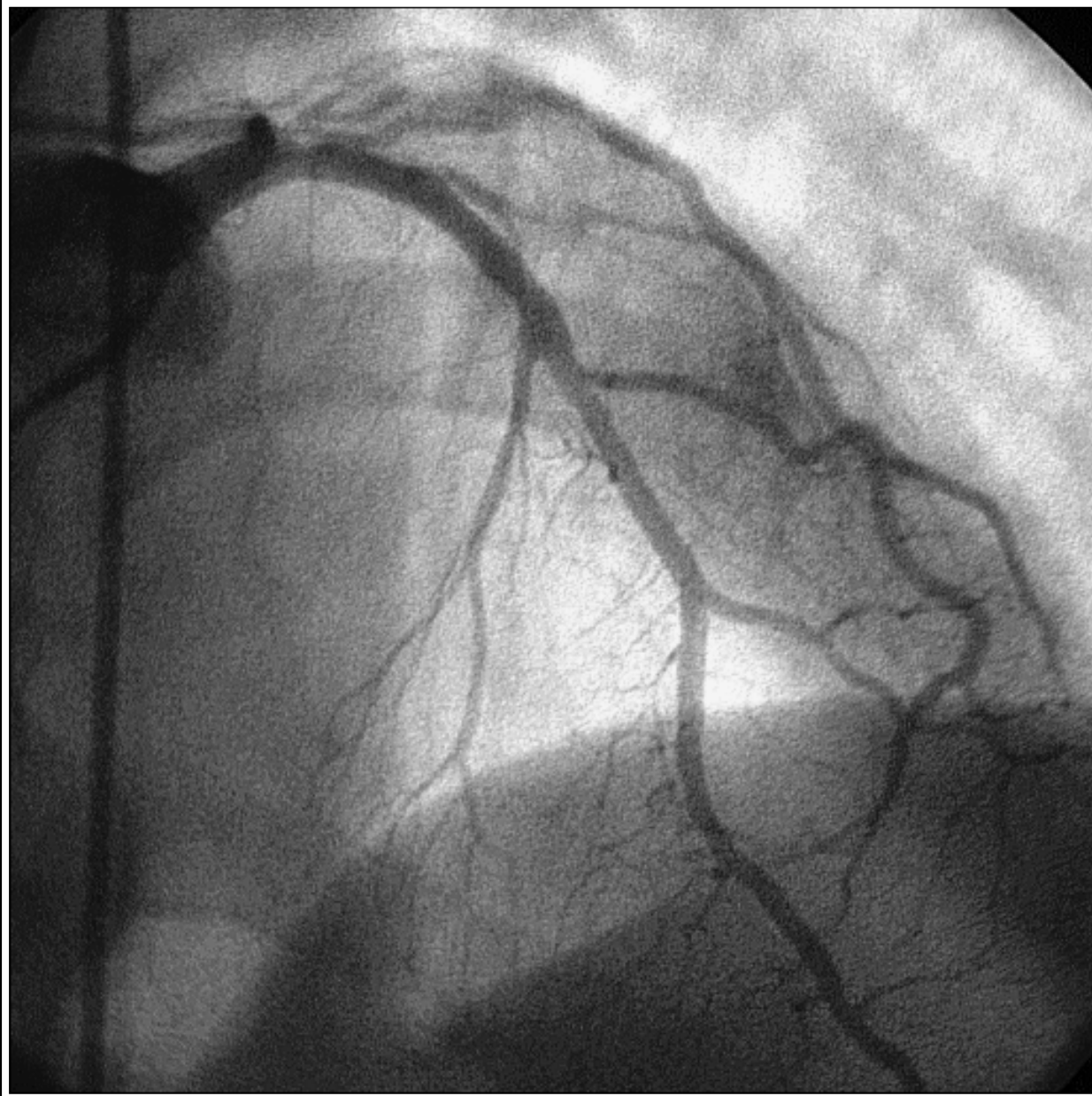
CASE #10

- 49 y/o male
- +Family history for CAD
- HTN x 10 yrs / hyperlipidemia
- Angina pectoris x 4 mos
- +ETT
- +SPECT (lateral wall ischemia)
- EKG: NSR



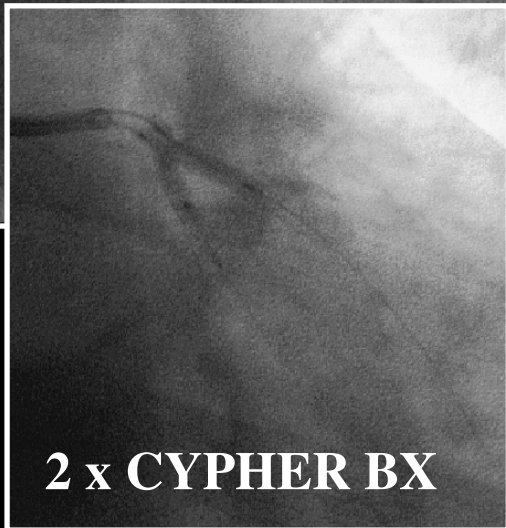
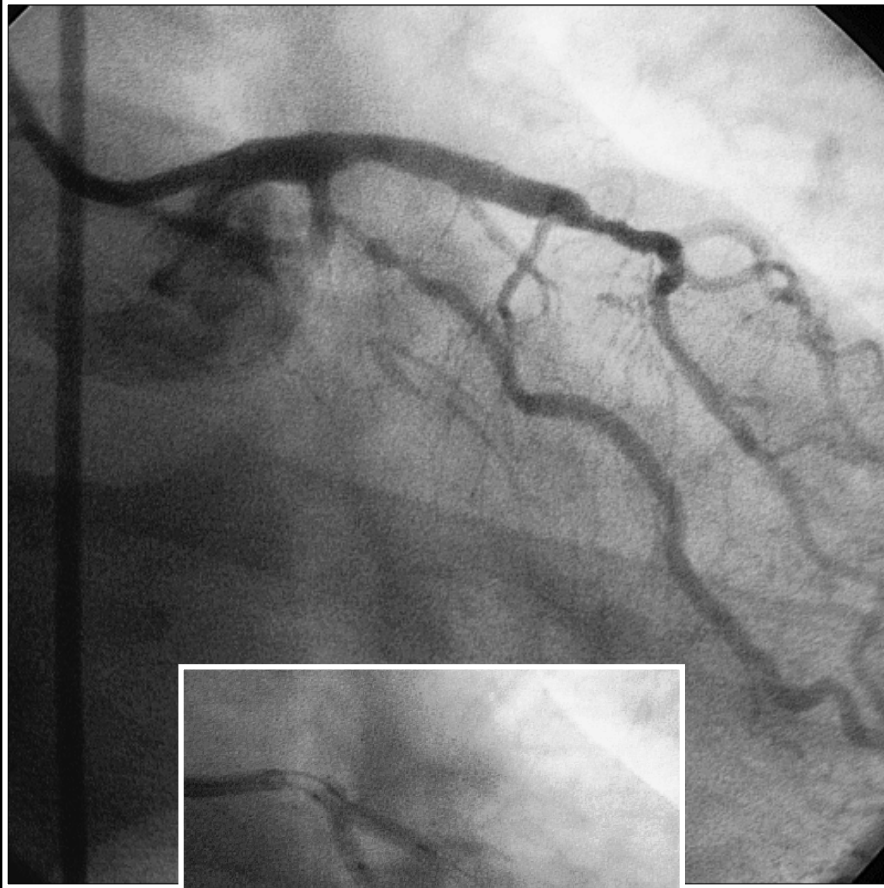




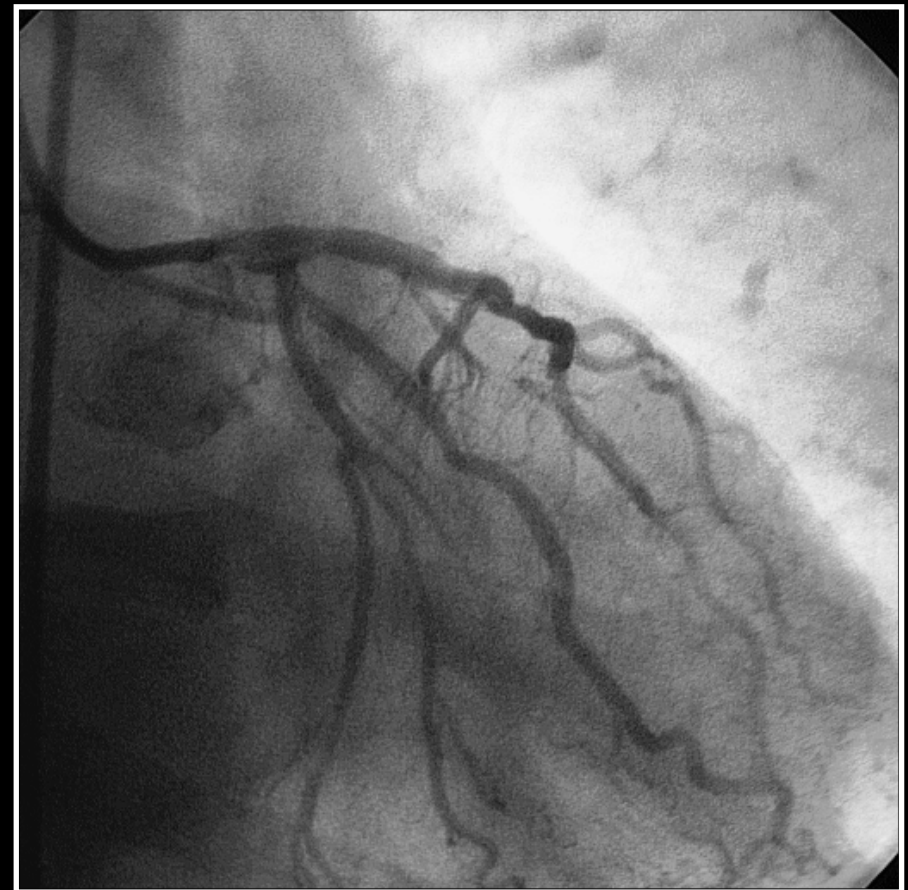




THE BIFURCATION EXPERIENCE



2 x CYPHER BX

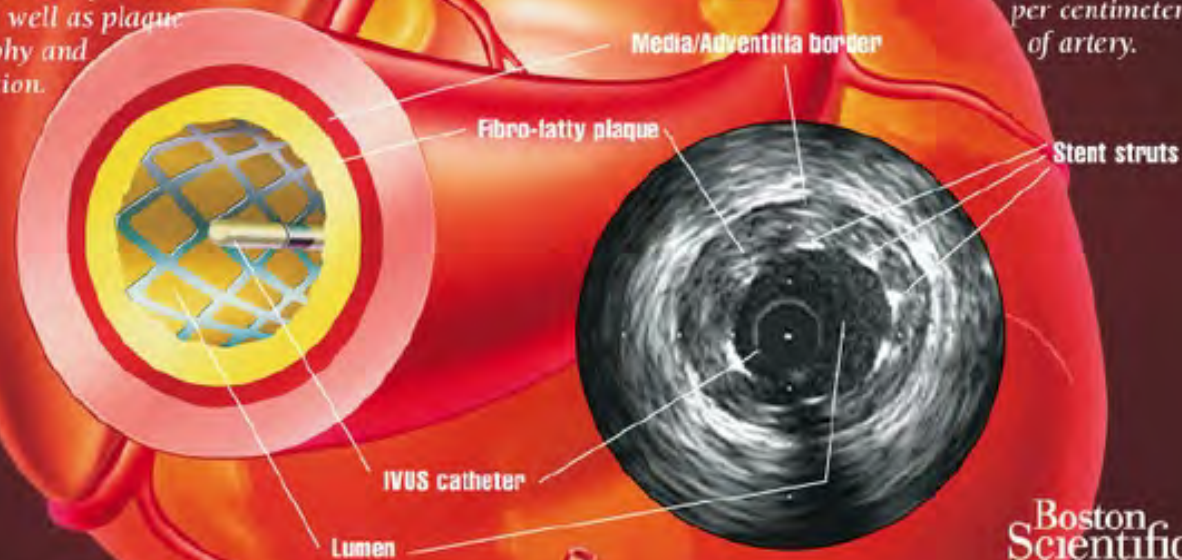


Intra-Vascular Ultrasound (IVUS)

What are we seeing when we look at an IVUS image?

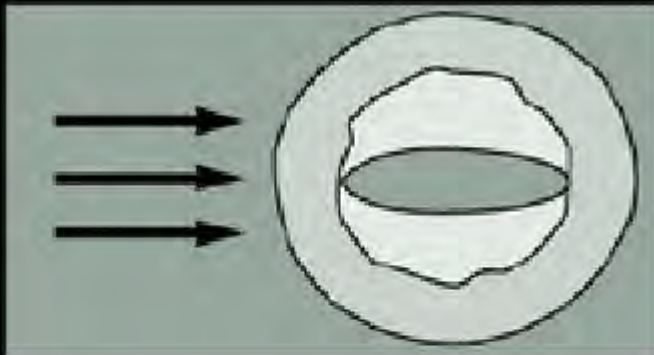
An IVUS image shows us a 360° cross-sectional view of an artery. We see lumen size and shape as well as plaque topography and composition.

The IVUS image is an extremely thin slice of the artery. The IVUS technology is capable of producing 500-600 images per centimeter of artery.

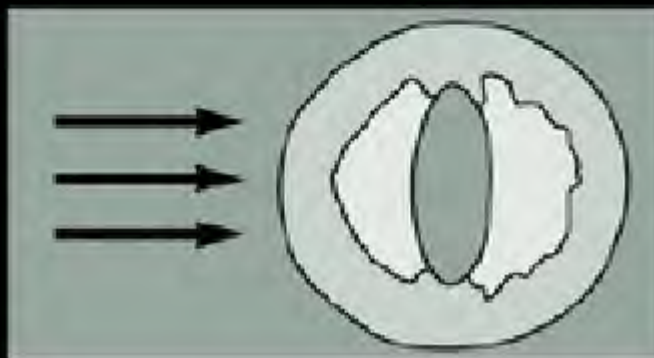
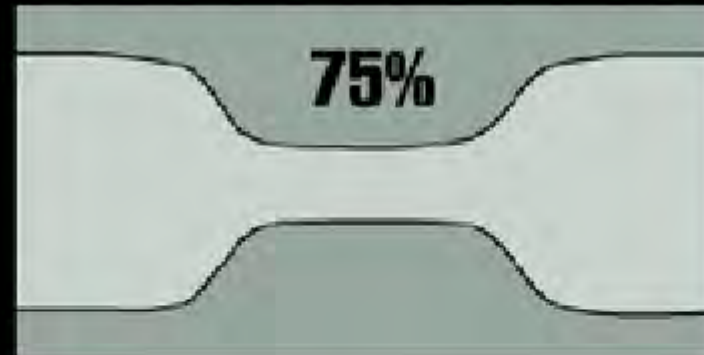


Intra-Vascular Ultrasound (IVUS)

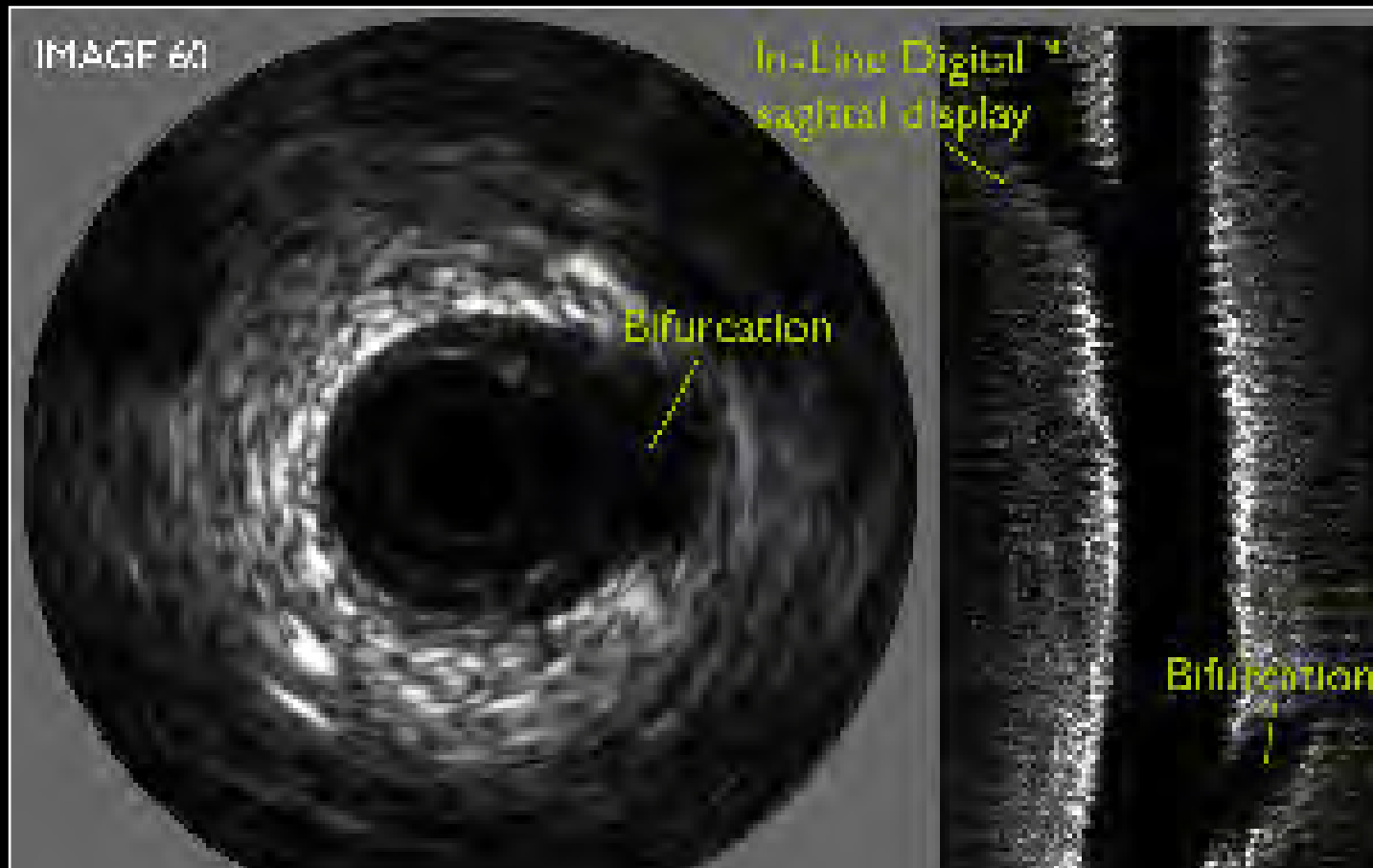
Coronary cross-section



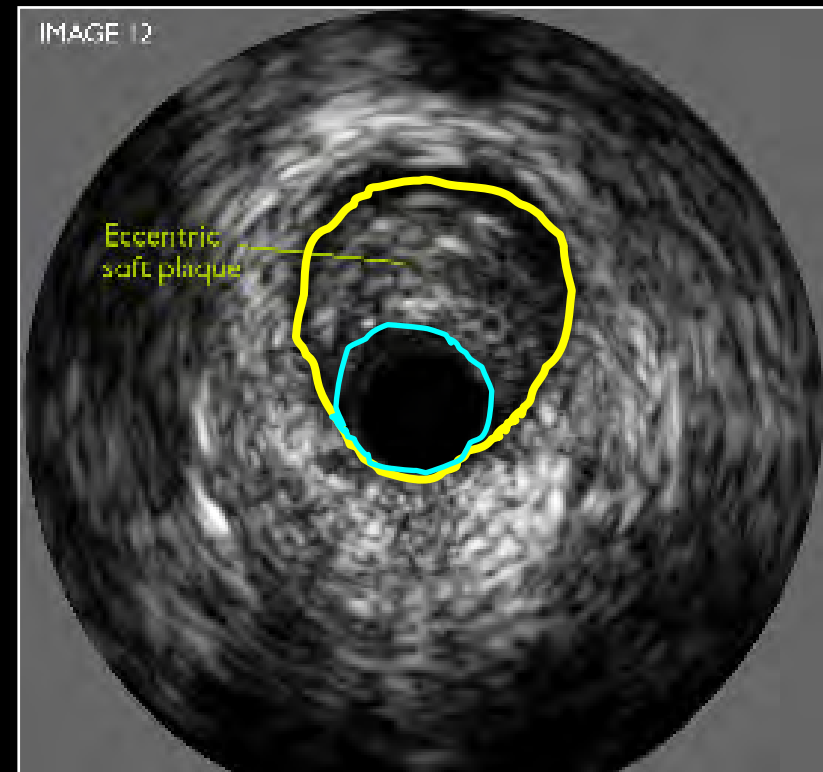
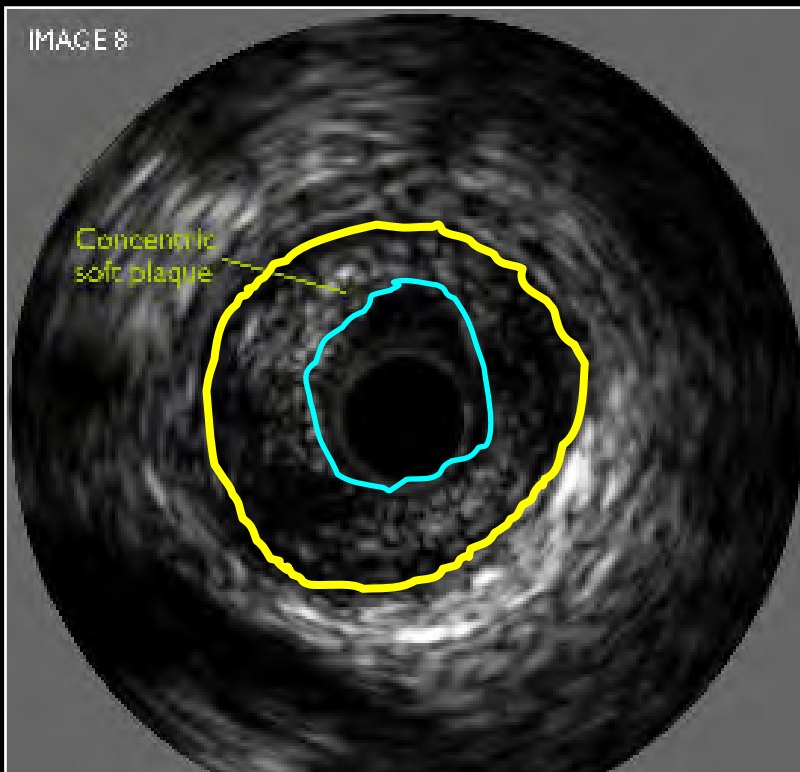
Angiogram silhouette

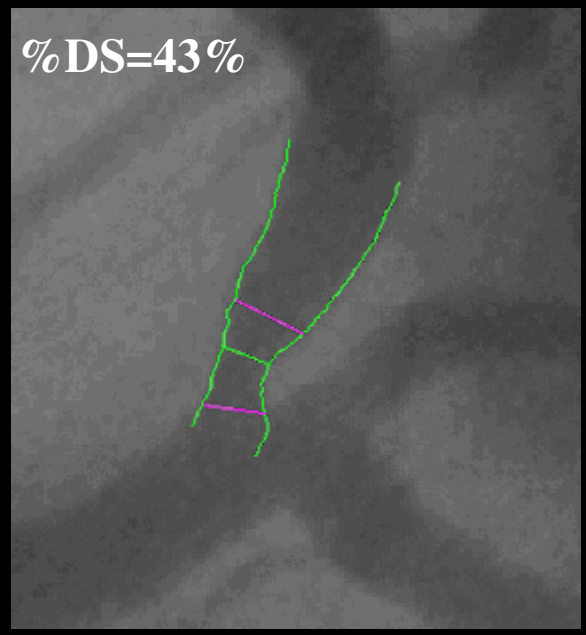
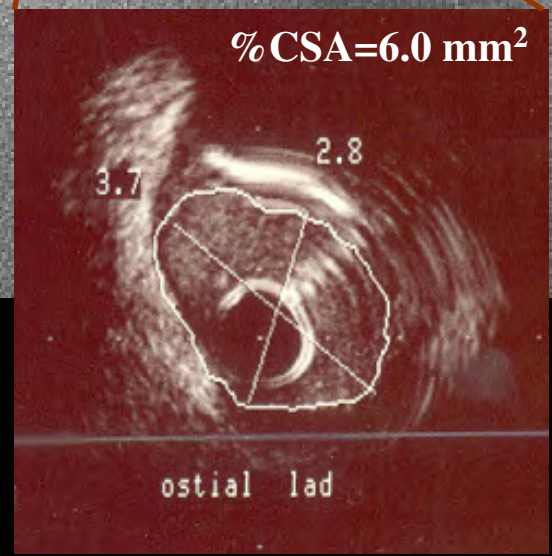
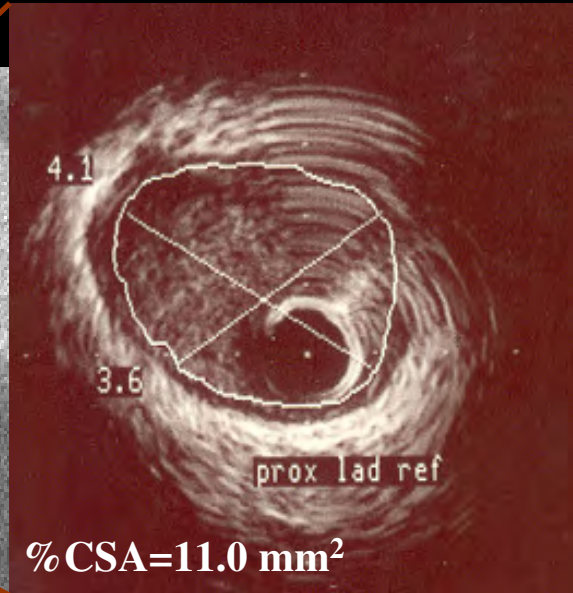
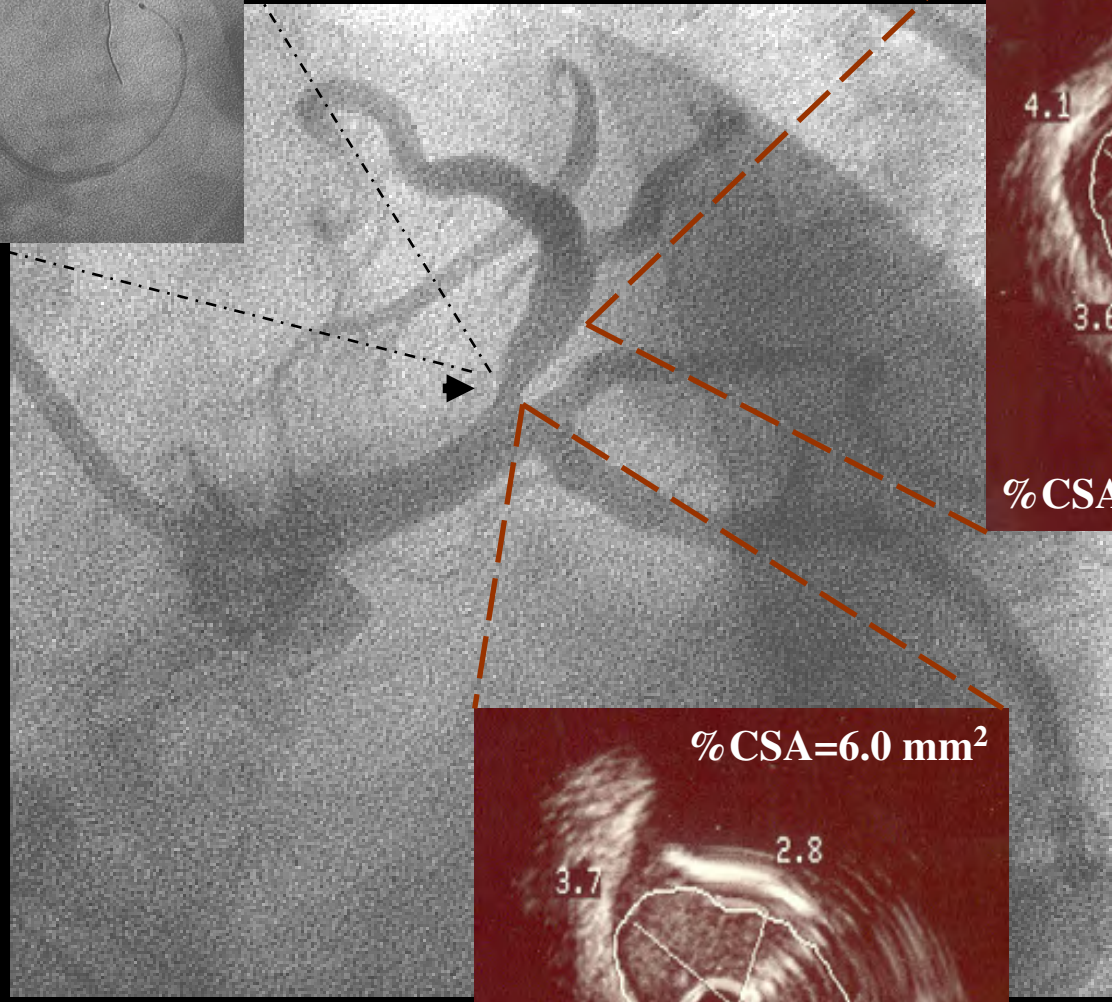
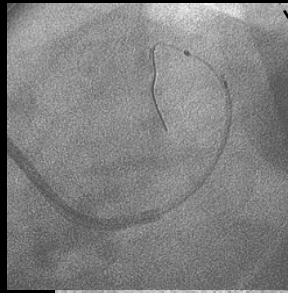


Intra-Vascular Ultrasound (IVUS)



Intra-Vascular Ultrasound (IVUS) *Concentric and Eccentric Plaques*



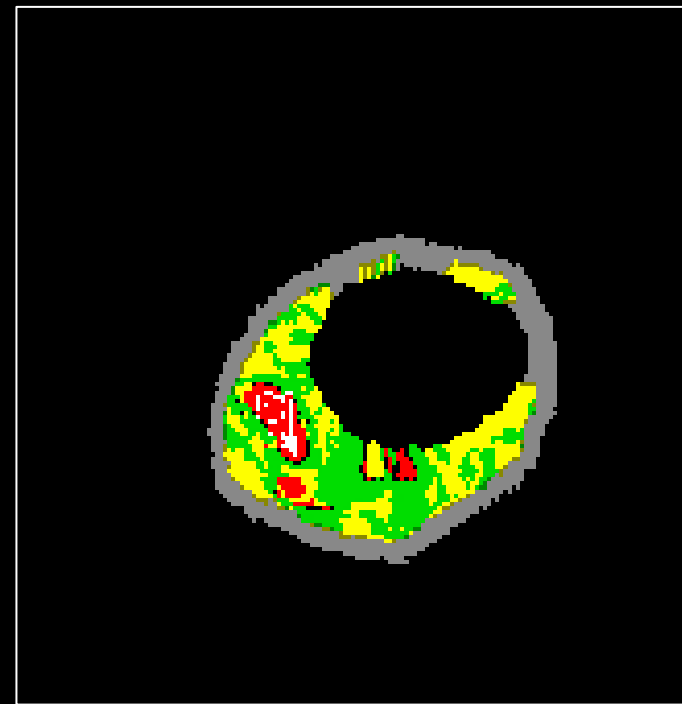
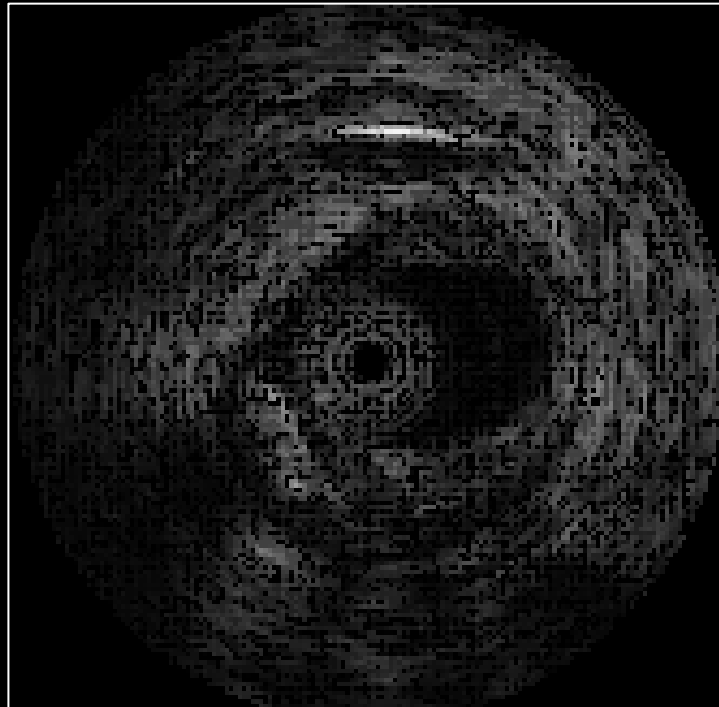


AREA STENOSIS=46%

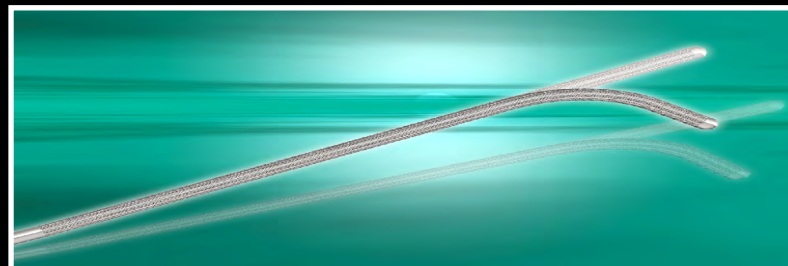
CONSERVATIVE TX

Integrated IVUS-Virtual Histology

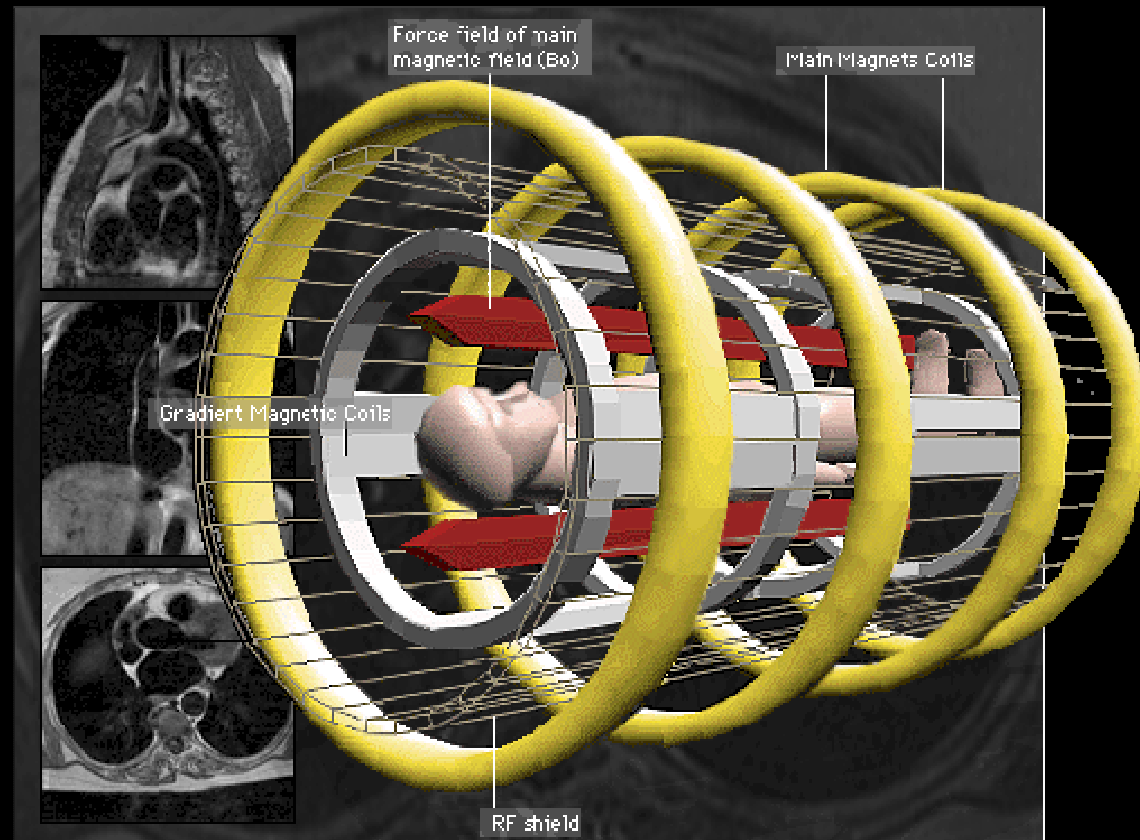
Atherosclerotic Plaque Characterization



Coronary Physiology Pressure Sensors

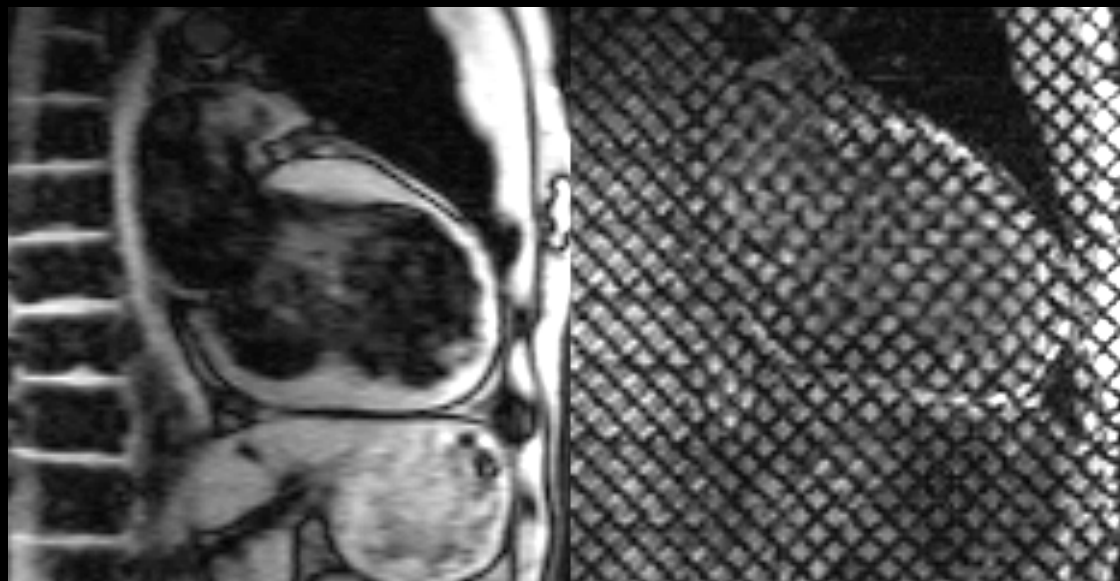
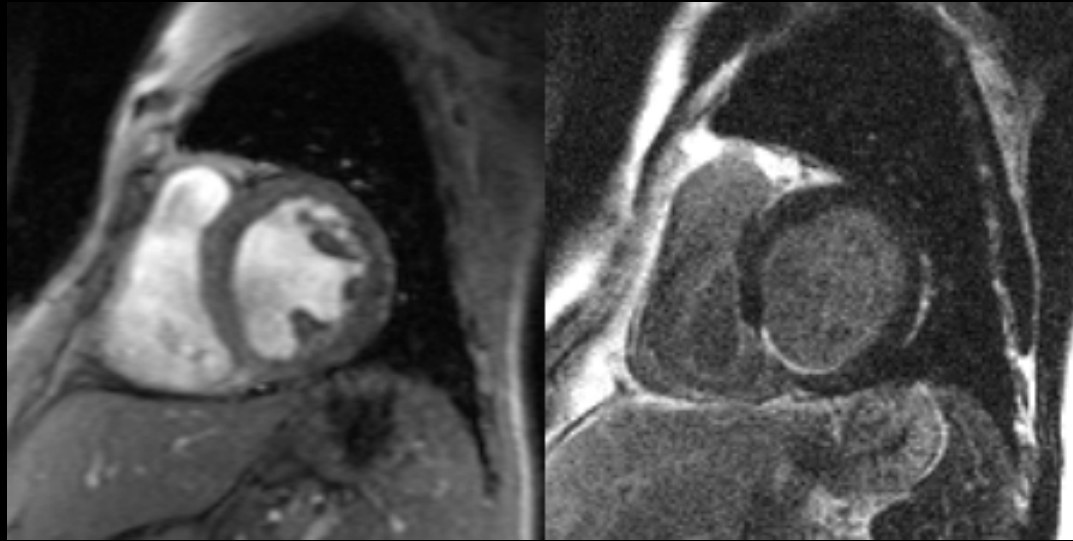


Cardiac MRI

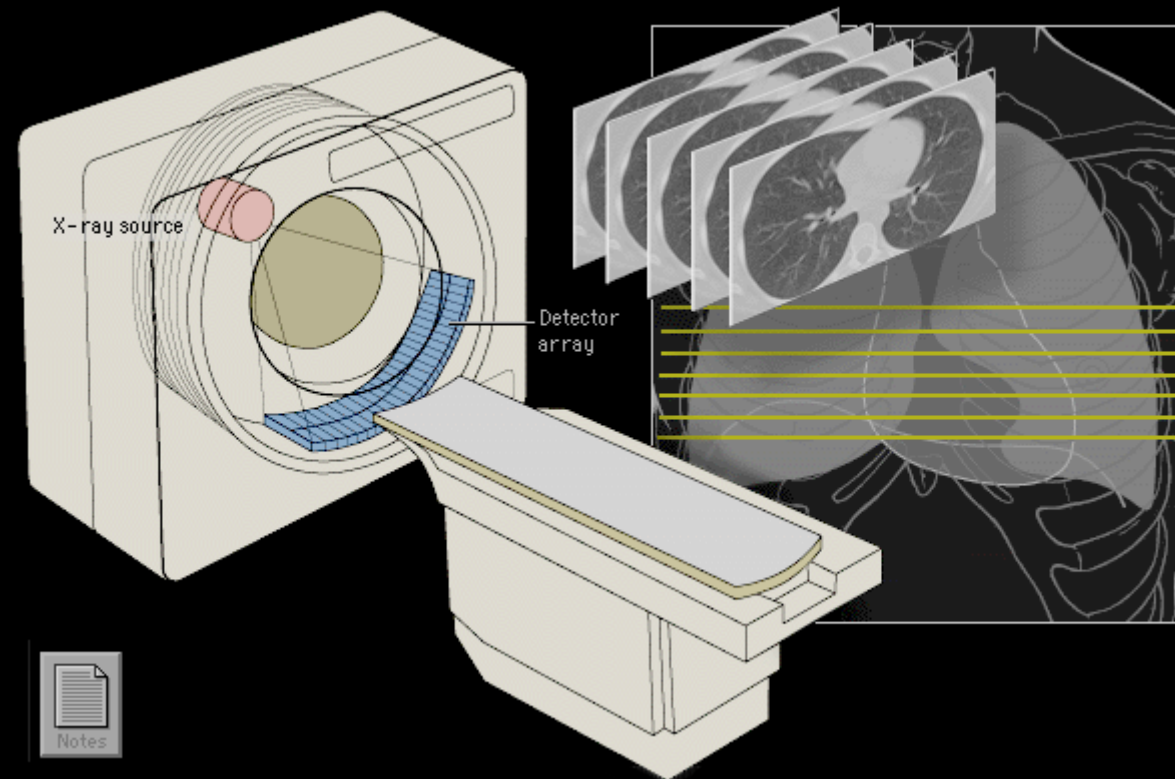


Artwork courtesy of Rebecca Cagle, National Library of Medicine—Lister Hill Center for Biocommunication

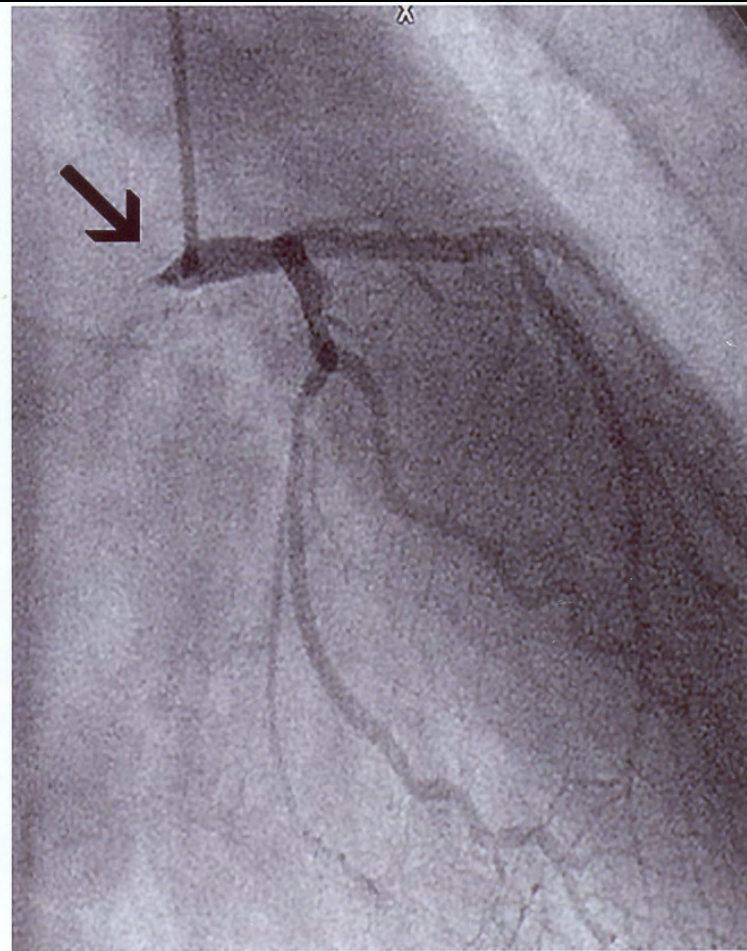
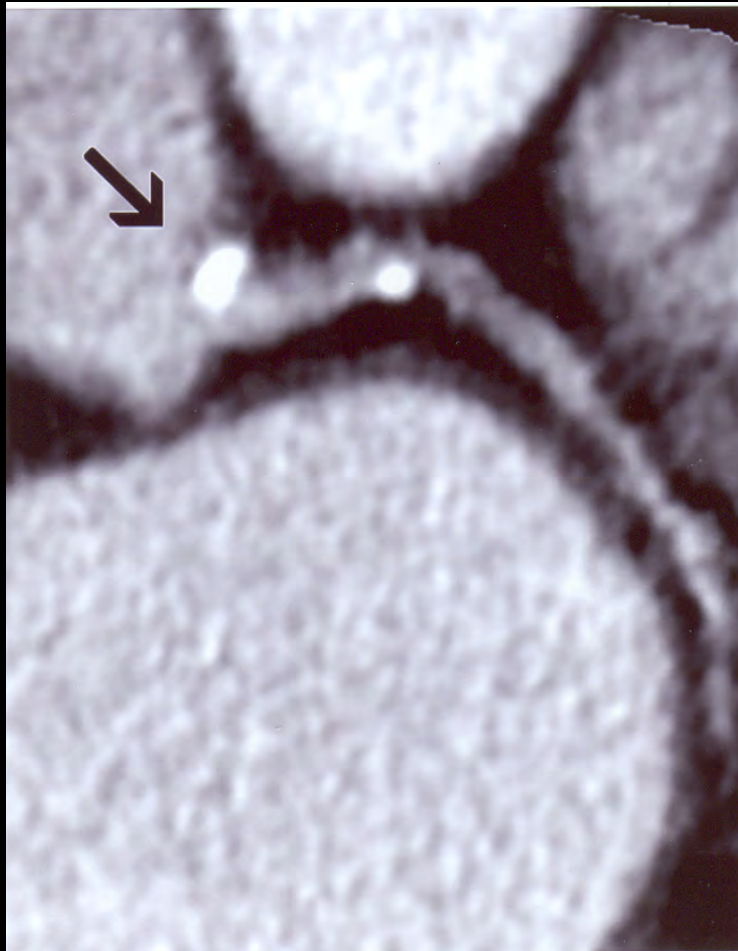
Cardiac MRI



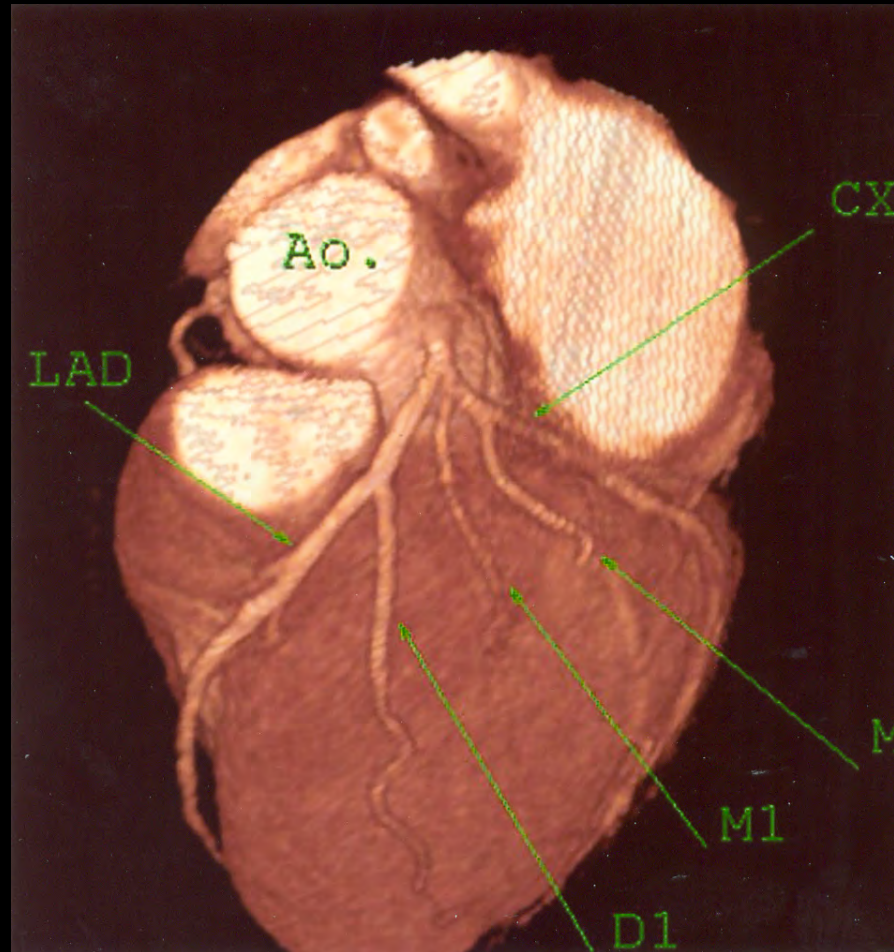
Cardiac CT Angiography



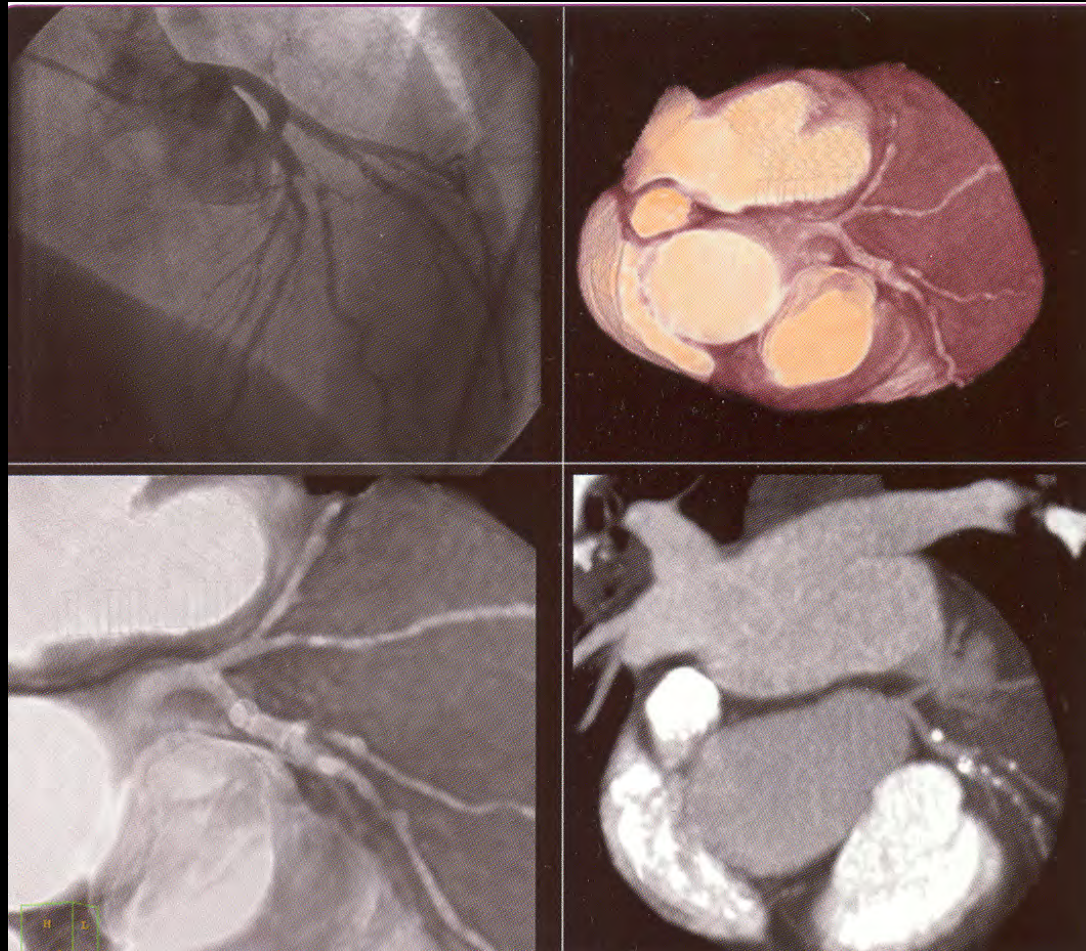
Cardiac CT Angiography (*Virtual Angiography*)



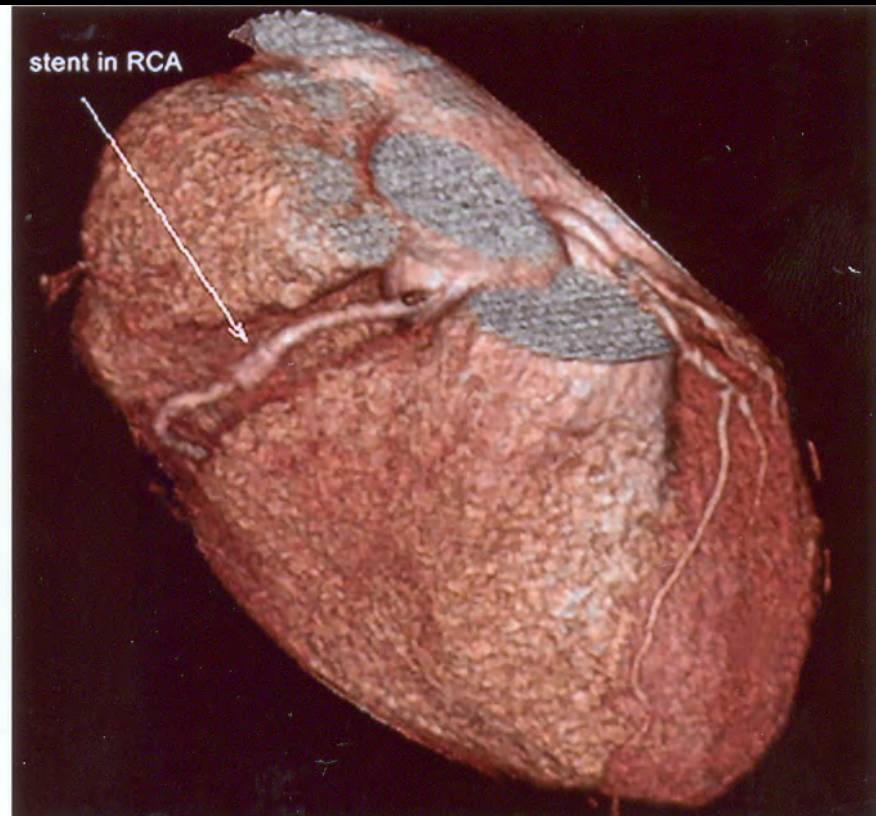
Cardiac CT Angiography



Cardiac CT Angiography



Cardiac CT Angiography



THNAK YOU !