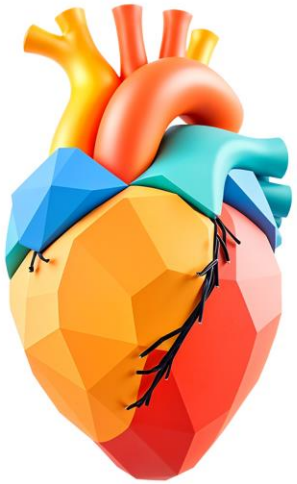

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12th
Annual Tehran Heart Center Congress
7th CRITICAL CARDIOVASCULAR CARE
دوازدهمین کنگره سالیانه مرکز قلب تهران
2025
۲۵ و ۲۶ بهمن ماه ۱۴۰۳
13 & 14 February
Tehran Heart Center
Tehran, Iran

Spontaneous coronary artery dissection

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SCAD patients:

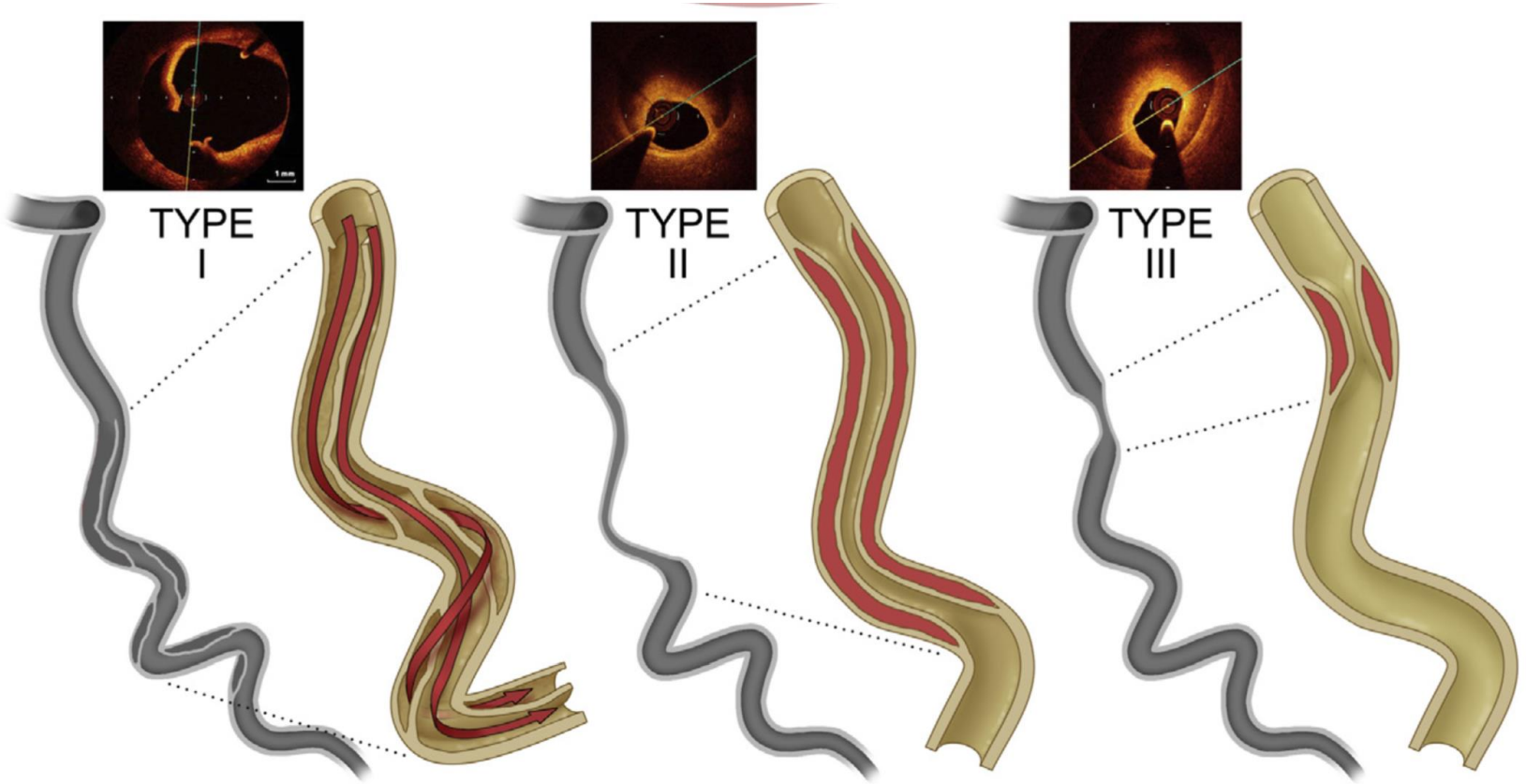
- few or **no** traditional cardiovascular **risk factors**.
- 1% to 4% of ACS cases.
- **Women** > men
- the cause of ACS in 35% of MIs in women <50 years of age
- most common cause of pregnancy-associated MI (43%)
- average age of women : 45 to 53 years
- men : slightly younger age than women

- Associated conditions & precipitating factors

Associated Condition or Factor	Reported Prevalence in Cohort Studies, %
Fibromuscular dysplasia	25–86[13,29,33,34]
Pregnancy	2–8[8,9,13,33]
Multiparity (≥4 births)	8.9–10[13,33]
Inherited arteriopathy and connective tissue disorder (see Table 4)	1.2–3.0[8,13]
Marfan syndrome, Loeys-Dietz syndrome, vascular Ehlers-Danlos syndrome, α_1-antitrypsin deficiency, polycystic kidney disease	
Exogenous hormones	10.7–12.6[8,13]
Oral contraceptives, postmenopausal therapy, infertility treatments, testosterone, corticosteroids	
Systemic inflammatory disease	<1–8.9[9,13]
Systemic lupus erythematosus, Crohn disease, ulcerative colitis, polyarteritis nodosa, sarcoidosis, Churg-Strauss syndrome, Wegener granulomatosis, rheumatoid arthritis, Kawasaki disease, celiac disease	
Migraine headache	NR
Coronary artery spasm	NR
Precipitating factors	>50% Patients recall a precipitating factor[13]
Intense exercise (isometric or aerobic)	
Intense Valsalva	

Saw angiographic SCAD classification

- type 1: (29%)classic appearance of **multiple radiolucent lumens** or arterial wall contrast staining
- Type 2: (most common 67%) presence of **diffuse stenosis** that can be of varying severity and length (usually >20 mm):
  - 2A: diffuse arterial narrowing bordered by **normal segments** proximal and distal to the IMH,
  - 2B: diffuse narrowing that extends to the distal tip of the artery
- Type 3(4%) **focal** or tubular stenosis, usually <20 mm in length, that mimics atherosclerosis
  - intracoronary imaging is required to confirm the presence of IMH and to diagnose SCAD


1 mm
TYPE I
TYPE II
TYPE III

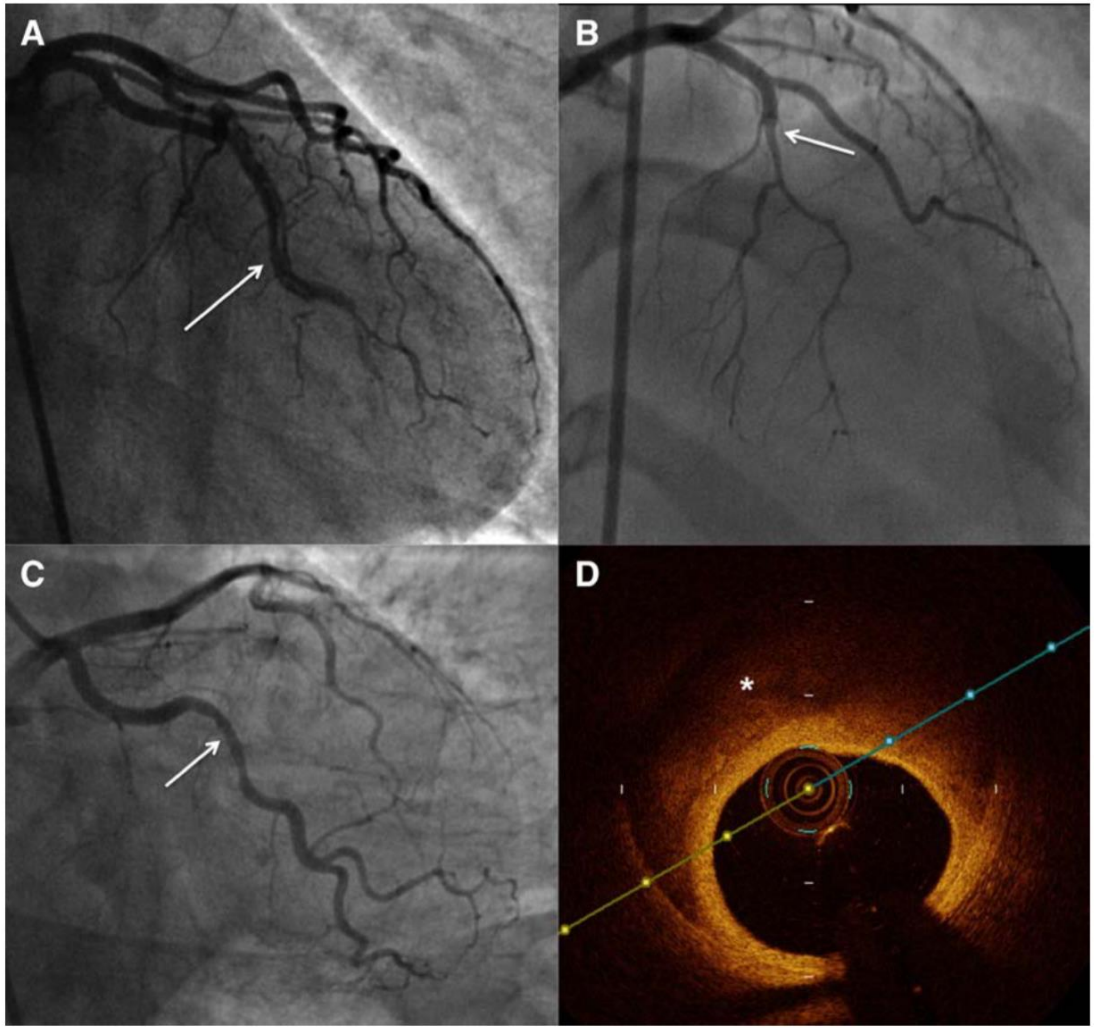


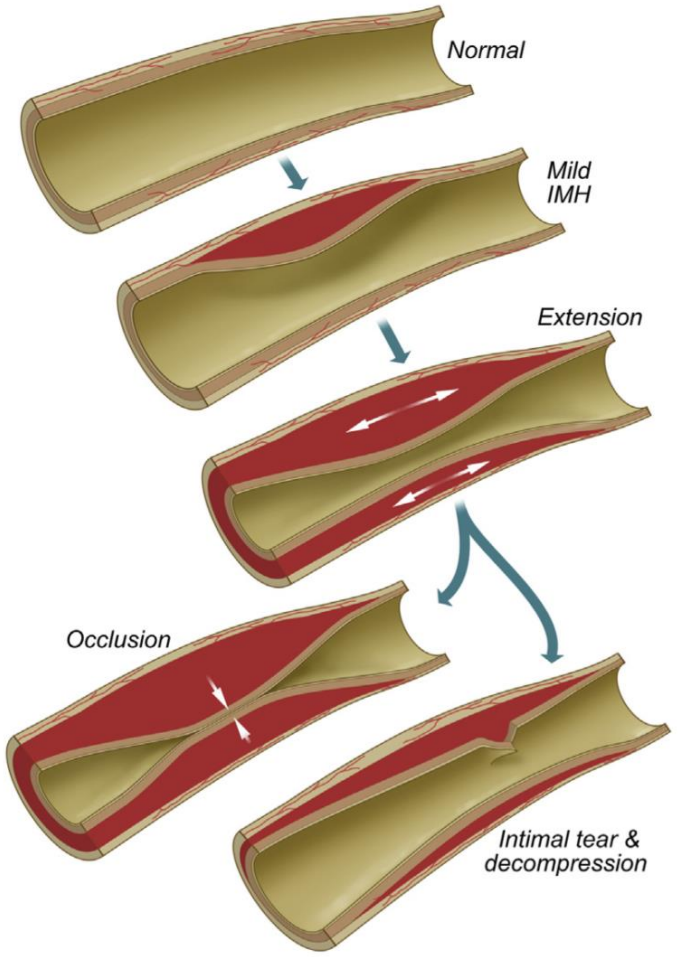
Figure 5. Angiographic features of spontaneous coronary artery dissection.

A, Type 1, multiple radiolucent lumens (arrow) or arterial wall contrast staining. **B**, Type 2, diffuse stenosis that can be of varying severity and length (dissection starting from arrow). **C**, Type 3: focal or tubular stenosis (arrow), usually <20 mm in length, that mimics atherosclerosis. Intracoronary imaging should be performed to confirm the presence of intramural hematoma or multiple lumens. **D**, Optical coherence tomography in type 3 (**C**) shows intramural hematoma (asterisk).

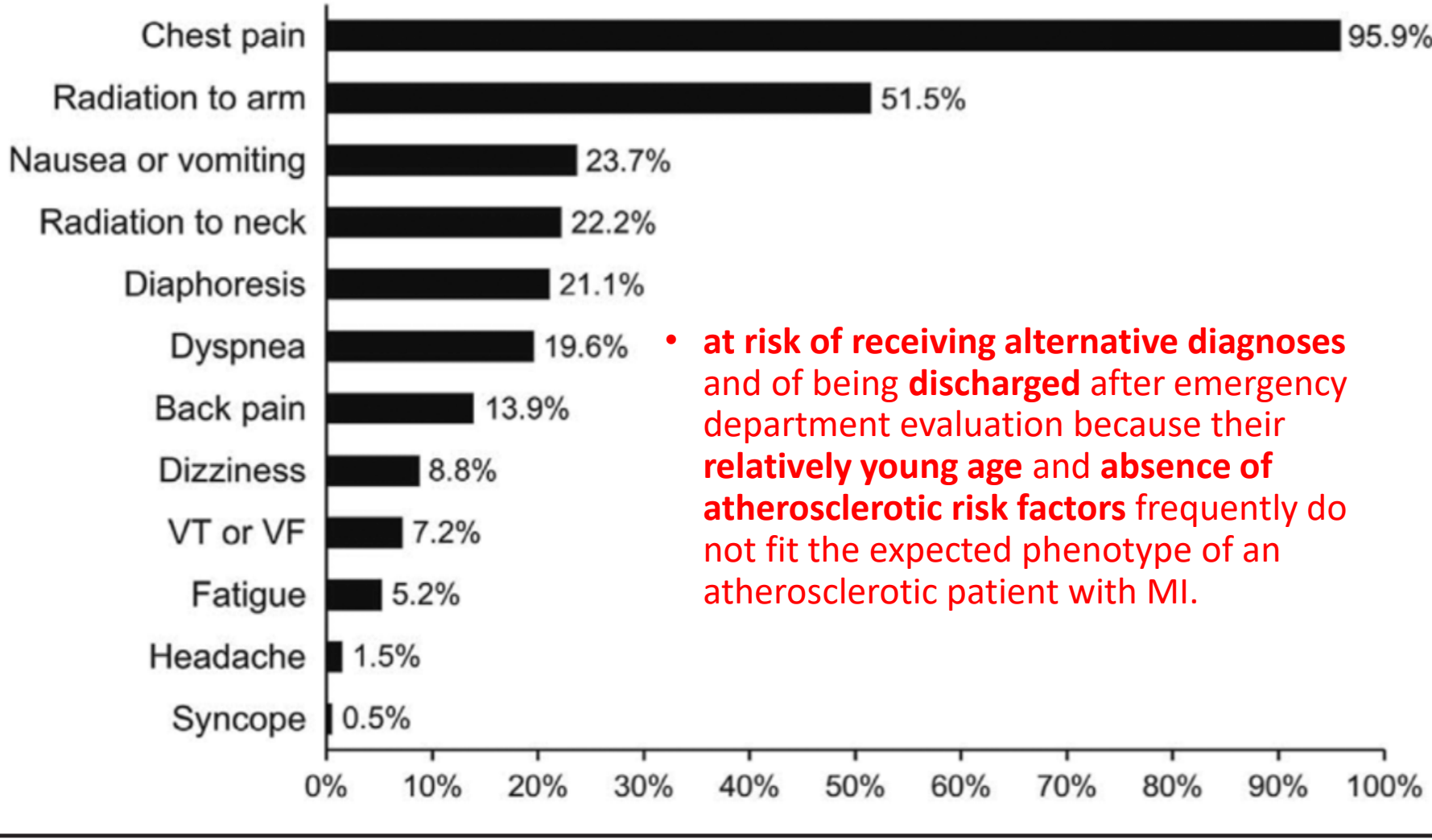
- LAD : is the most commonly affected (32%–46% of cases)
- LM : 4% of cases
- majority of cases, the **mid to distal segments** of coronary arteries are affected
  - only **<10%** of cases are the **proximal** LAD or LCX , RCA , or left main arteries affected.
- **Multivessel** SCAD : 9% to 23% of cases.
- STEMI > NSTEMI

Two theories

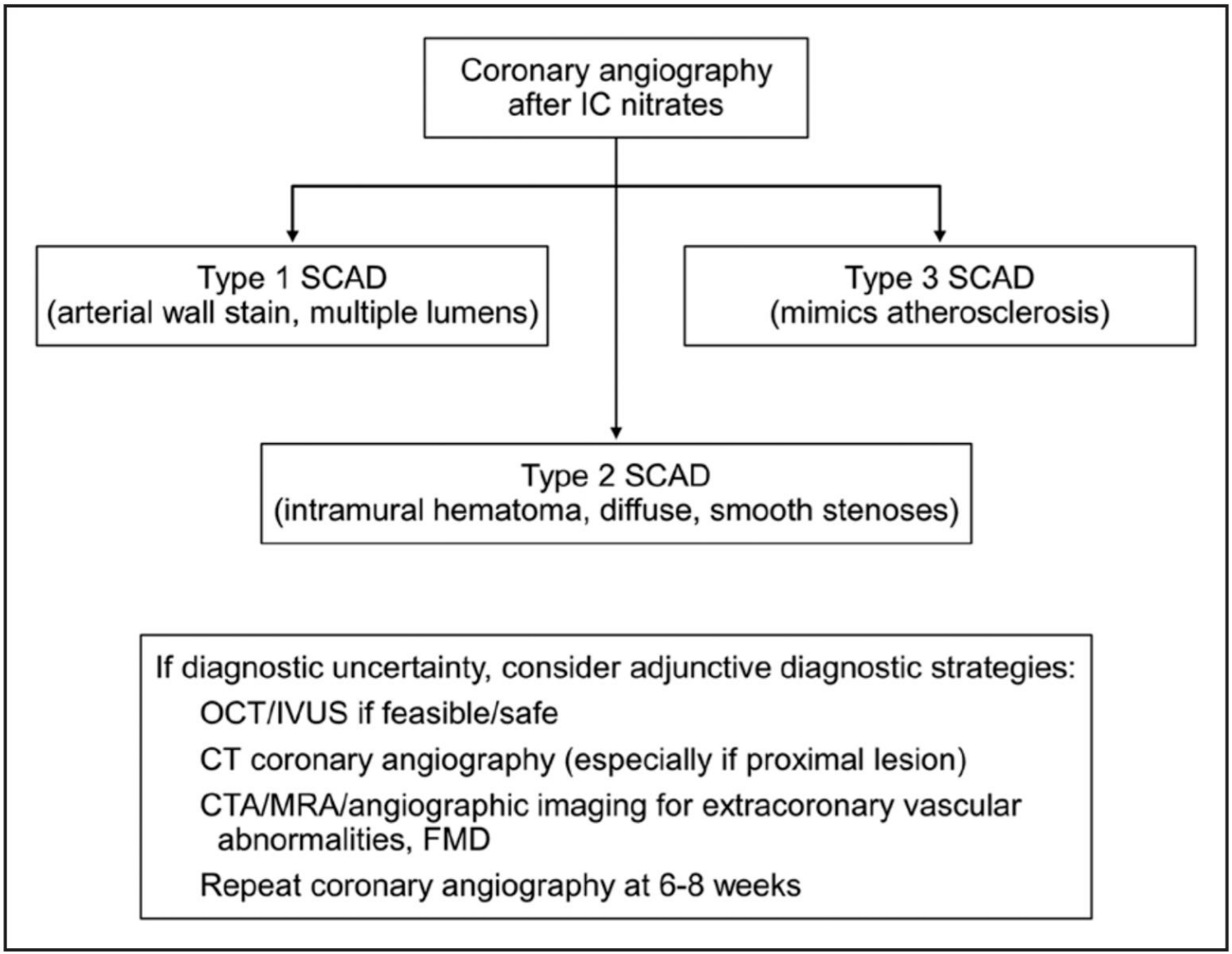
1. Intimal tear: development of a disruption in the vessel wall
2. spontaneous hemorrhage arising from vasa vasorum within the vessel wall



An intramural hematoma (IMH) forms, which most commonly resorbs and "heals." Early IMH extension can result in vessel occlusion or develop an intimal tear resulting in decompression and resumption of flow. D.F. © MAYO 2020. Used with permission of Mayo Foundation for Medical Education and Research, all rights reserved.



- **at risk of receiving alternative diagnoses** and of being **discharged** after emergency department evaluation because their **relatively young age** and **absence of atherosclerotic risk factors** frequently do not fit the expected phenotype of an atherosclerotic patient with MI.


Coronary angiography after IC nitrates
Type 1 SCAD (arterial wall stain, multiple lumens)
Type 3 SCAD (mimics atherosclerosis)
Type 2 SCAD (intramural hematoma, diffuse, smooth stenoses)
If diagnostic uncertainty, consider adjunctive diagnostic strategies:
OCT/IVUS if feasible/safe
CT coronary angiography (especially if proximal lesion)
CTA/MRA/angiographic imaging for extracoronary vascular abnormalities, FMD
Repeat coronary angiography at 6-8 weeks

Iatrogenic dissection

- Iatrogenic catheter-induced coronary artery dissection:
  - Normal patients: <0.2%
  - SCAD: 3.4%
    - Underlying arterial fragility in patients with SCAD is believed to accentuate the risks for iatrogenic dissection.

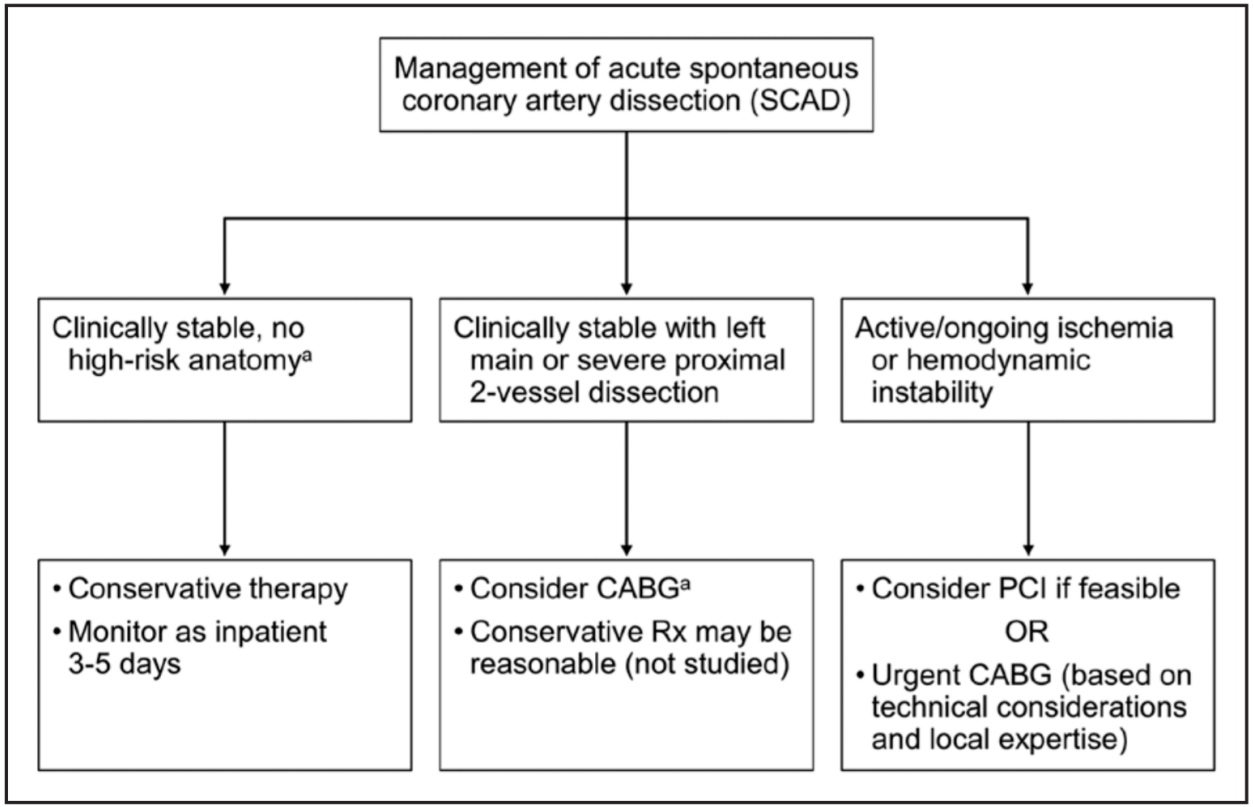


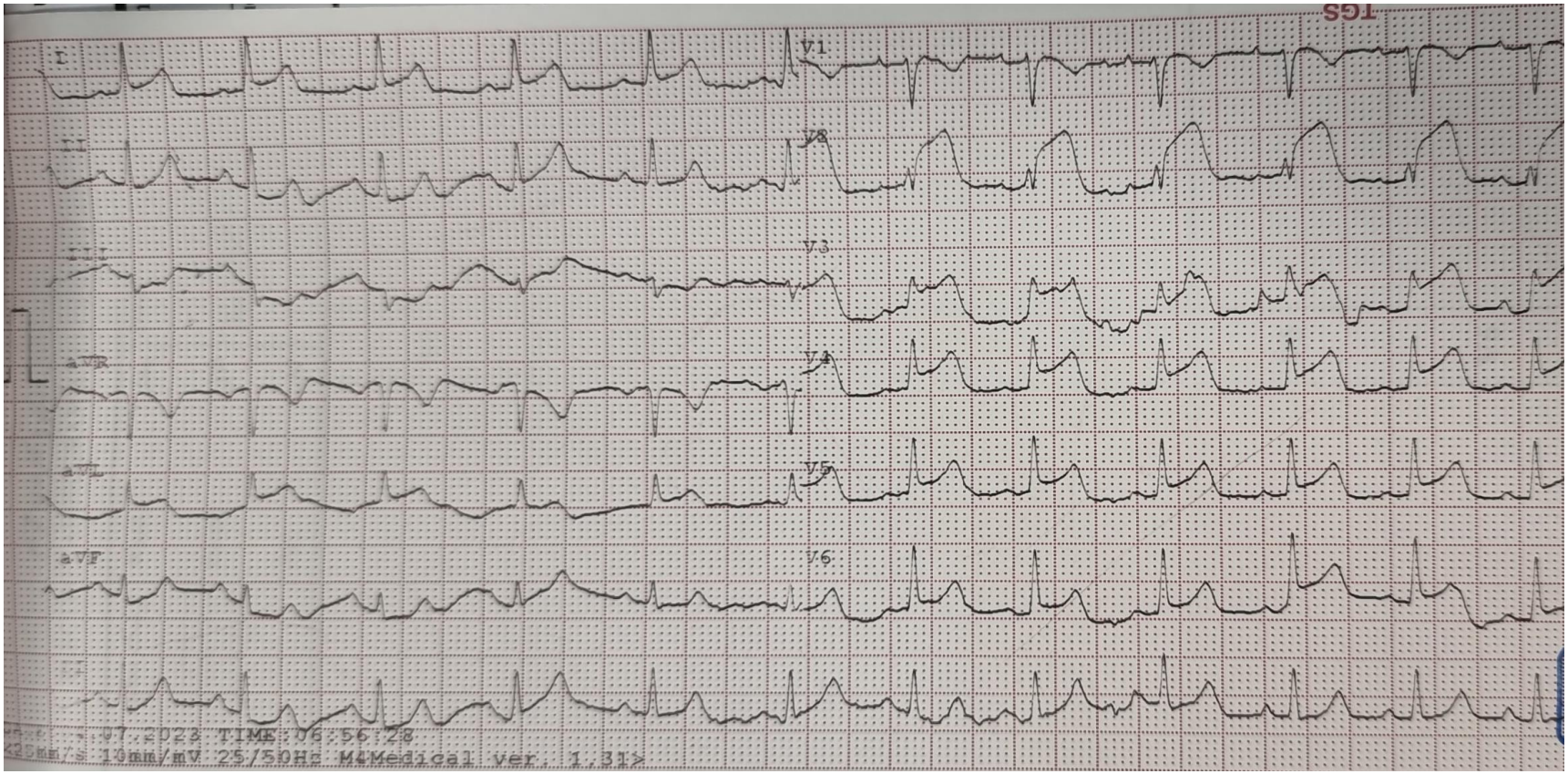
Figure 8. Algorithm for management of acute spontaneous coronary artery dissection.
CABG indicates coronary artery bypass grafting; PCI, percutaneous coronary intervention; and Rx, management. [a]Left main or proximal 2-vessel coronary artery dissection.

Case 1

Case presentation

- 35 y/o pregnant woman.
- 31th week of pregnancy (twins).
- No problem in 2 previous pregnancies.
- No PMH/RF.
- BP: 120/70 mmHg PR: 90/min RR: 12/min O2sat: 98%
- Acute chest pain from **2 hrs.** ago.
- Referred to Imam Khomeini Hospital with **anterior ST elevation MI**.

ECG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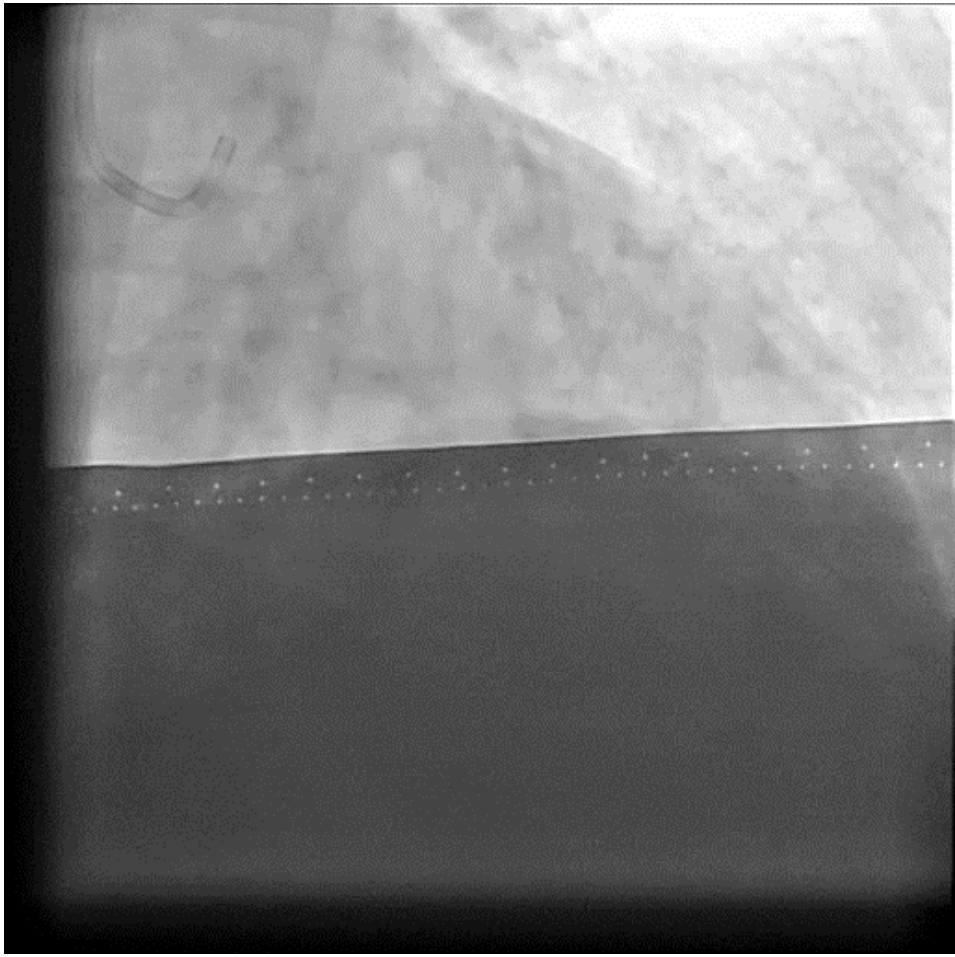
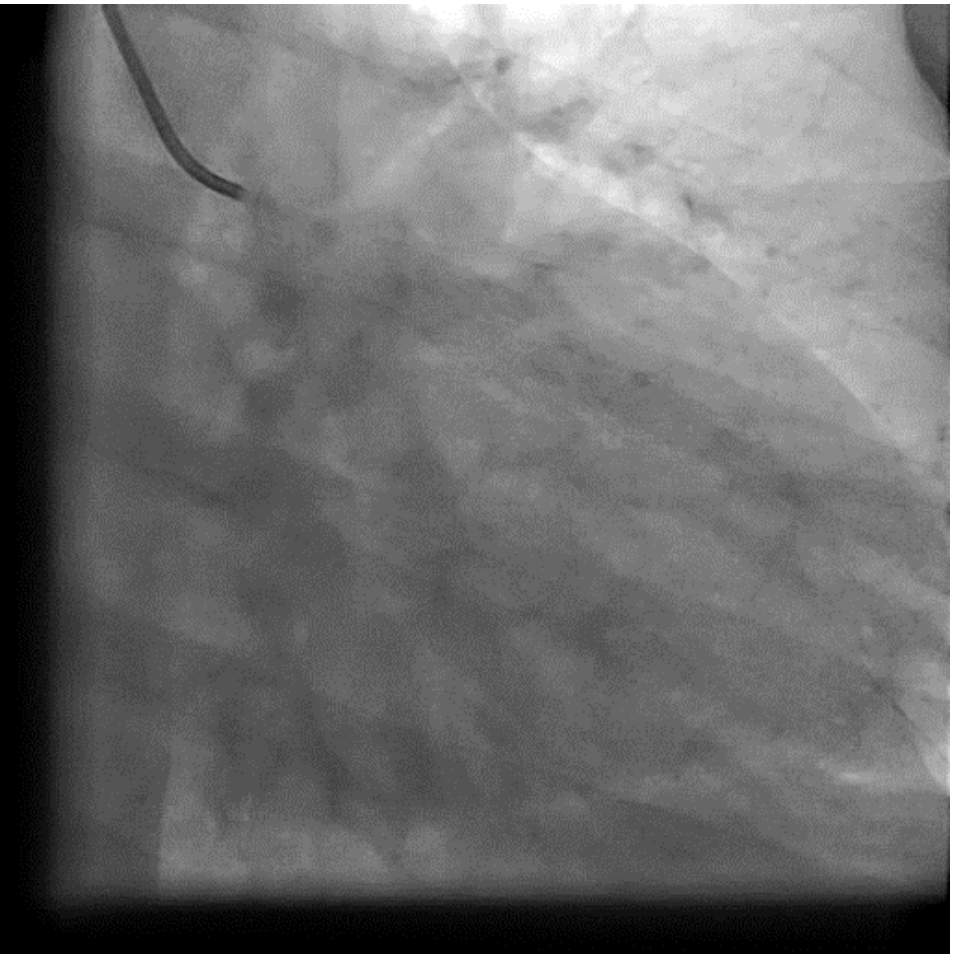
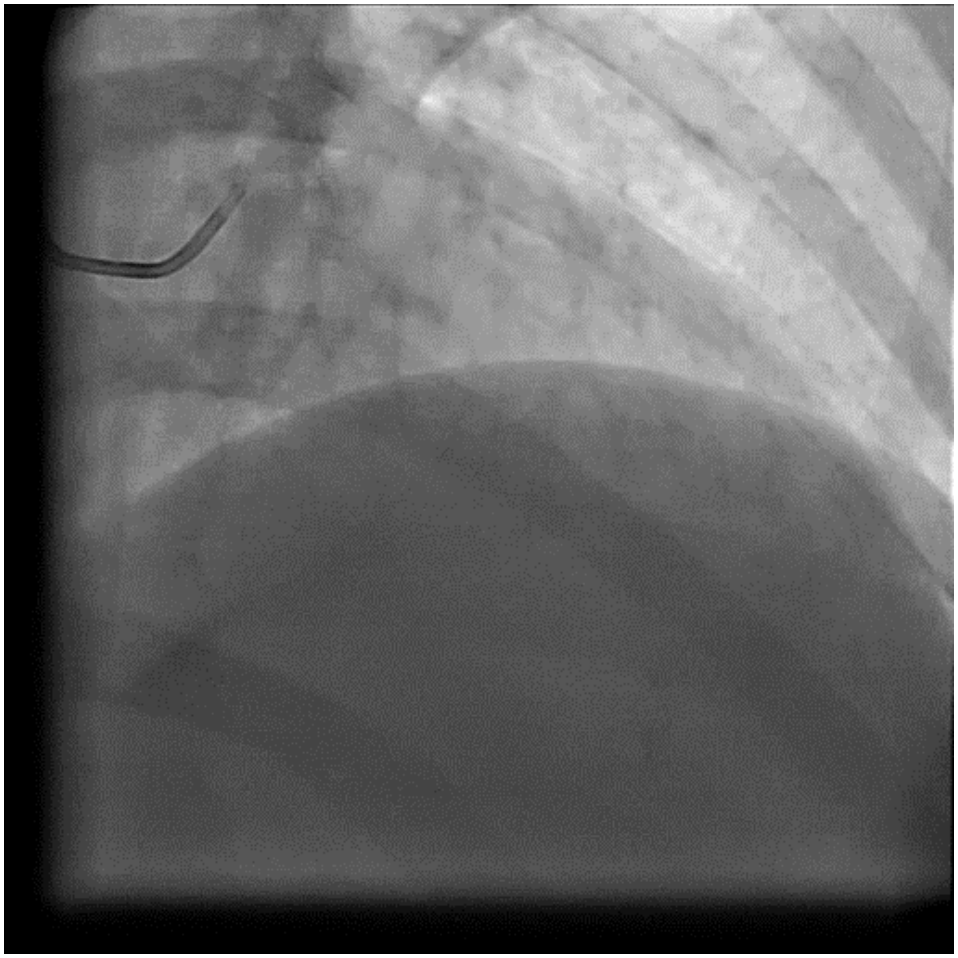
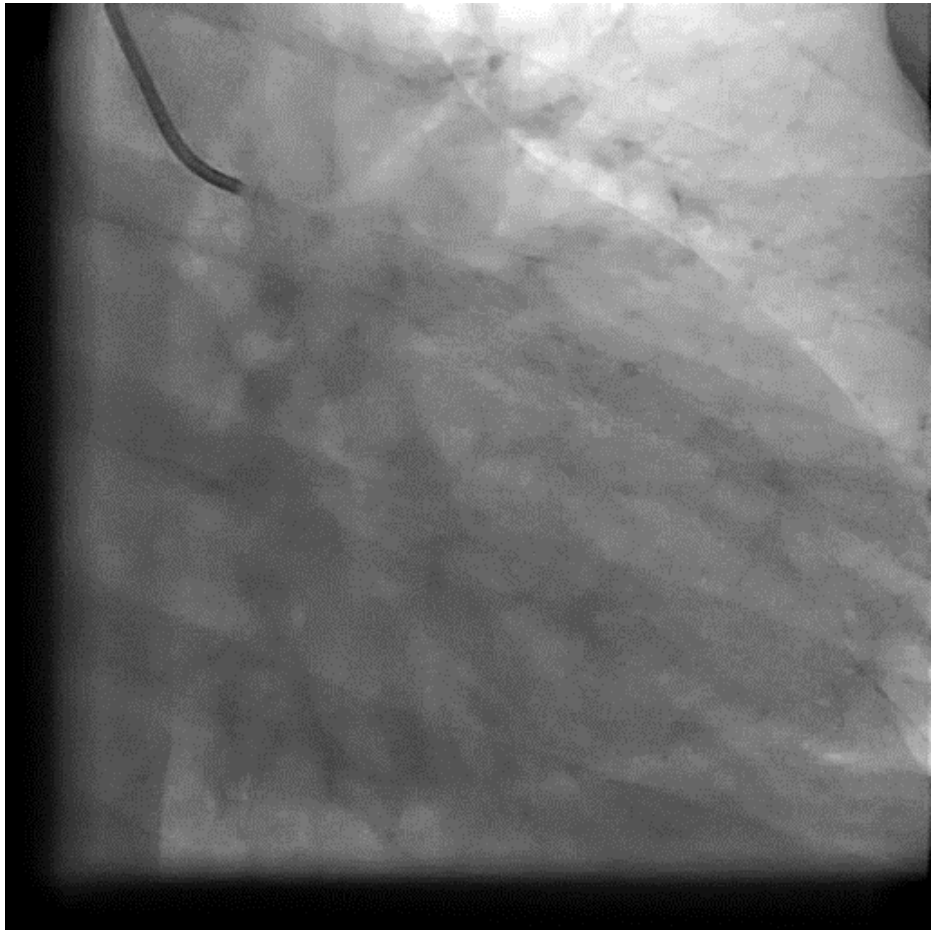


CAG After pregnancy



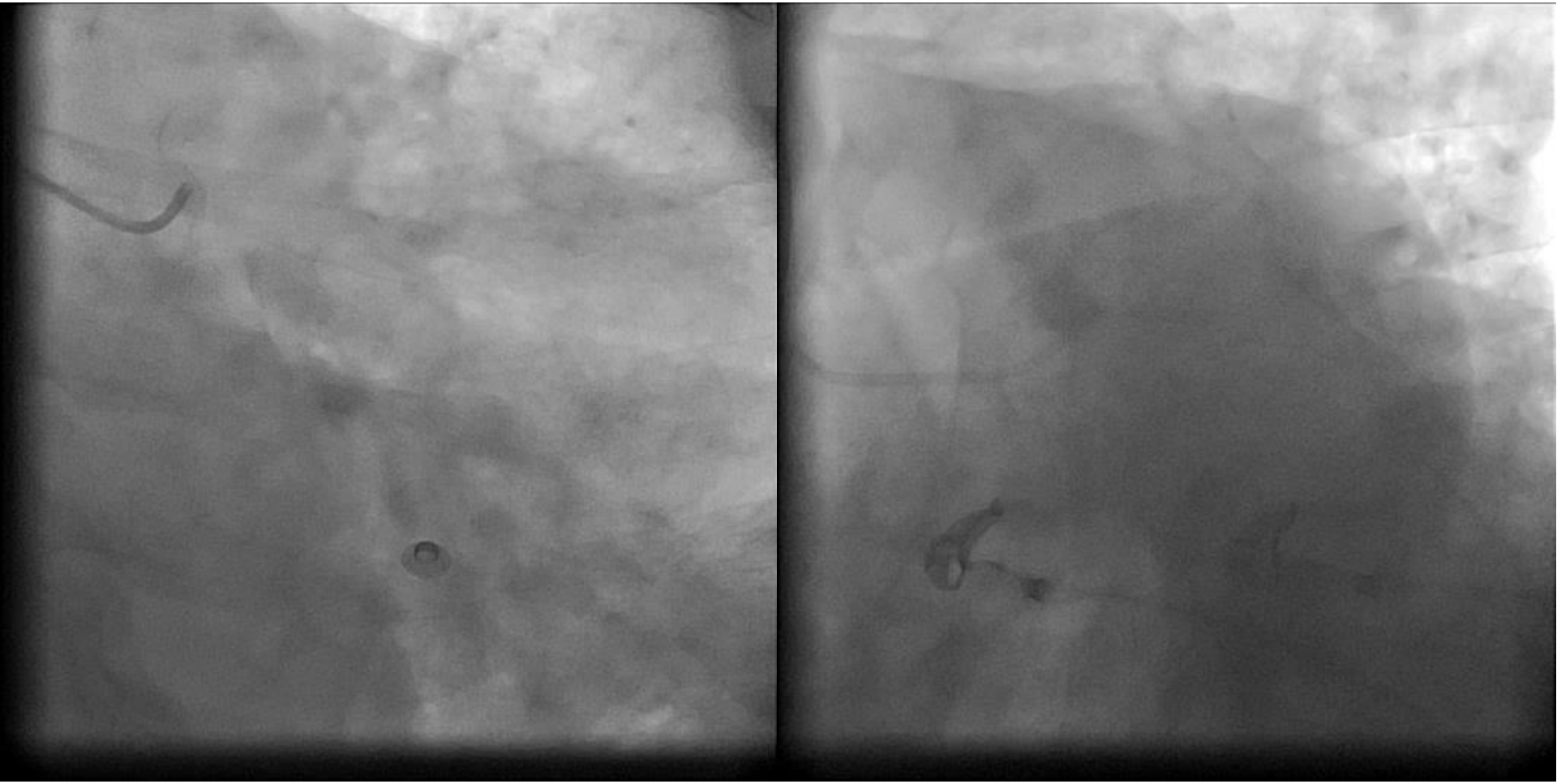




Case 2

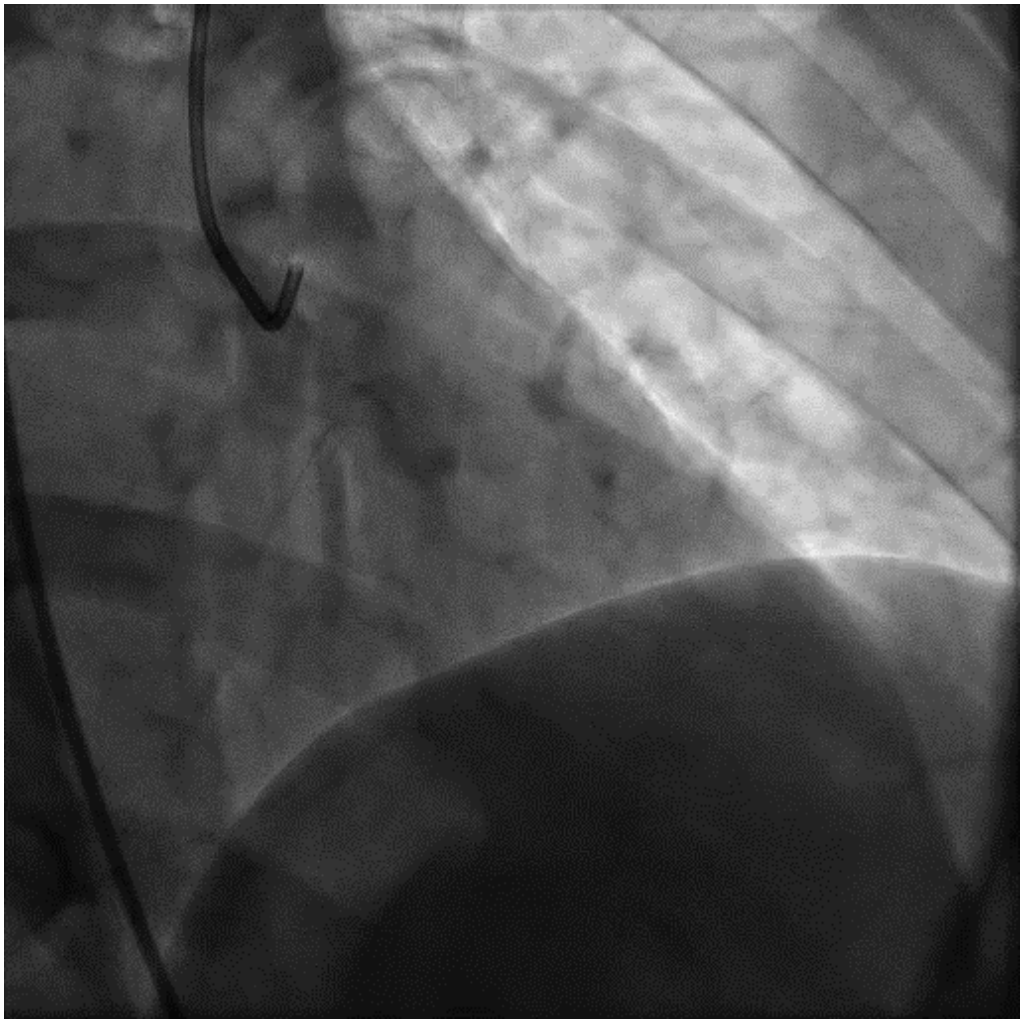
55 yr woman

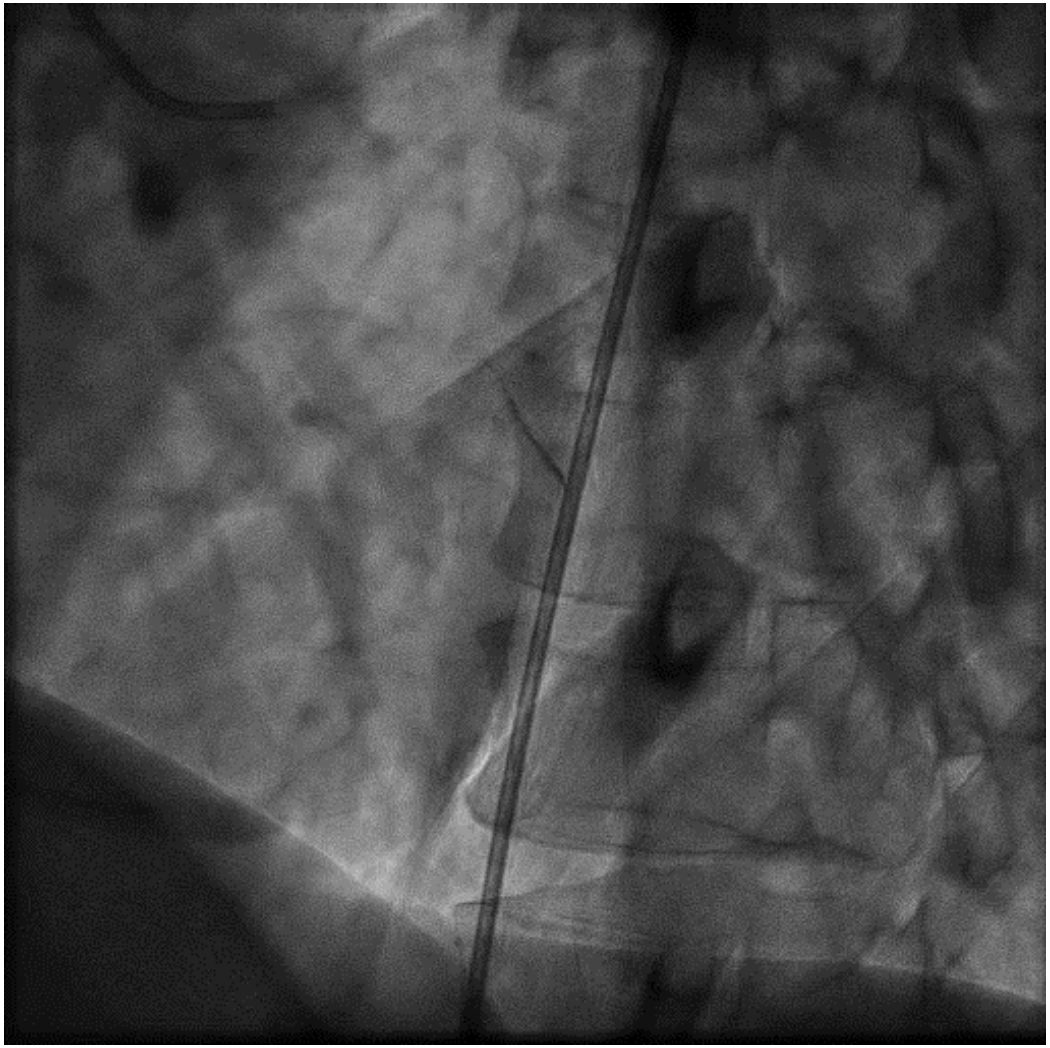
Inferior MI



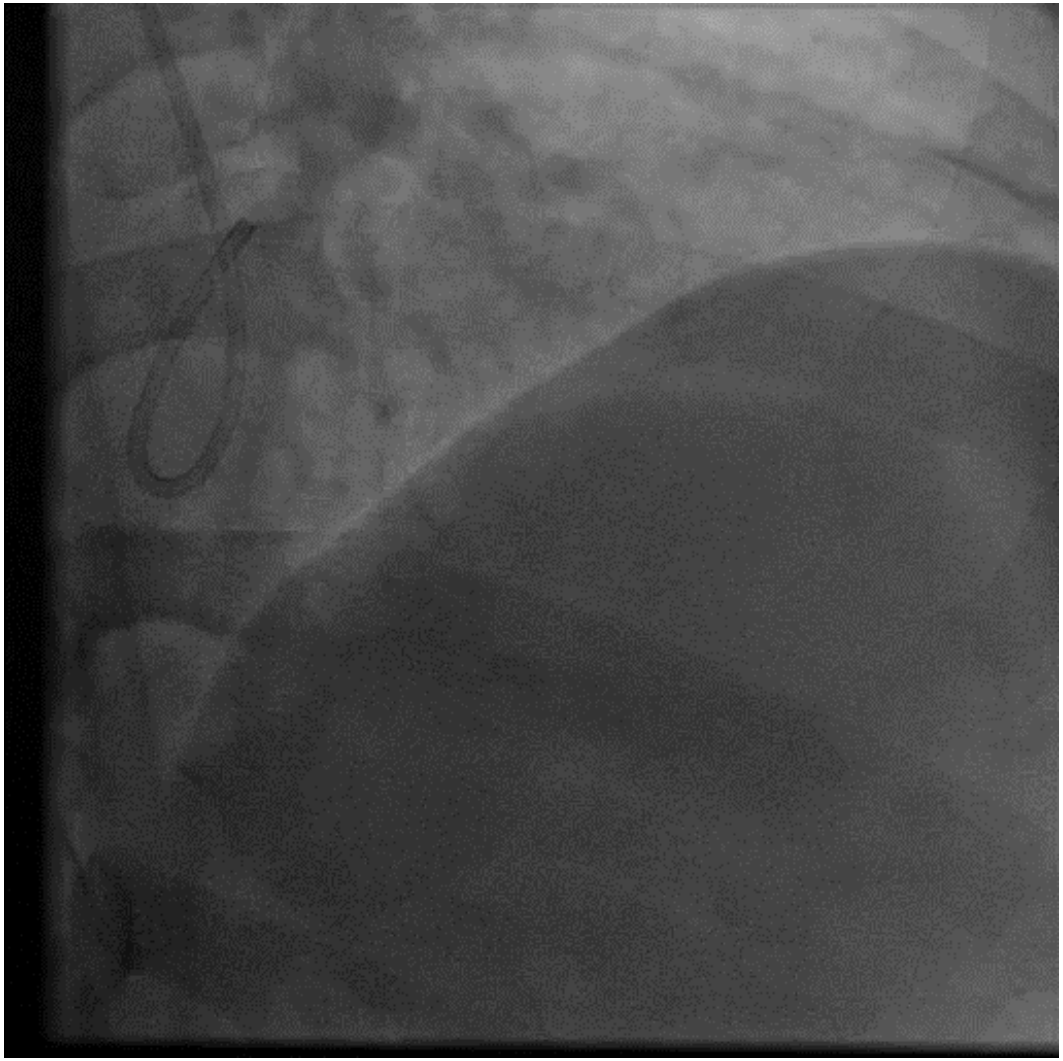
1 month later

Case 3





Case 4



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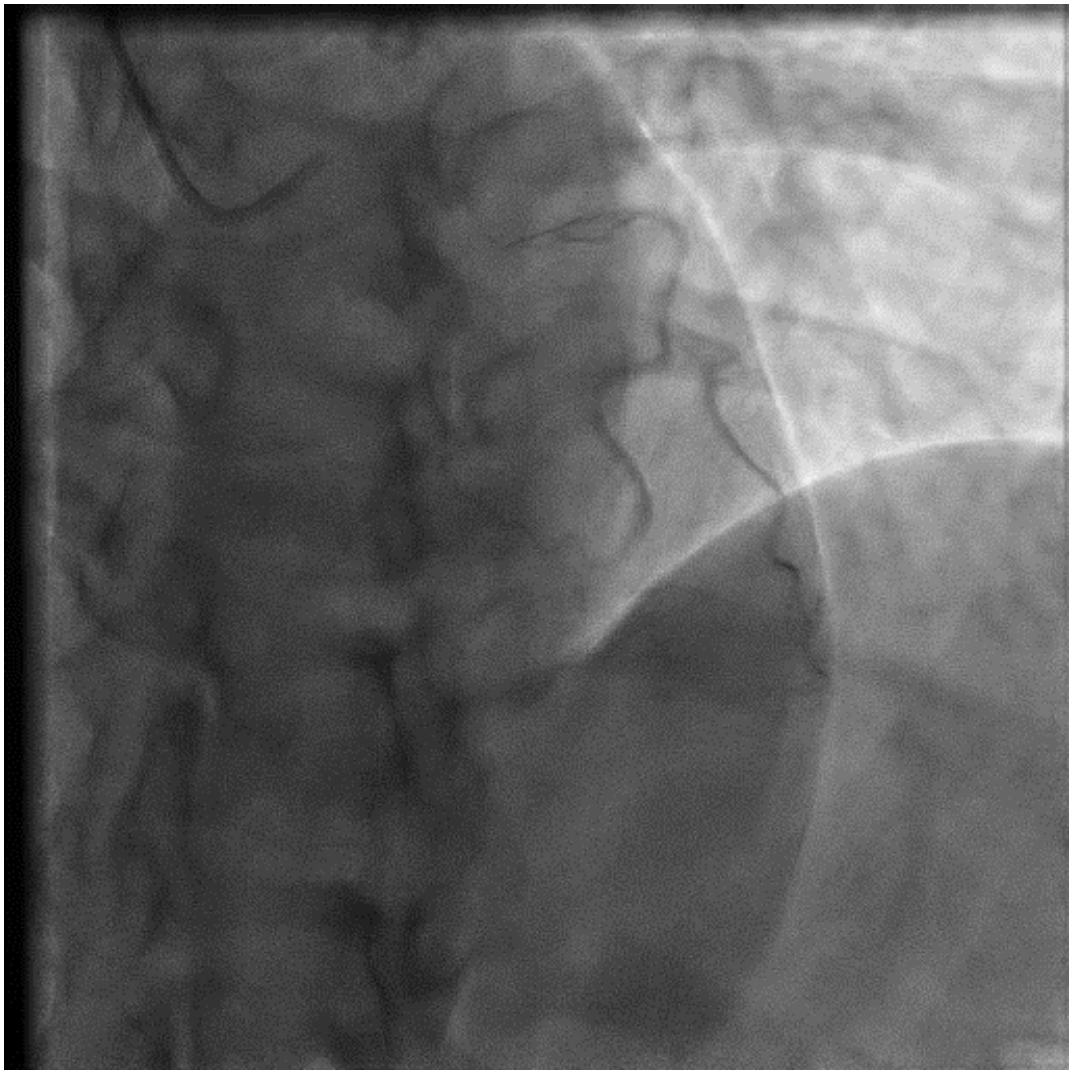
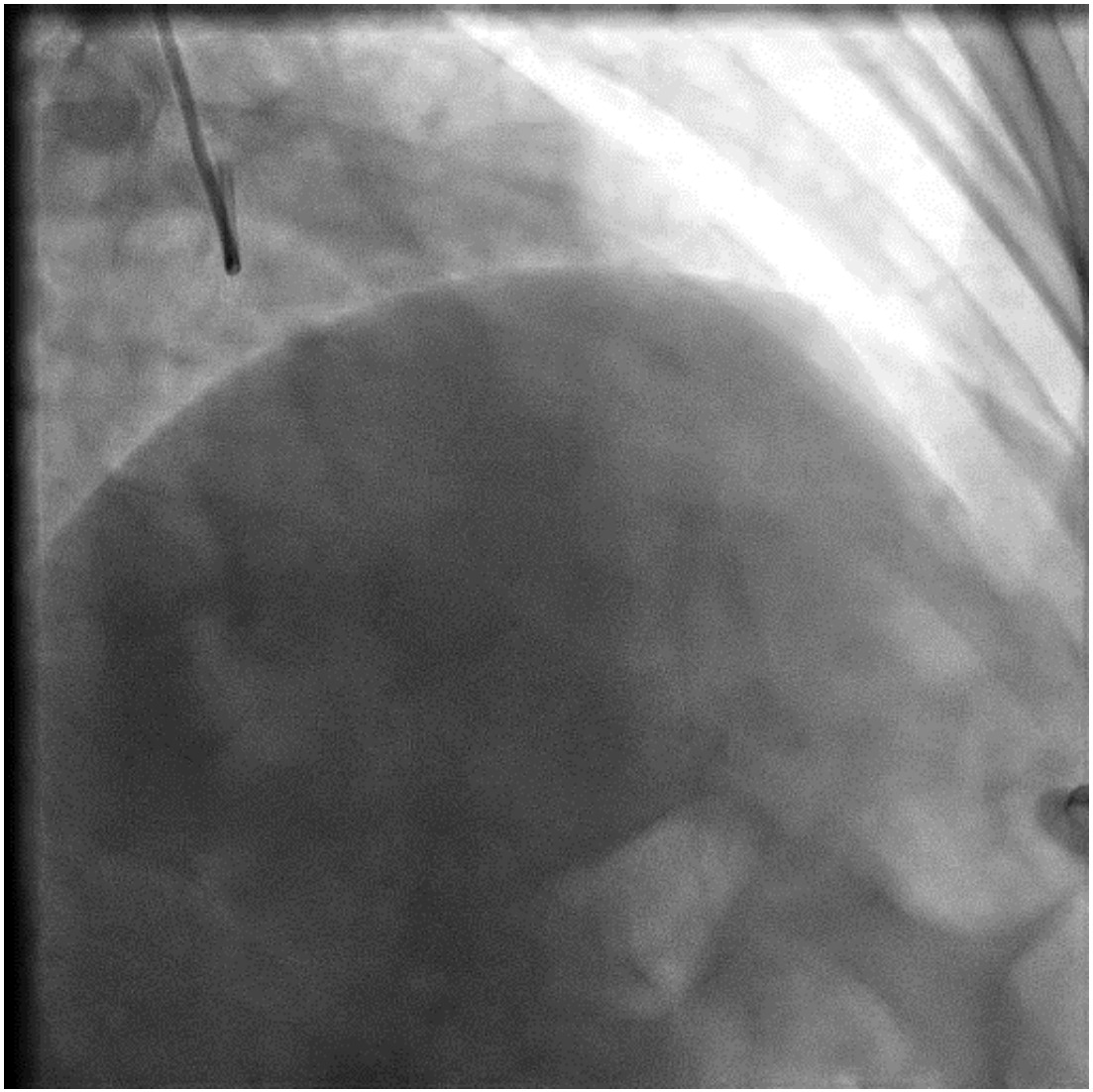
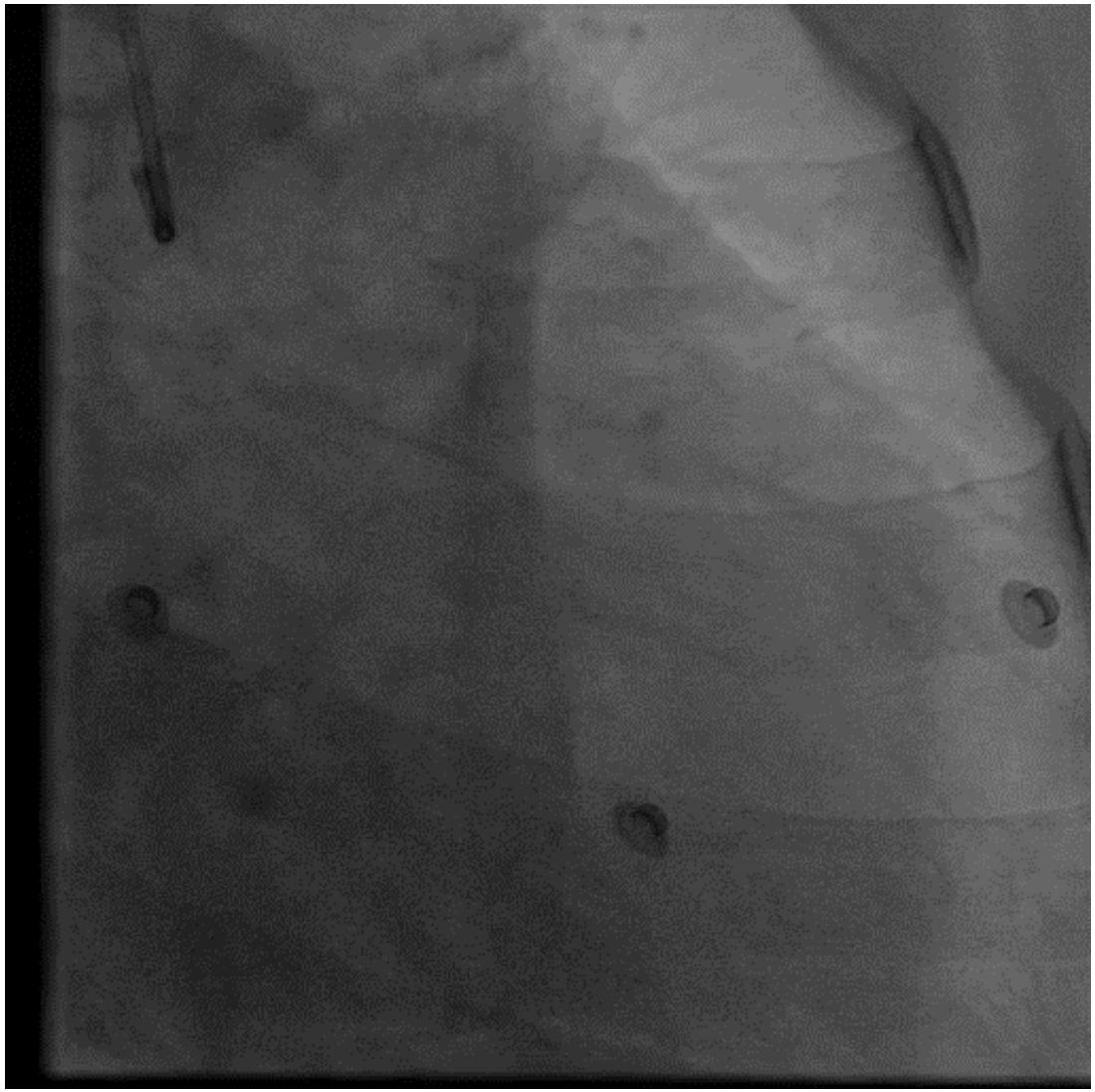
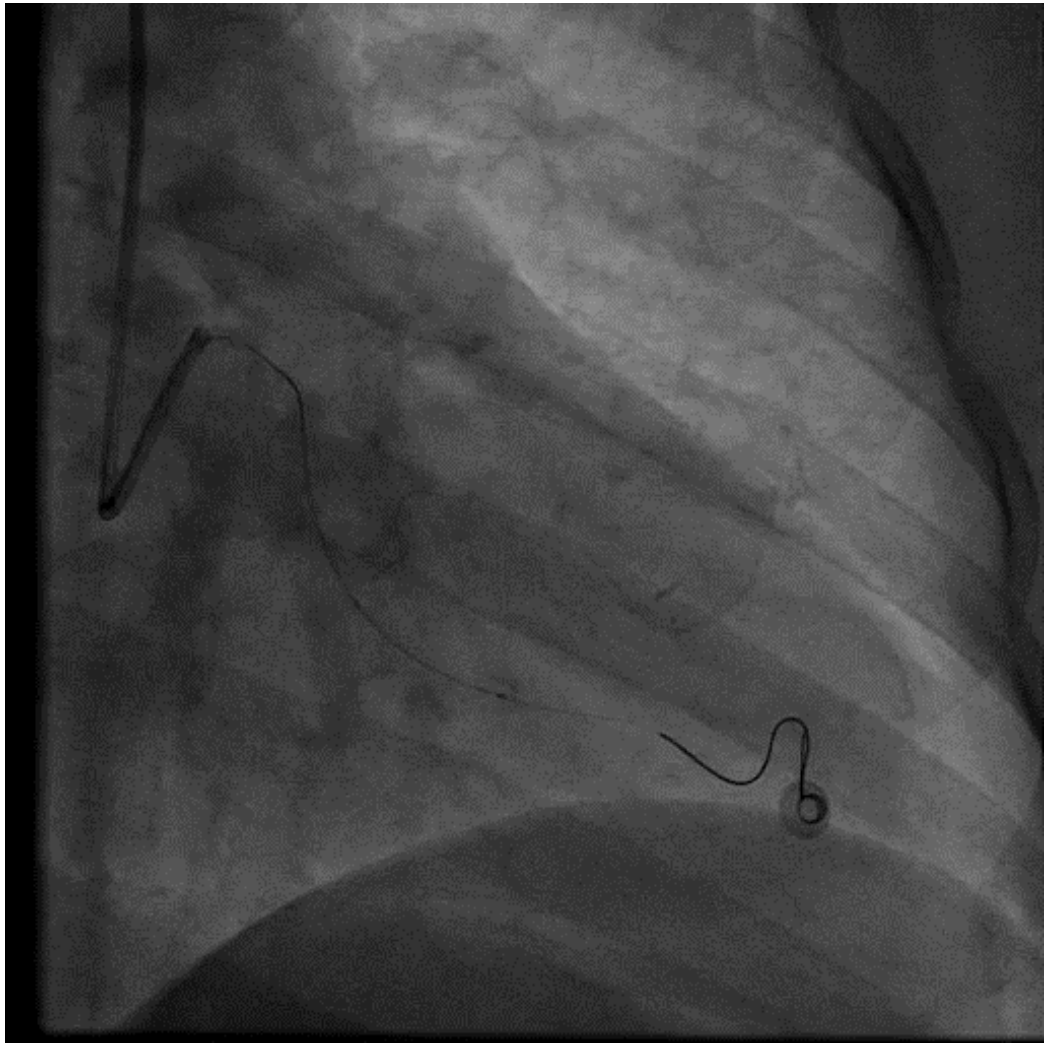
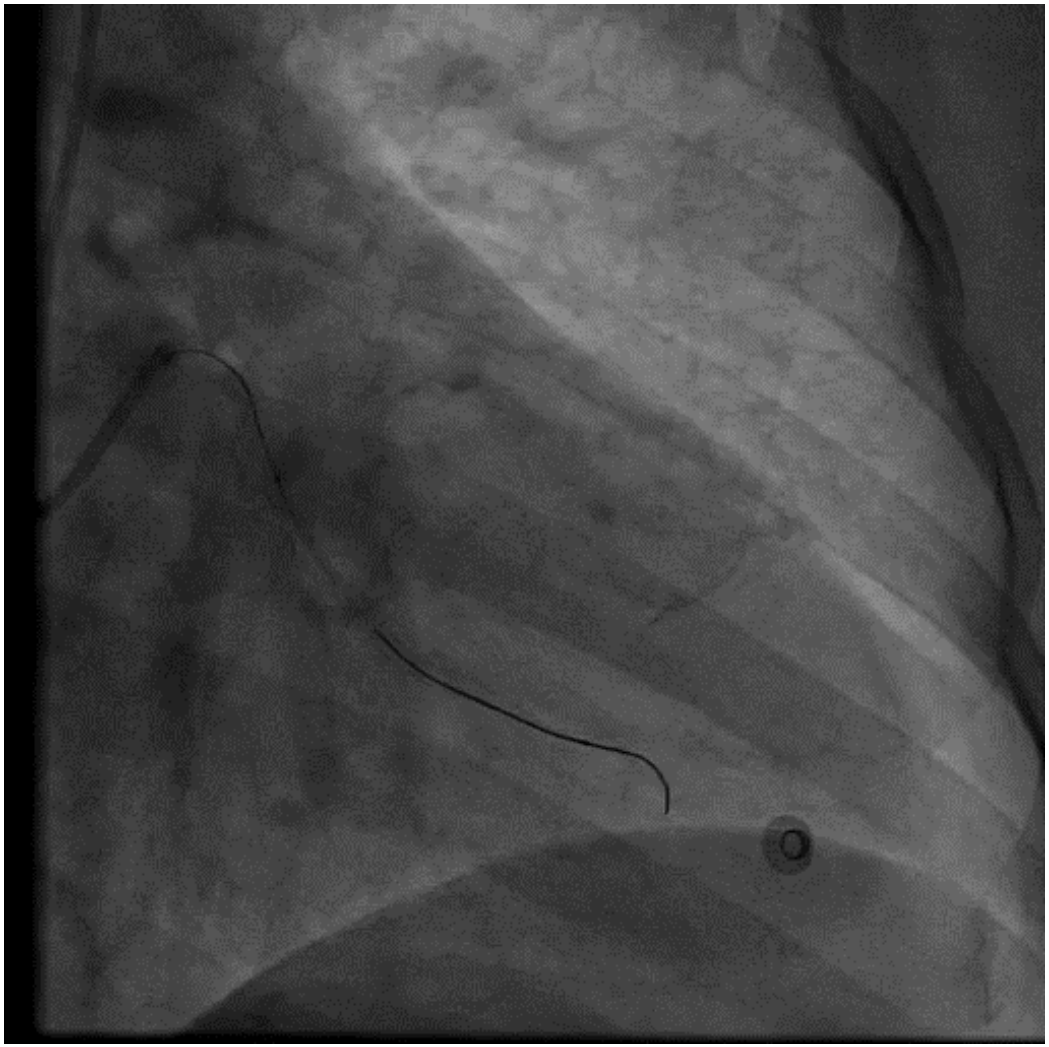


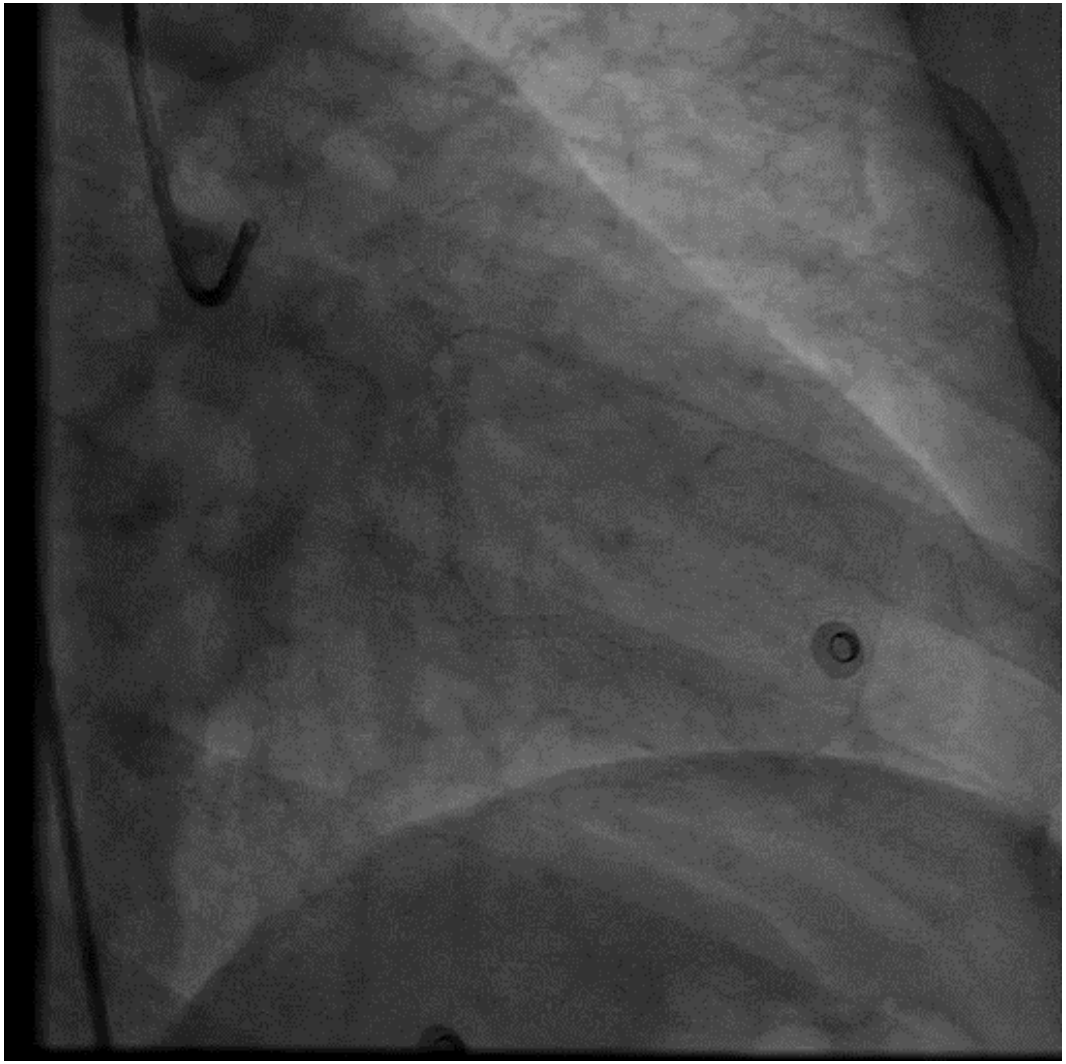


Case 6

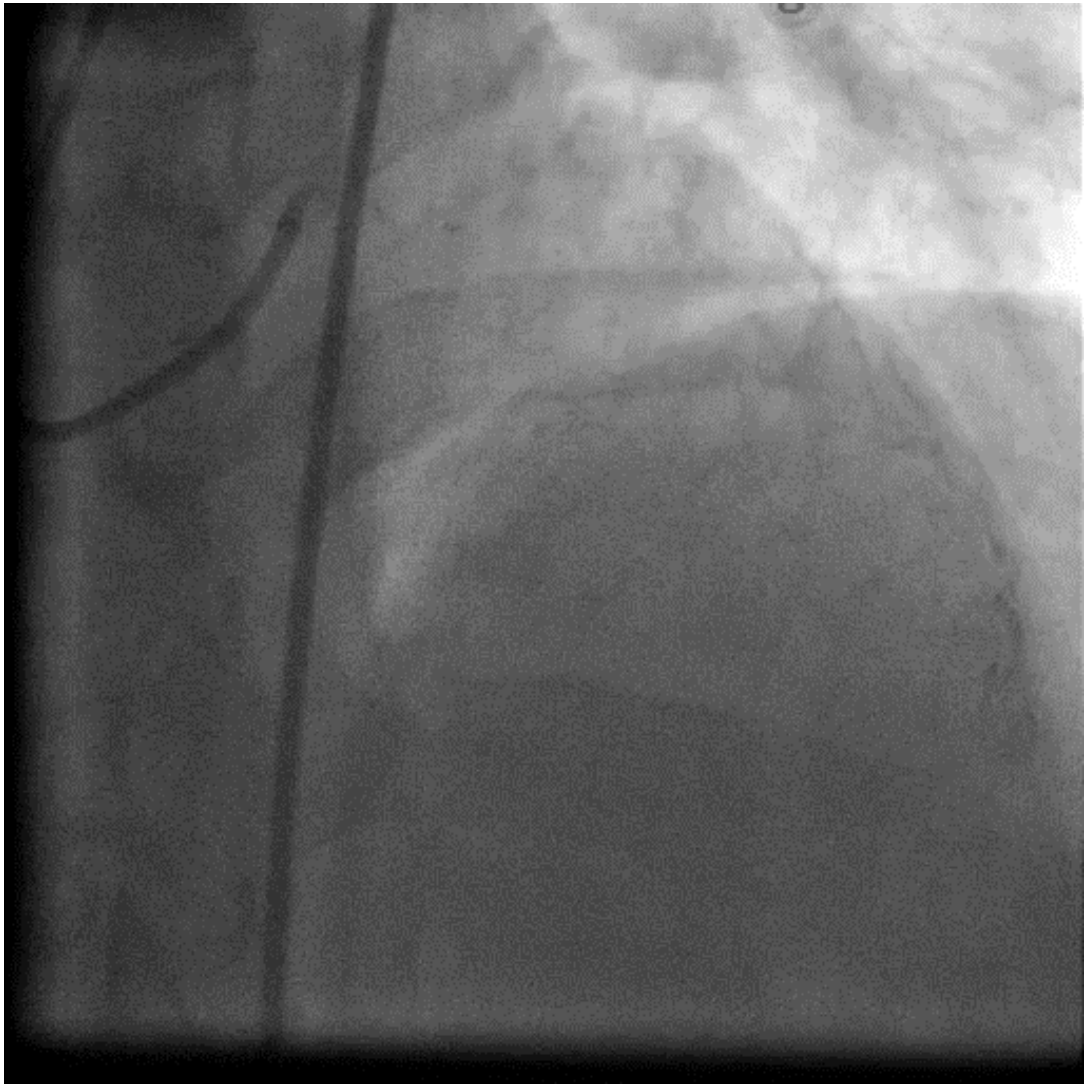


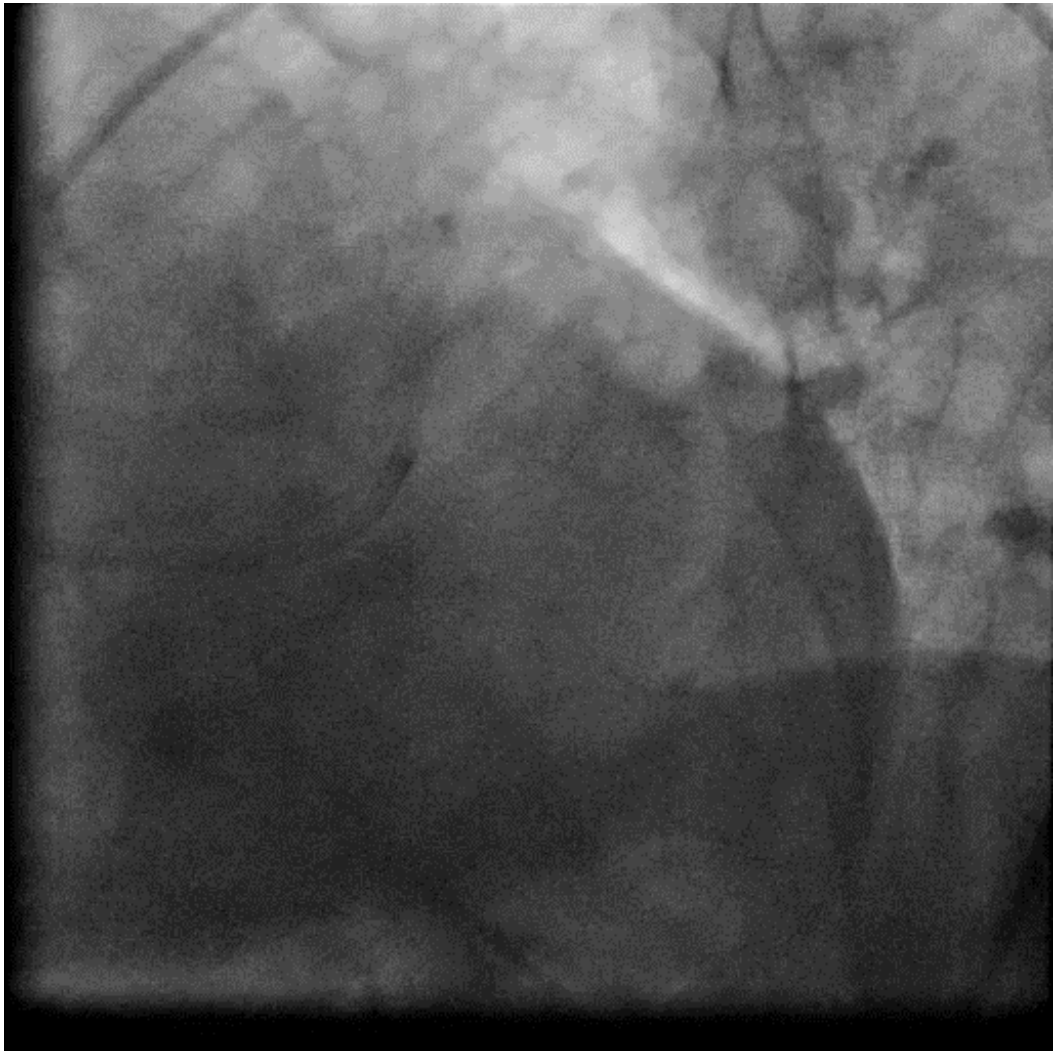






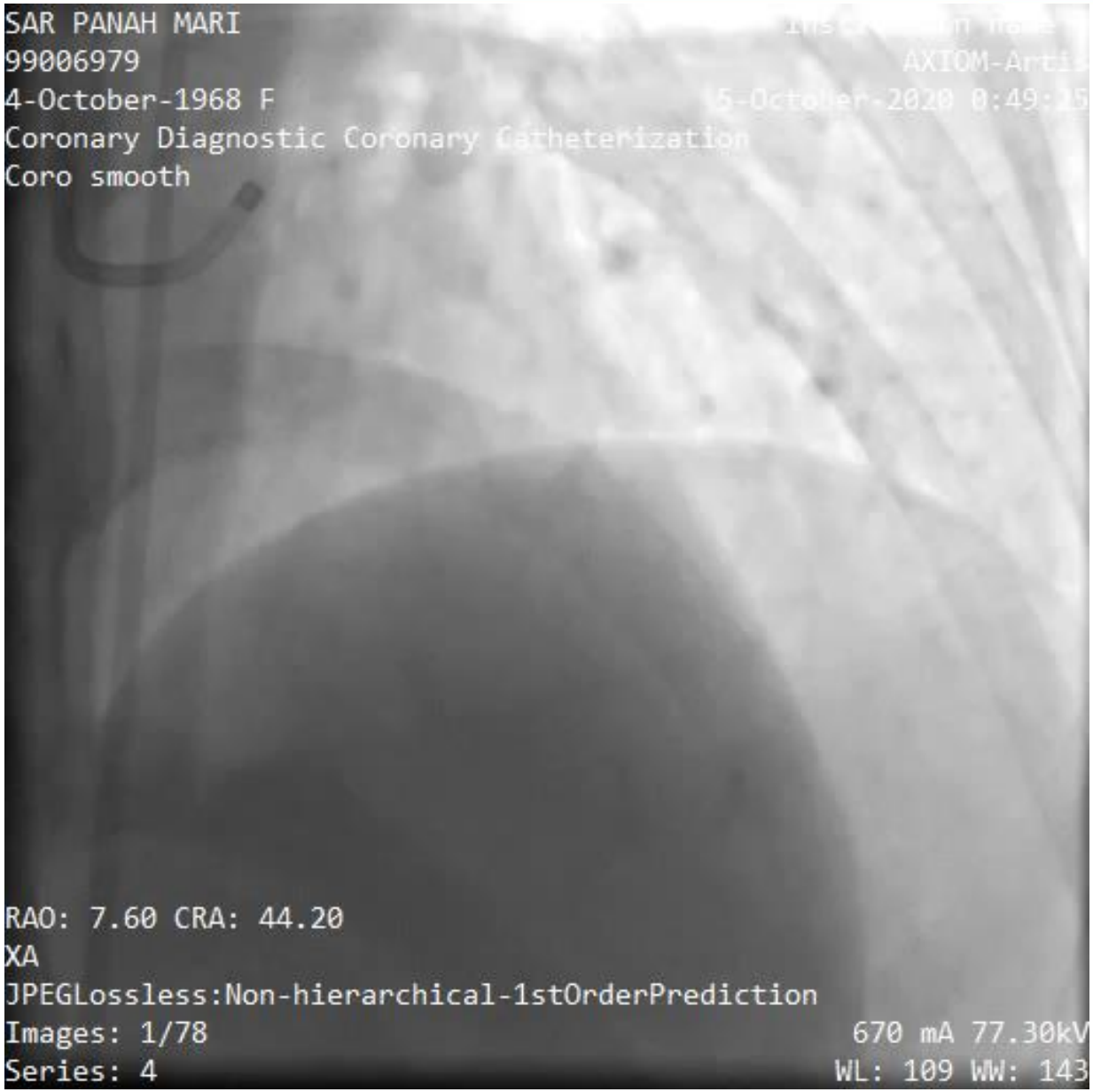
Case 7





Case 8

- 50 yr/o female
- No risk factor
- Professional tennis player
- Acute CP after Playing tennis
- ECG: anterior STEMI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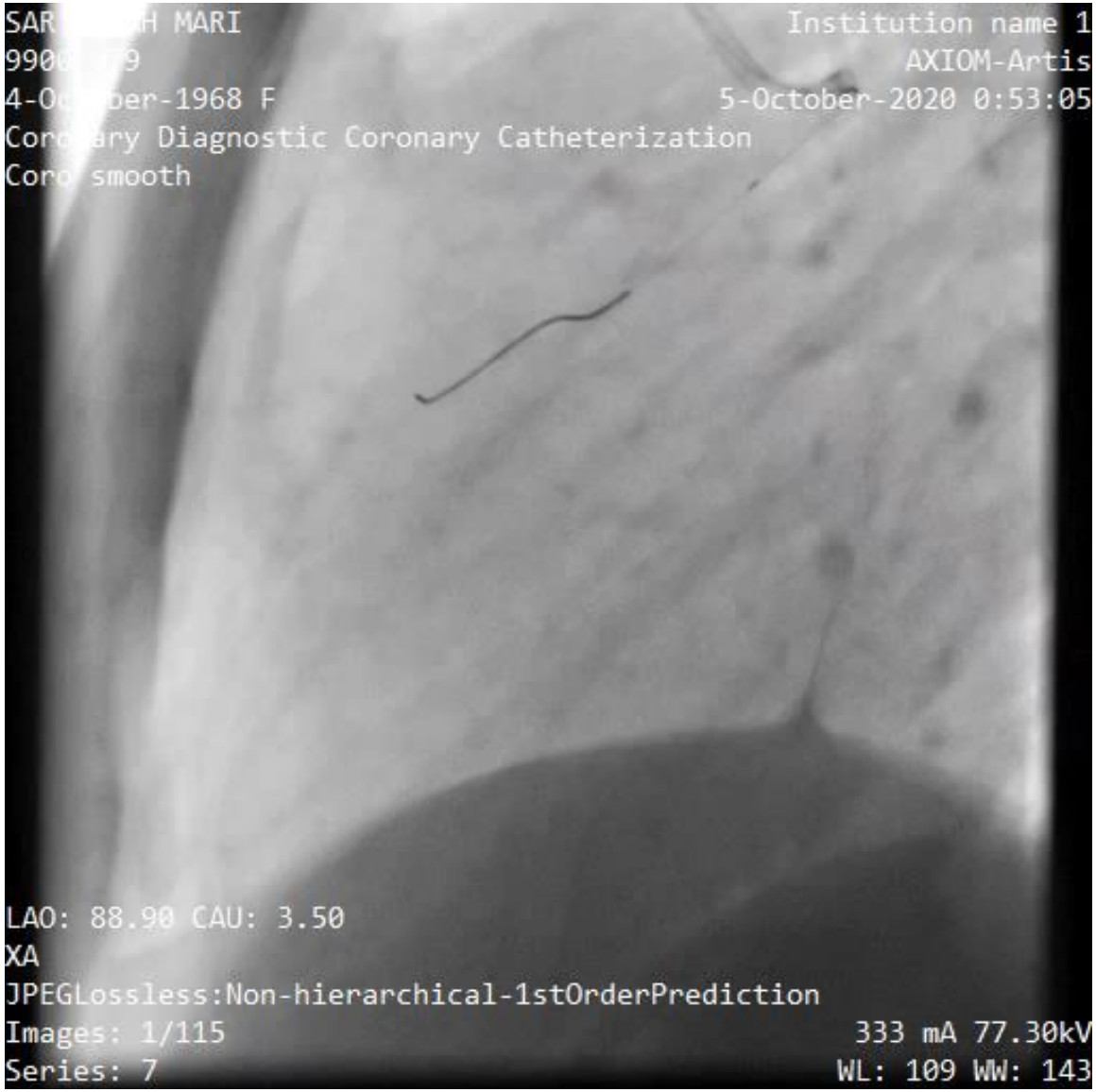
99006979
4-October-1968 F
Coronary Diagnostic Coronary Catheterization
Coro smooth
RAO: 7.60 CRA: 44.20
XA
JPEGLossless:Non-hierarchical-1stOrderPrediction
Images: 1/78
Series: 4
670 mA 77.30kV
WL: 109 WW: 143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Institution name 1
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Coro smooth
LAO: 88.90 CAU: 3.50
XA
JPEGLossless:Non-hierarchical-1stOrderPrediction
Images: 1/115
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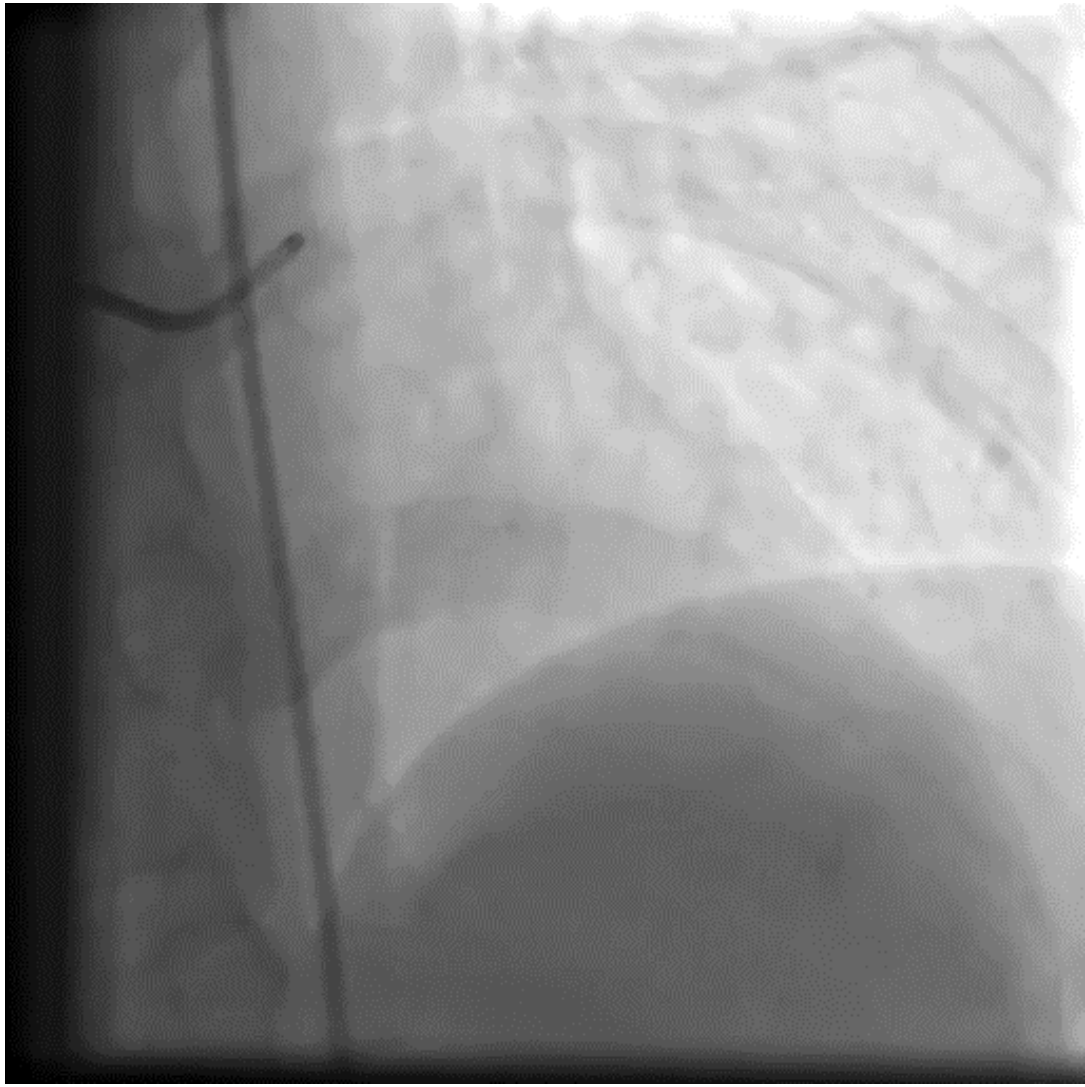
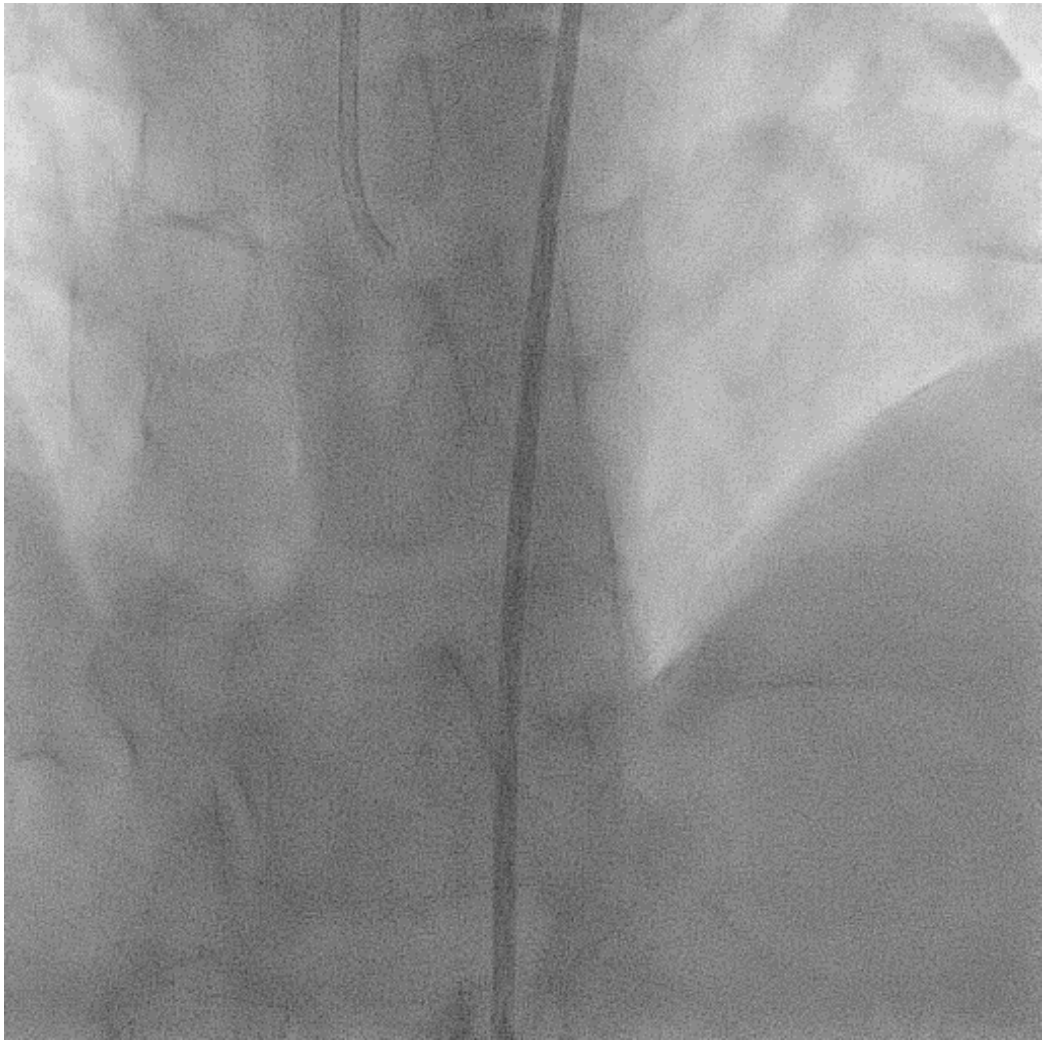
Series: 7
WL: 109 WW: 143

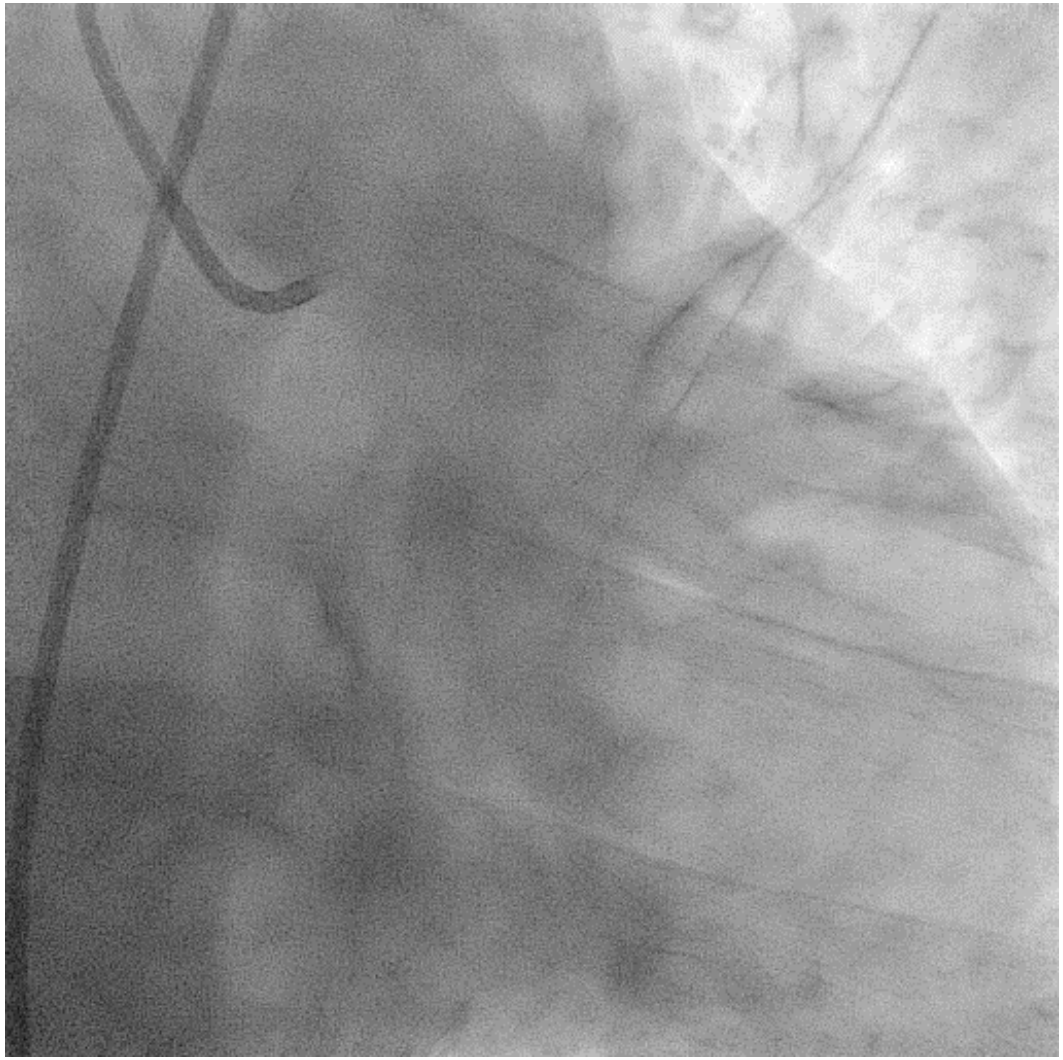
2 months later…

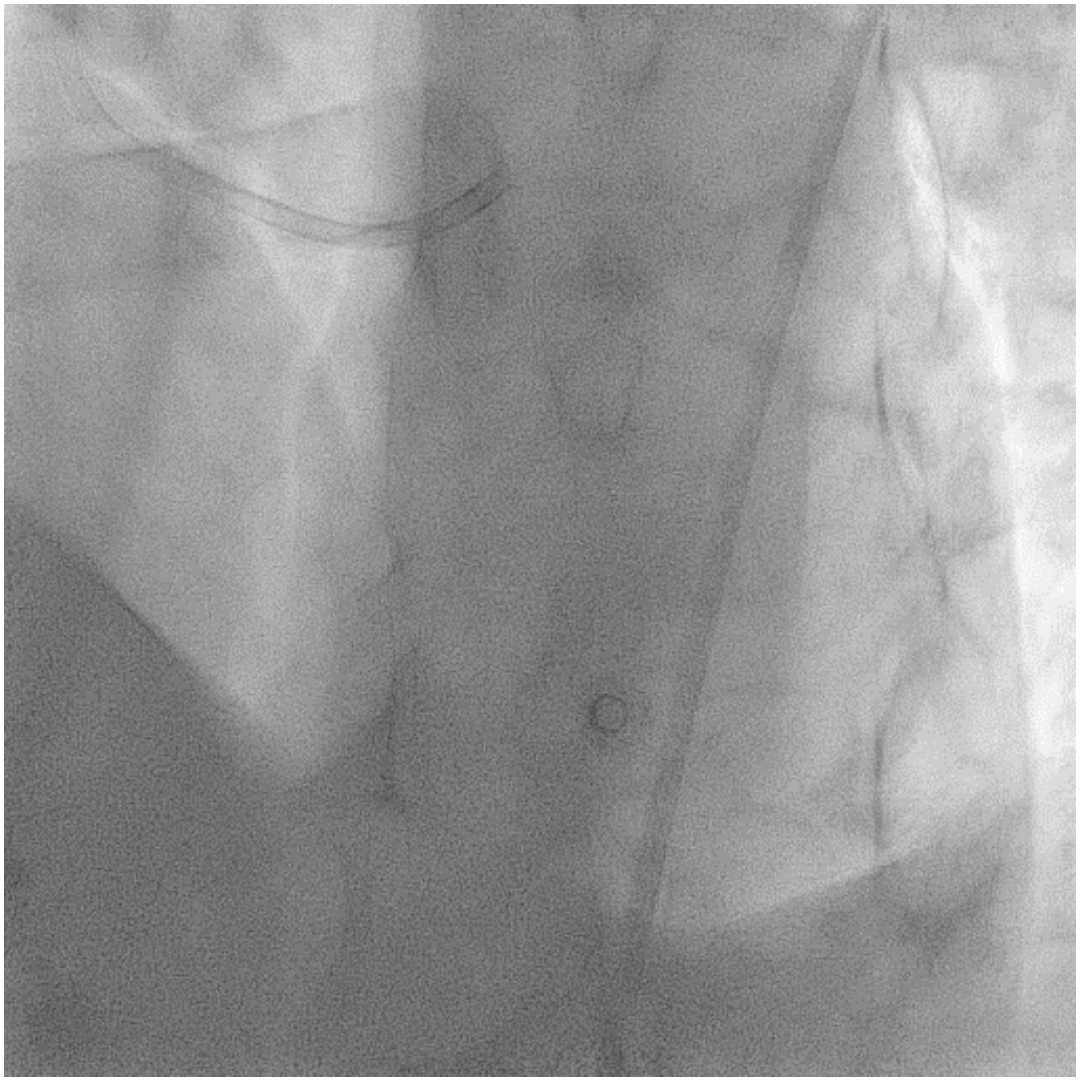


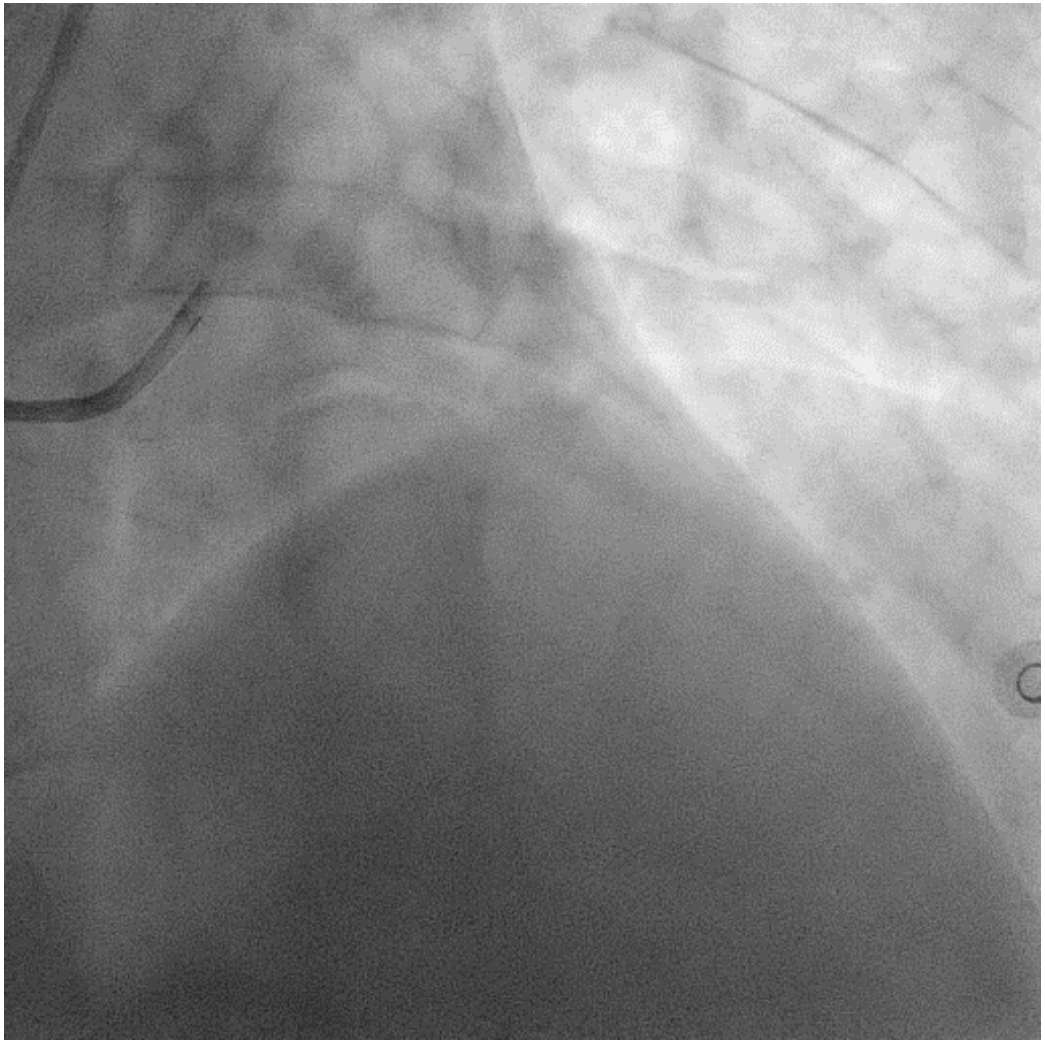
Case 9

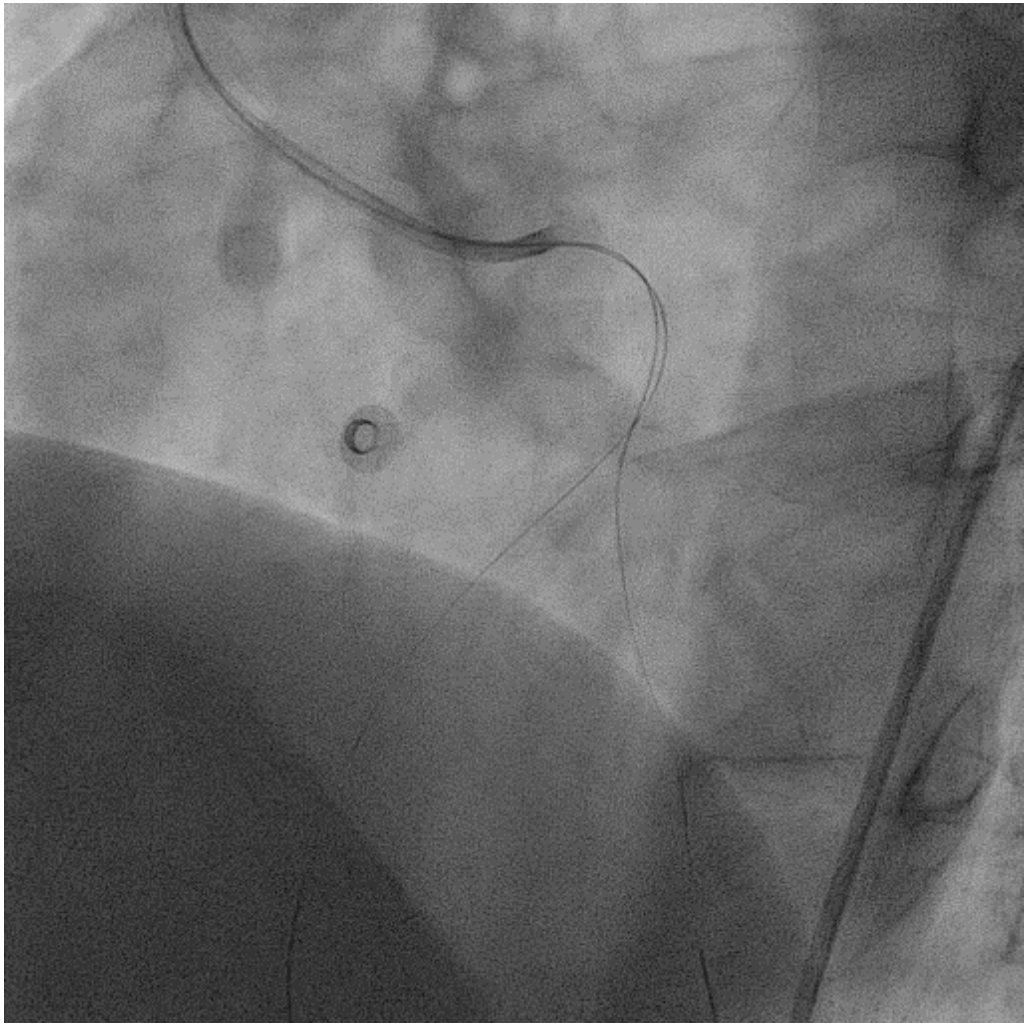
- 36 yr/o male
- Multidrug & c/s user.
- Acute chest pain from 6 hrs ago.
- Referred from other hospital as Anterior STEMI.
- Pre cath echocardiography:
  - EF: 30%
  - Apical & apicolateral Akinesia

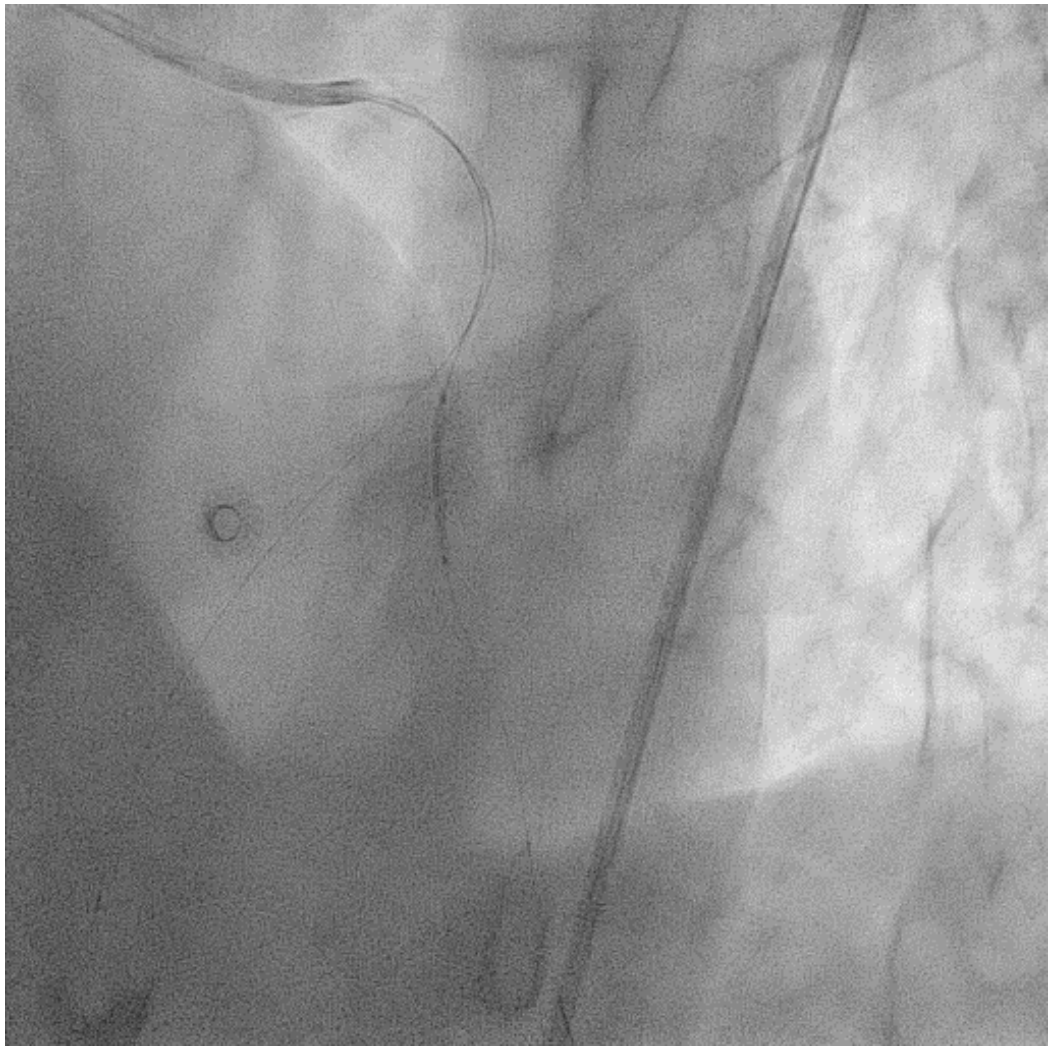


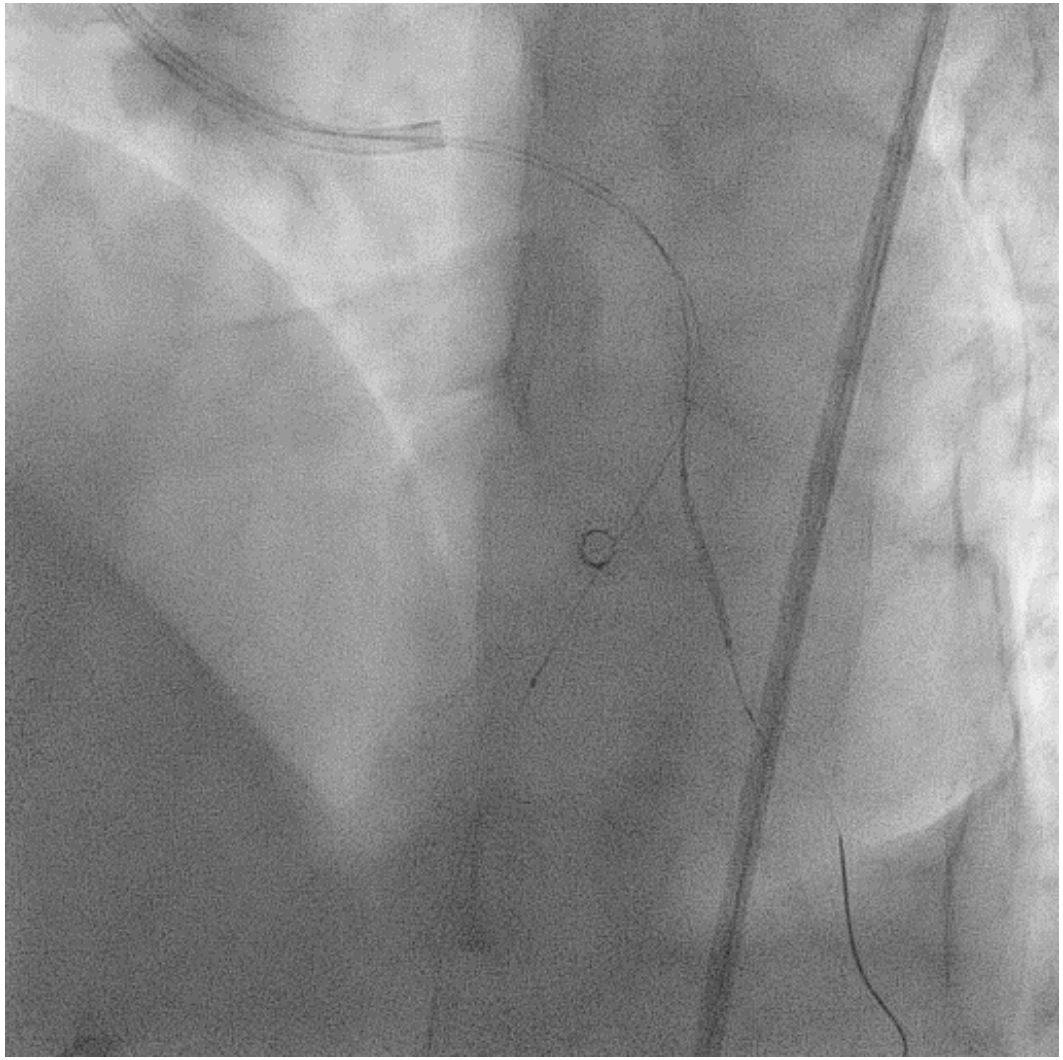


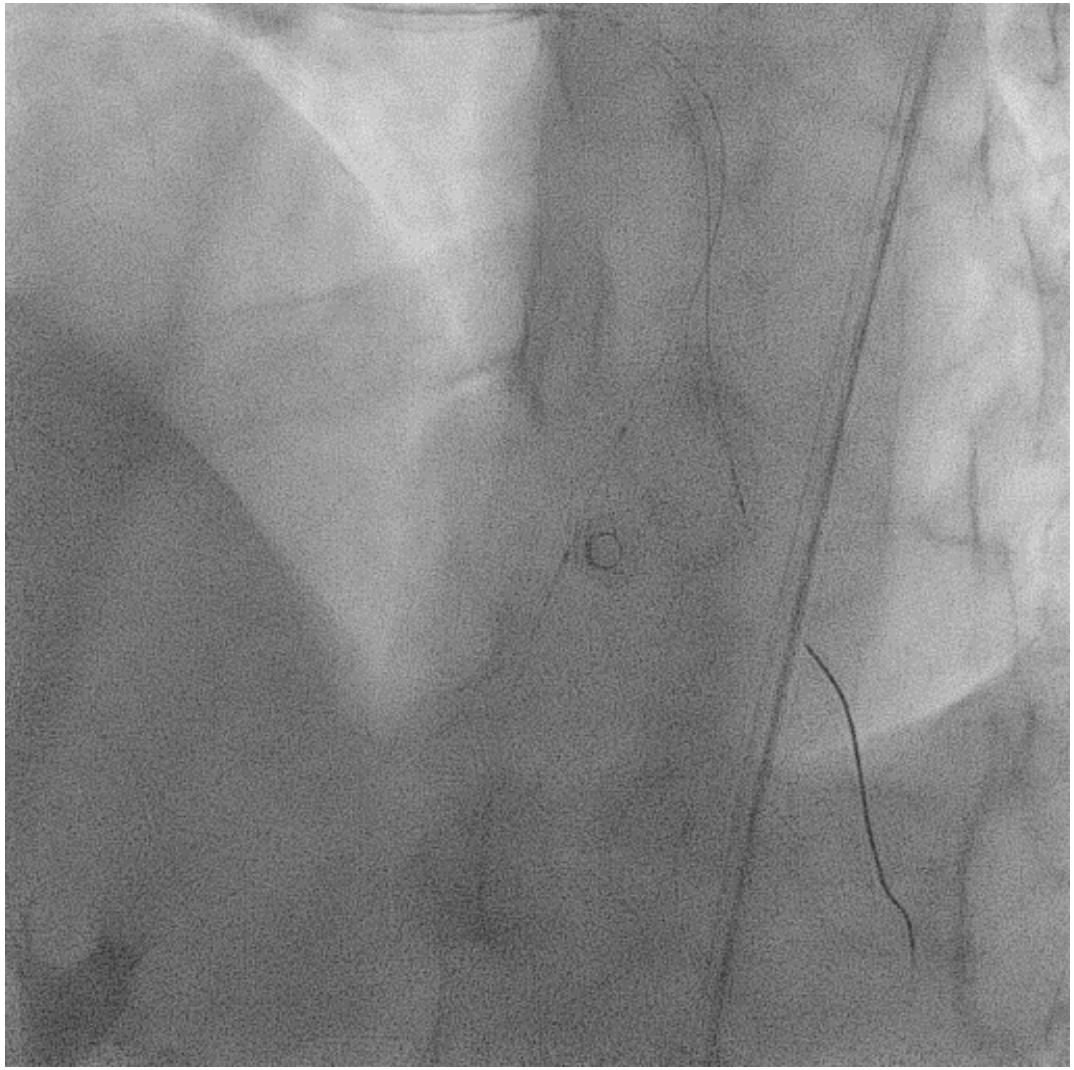


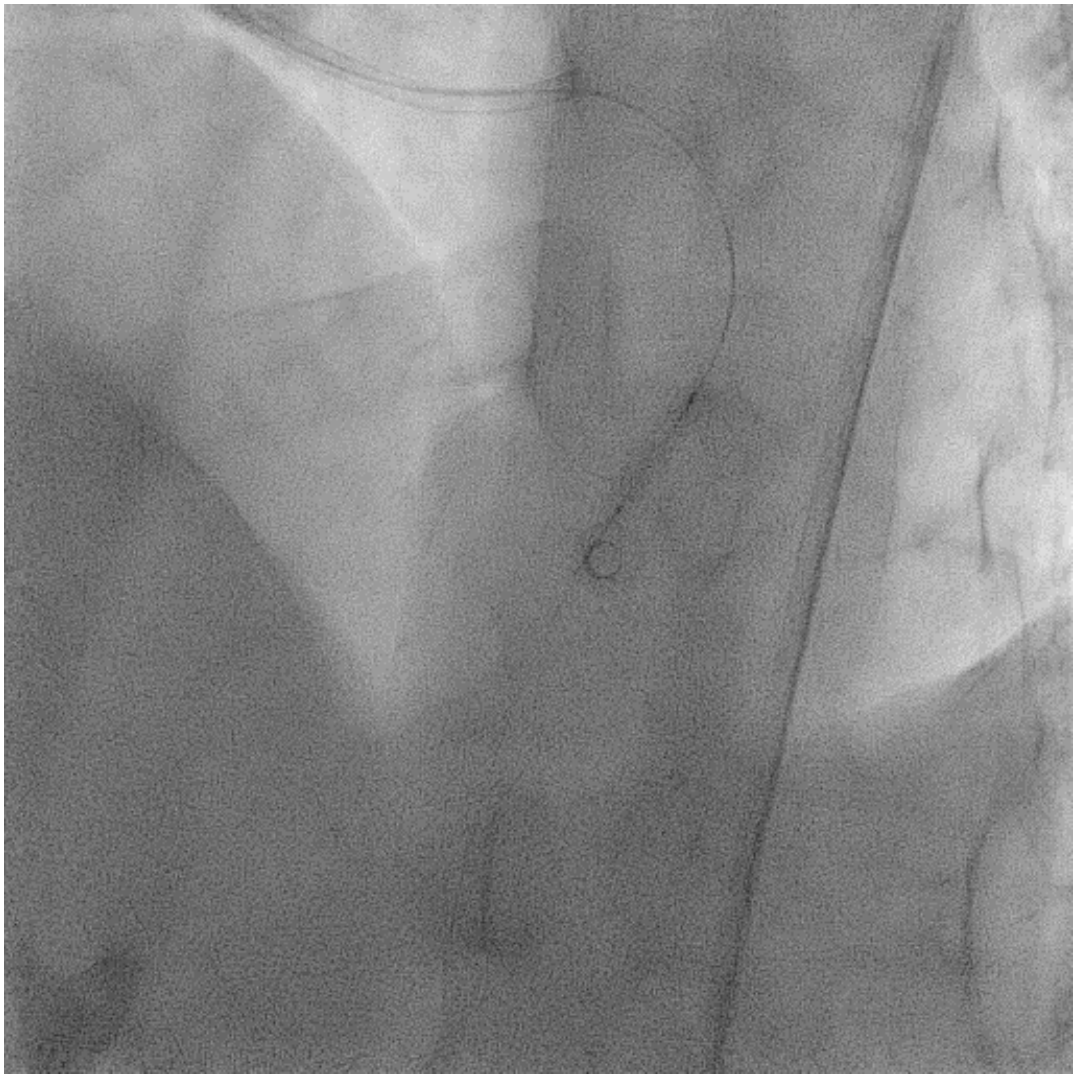


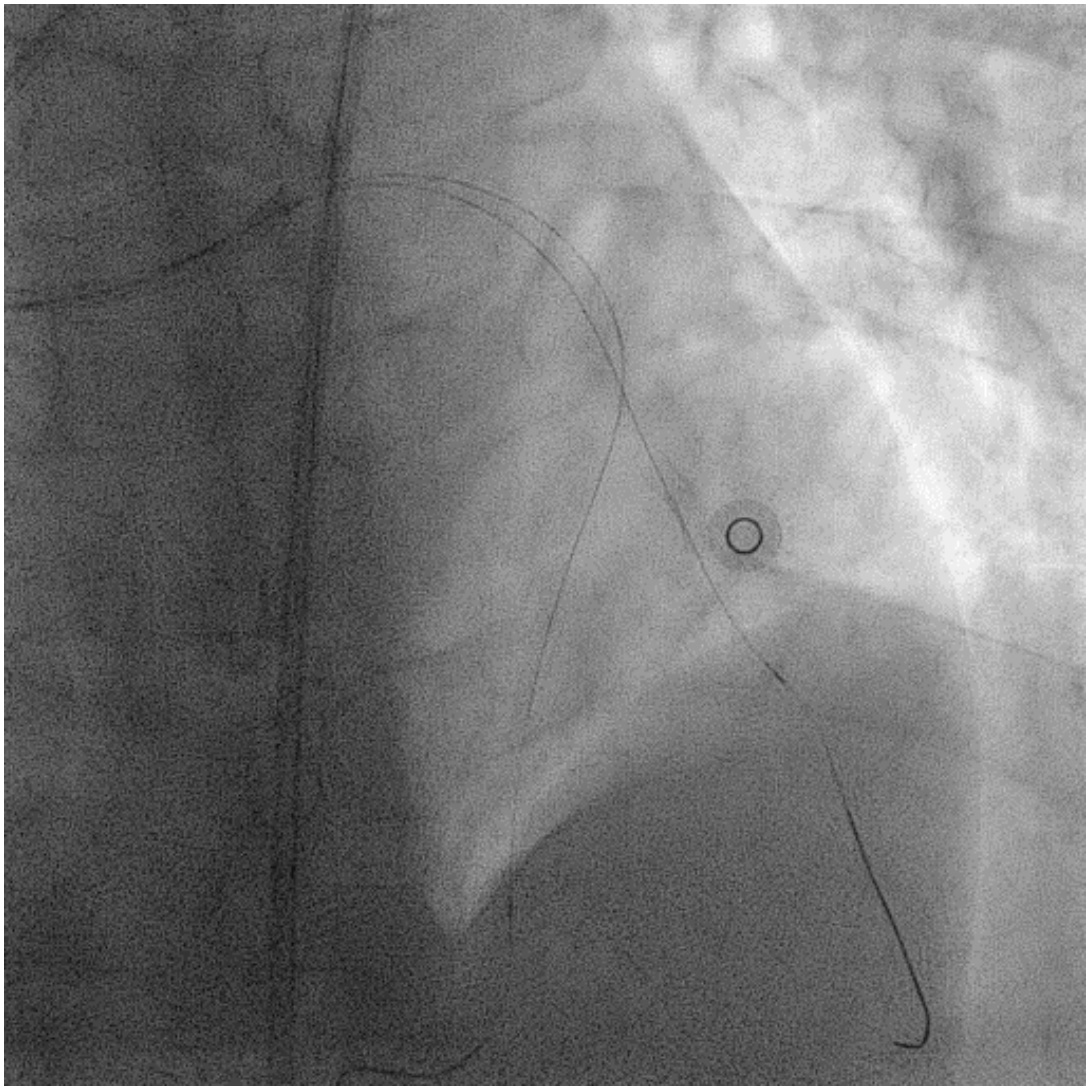


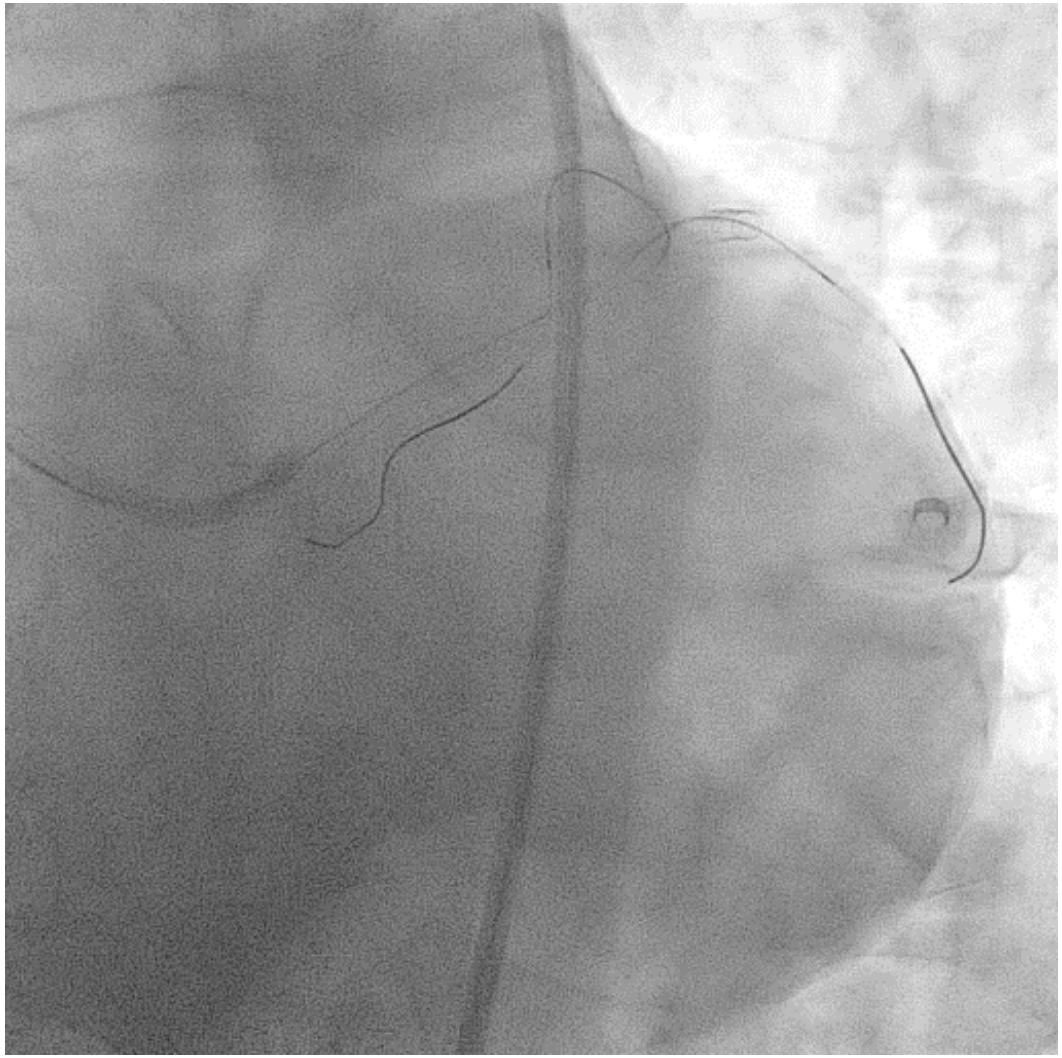


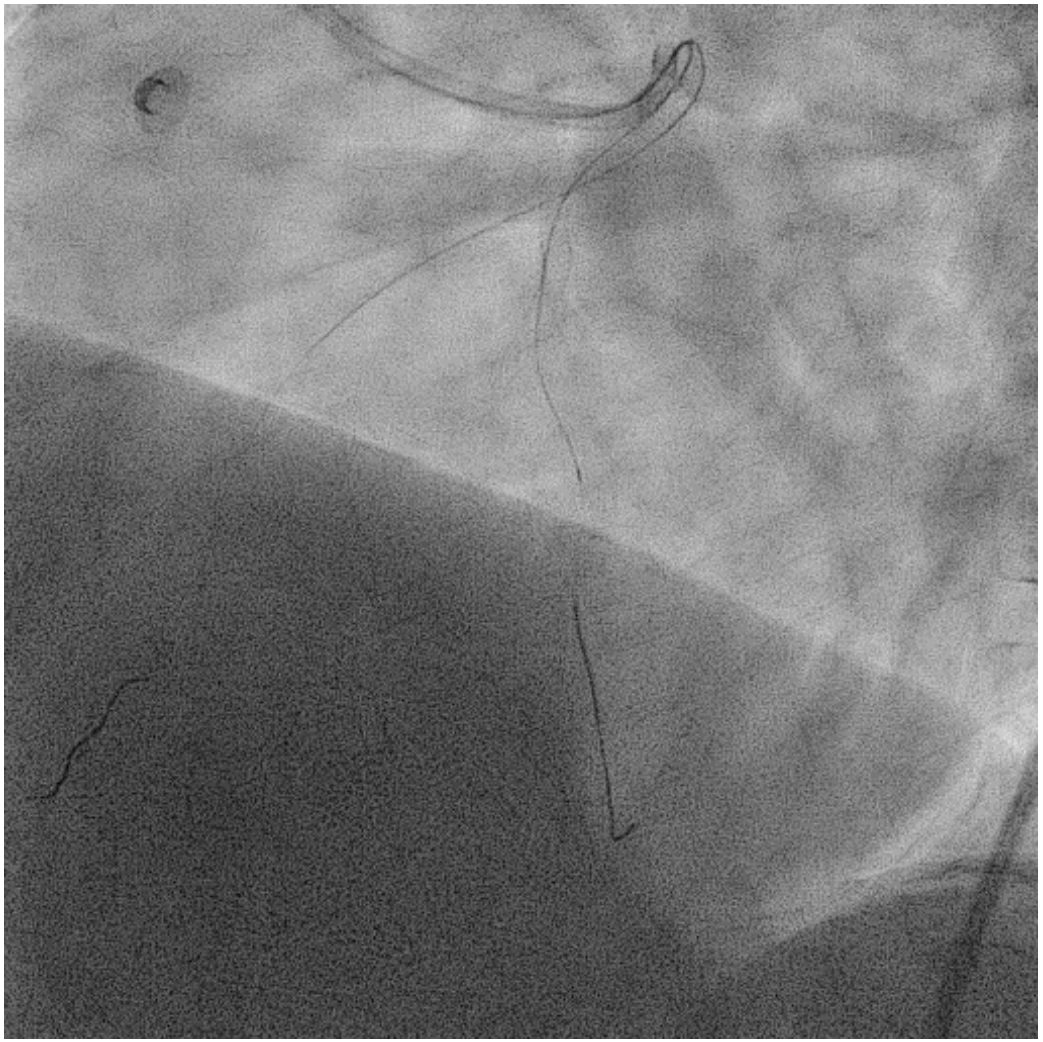


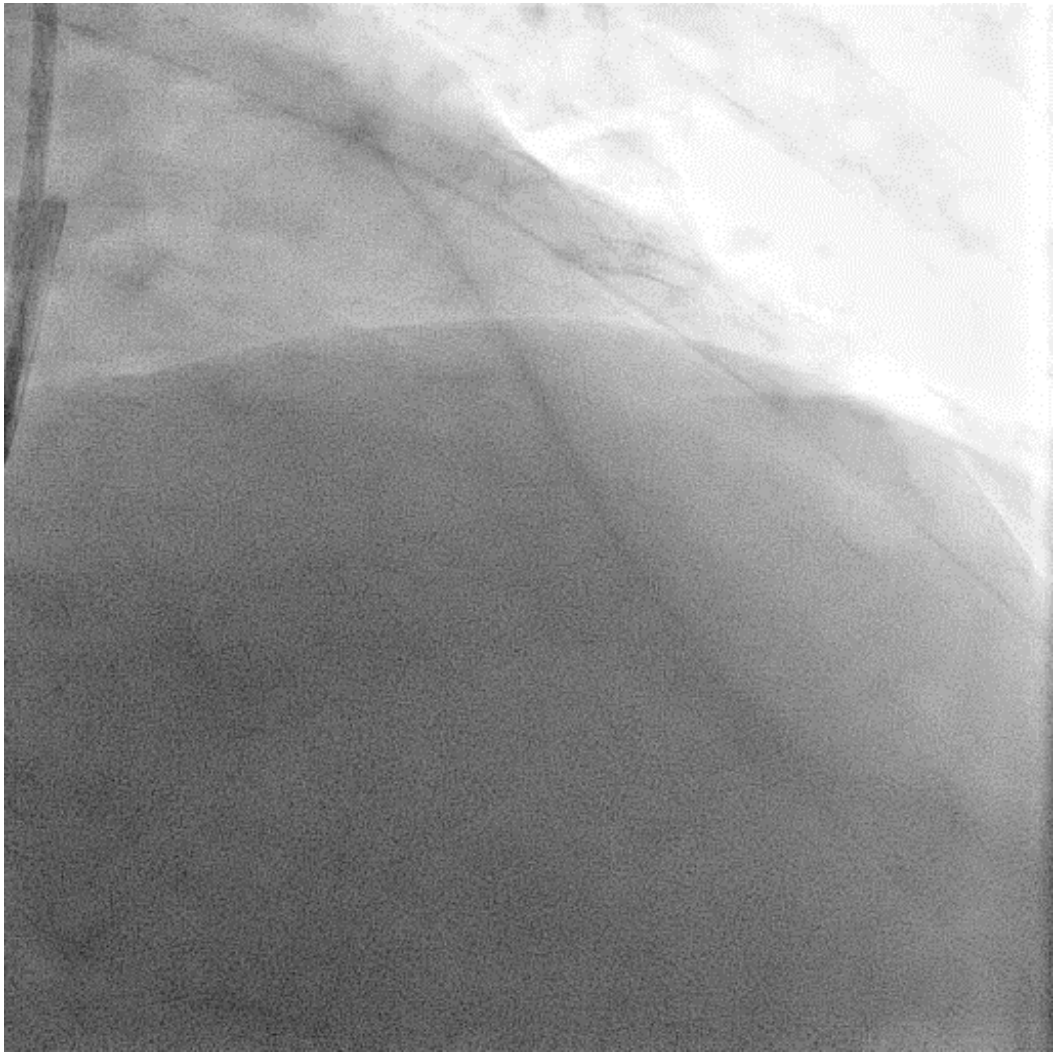






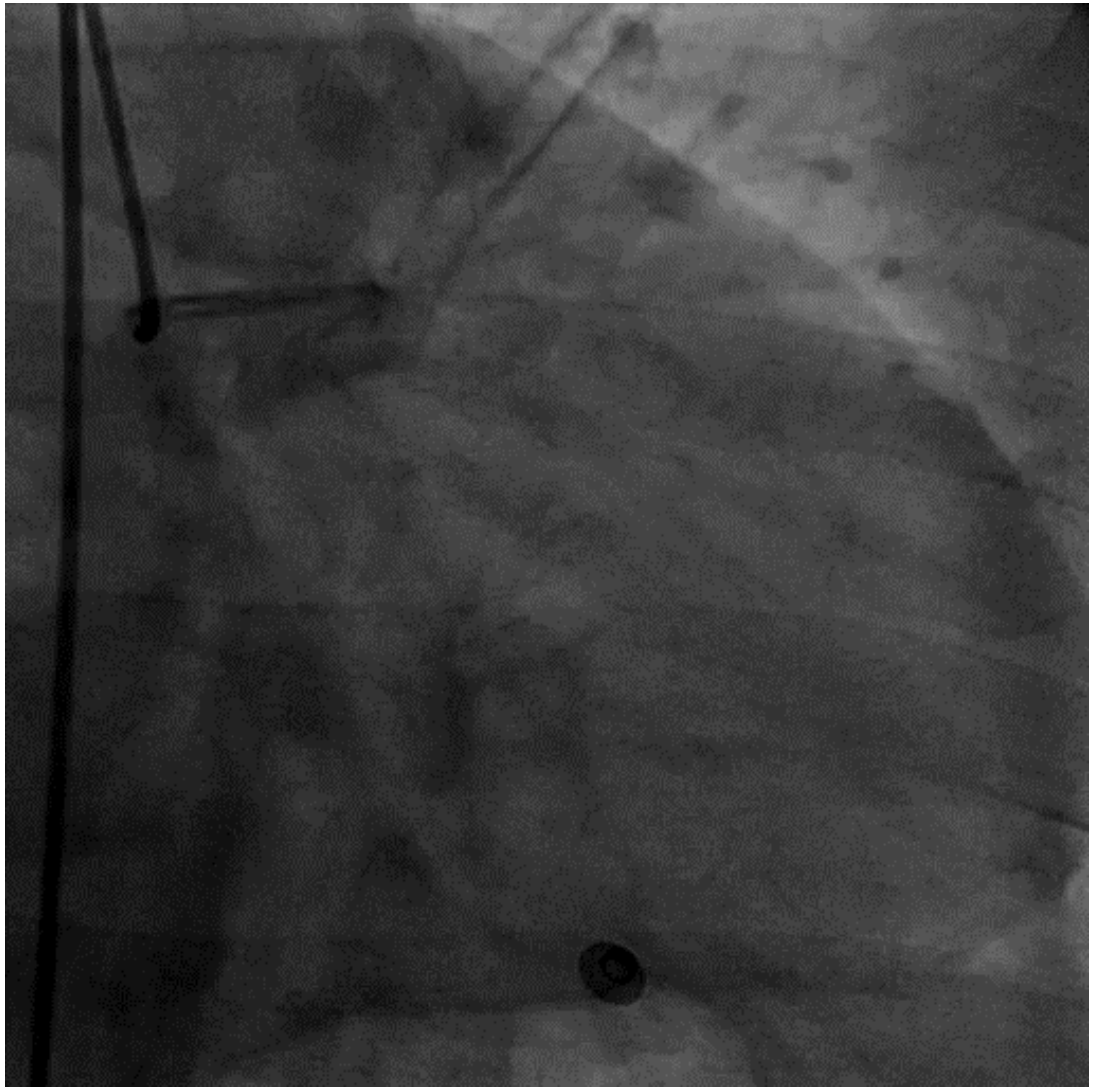


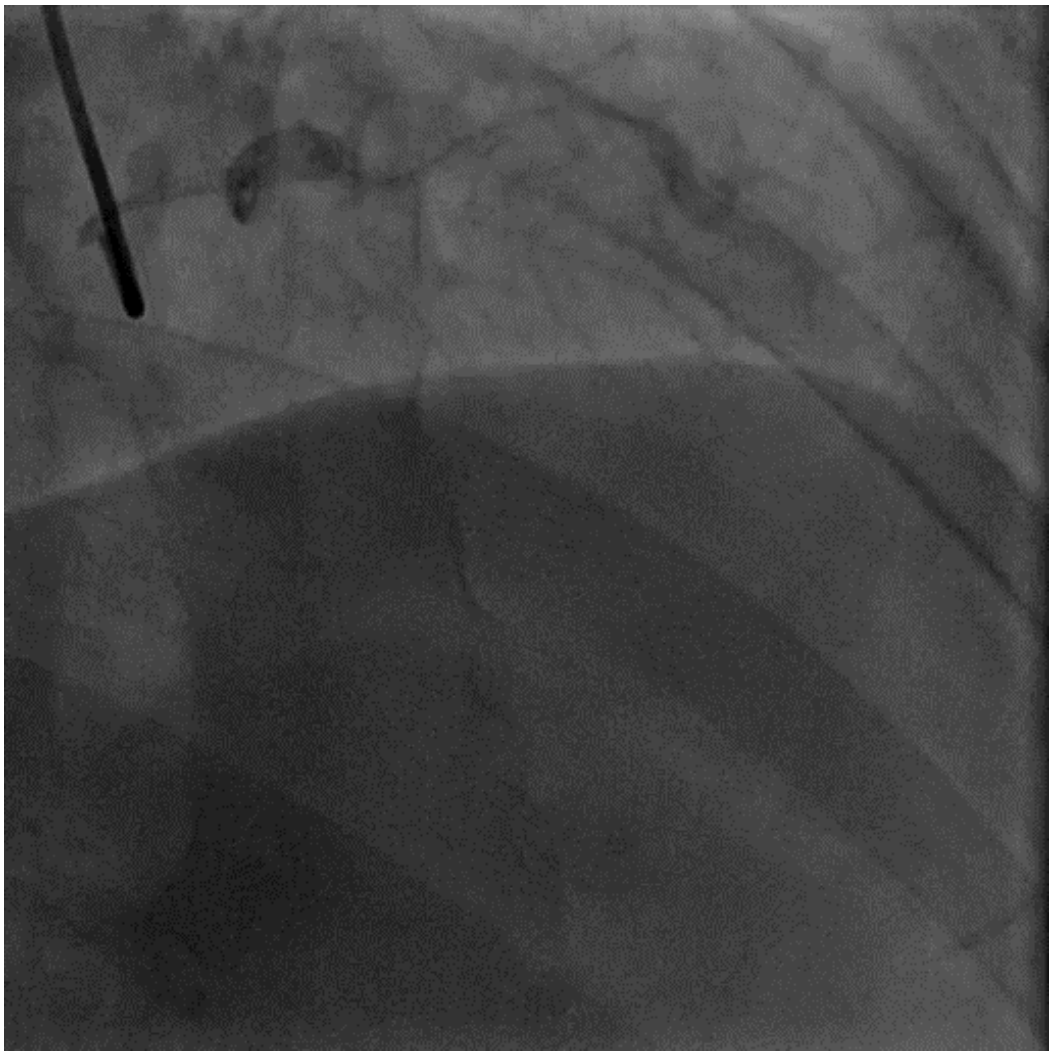


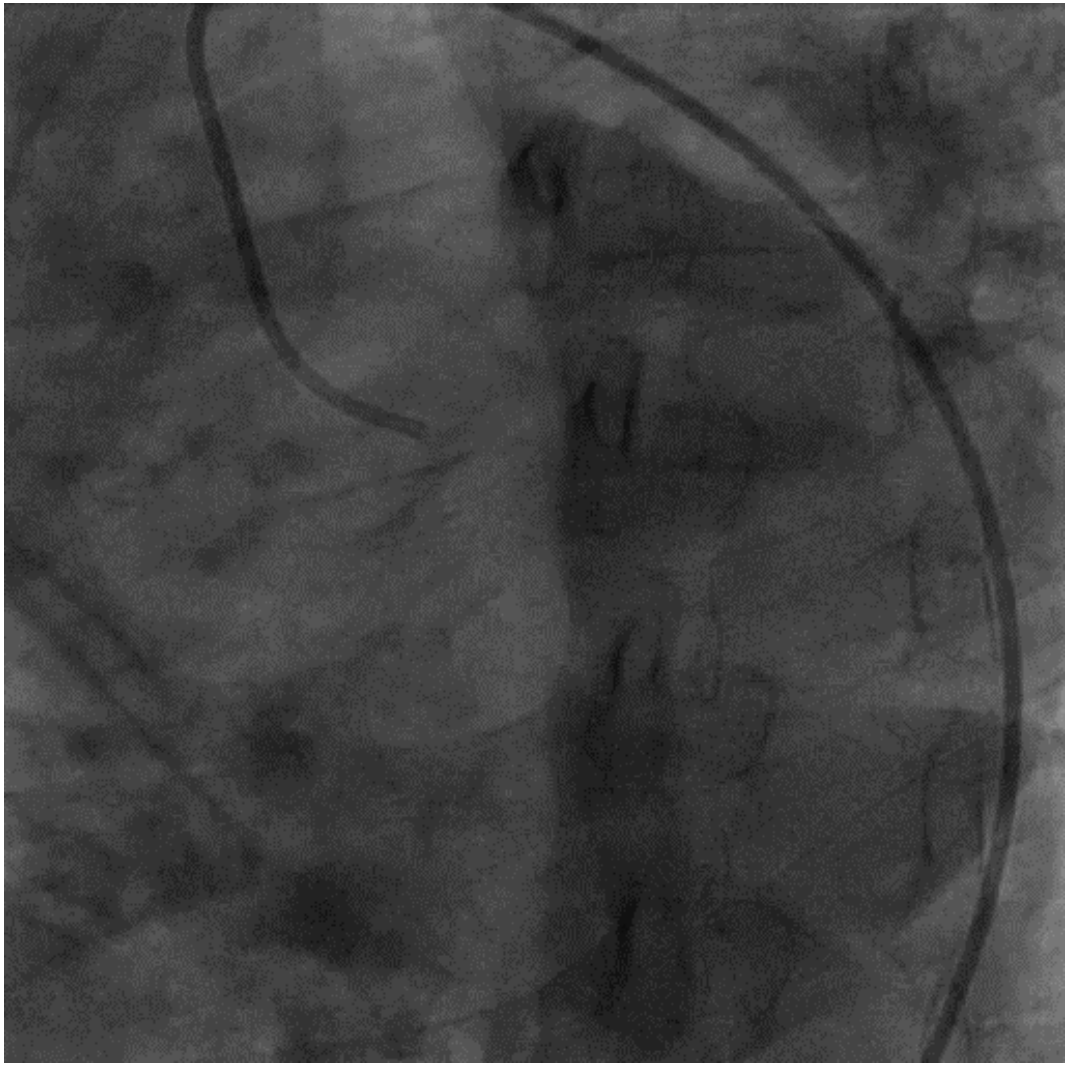


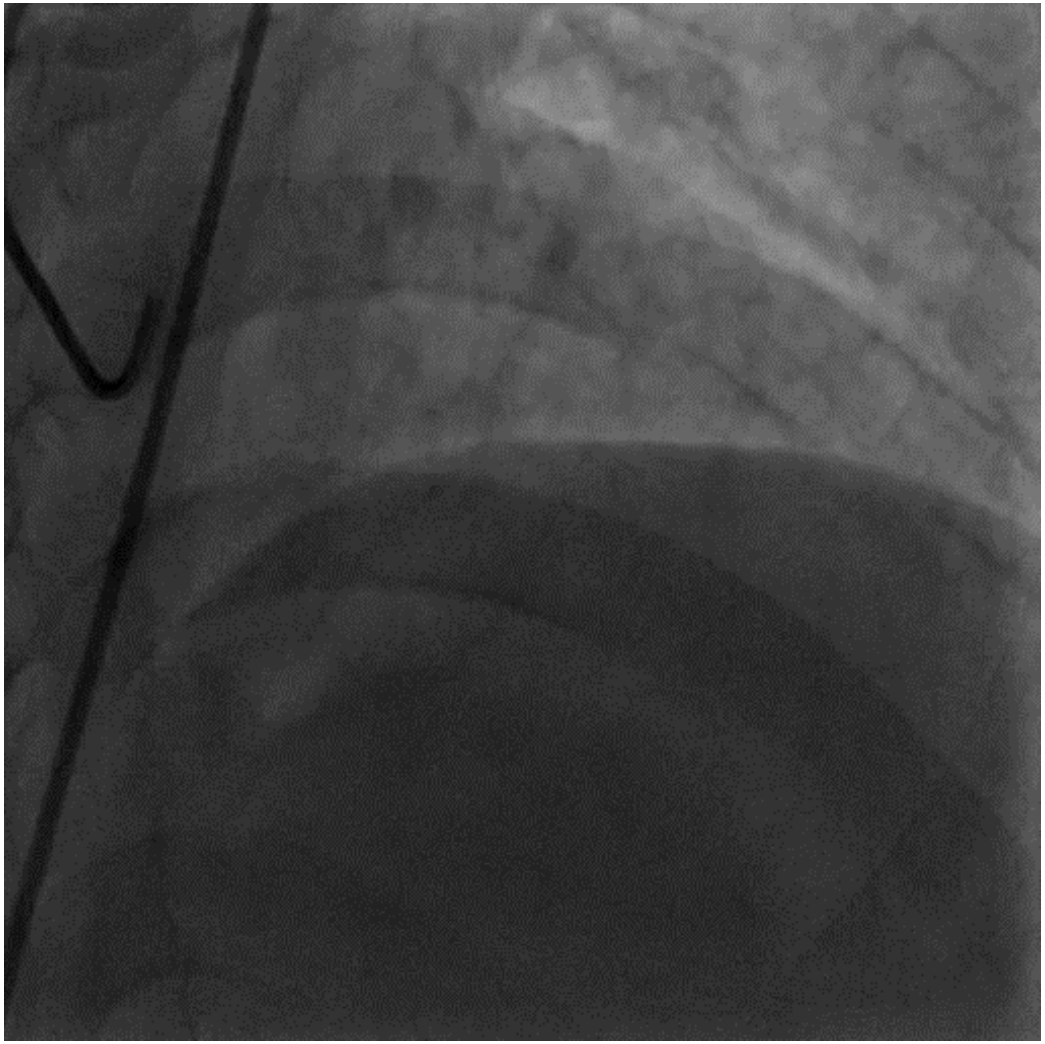
Case 10

- 48 yr/o female
- NSTEMI



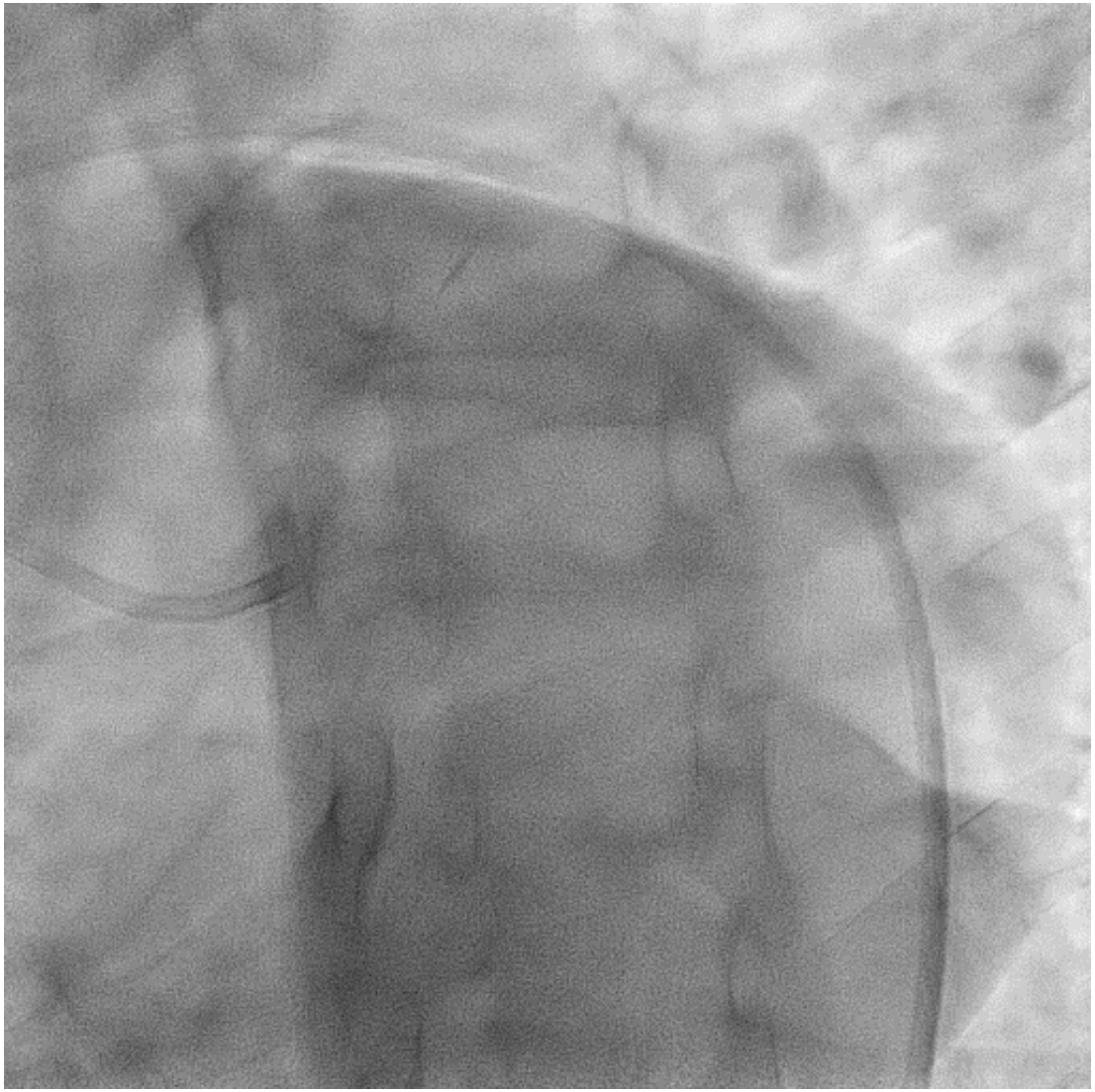


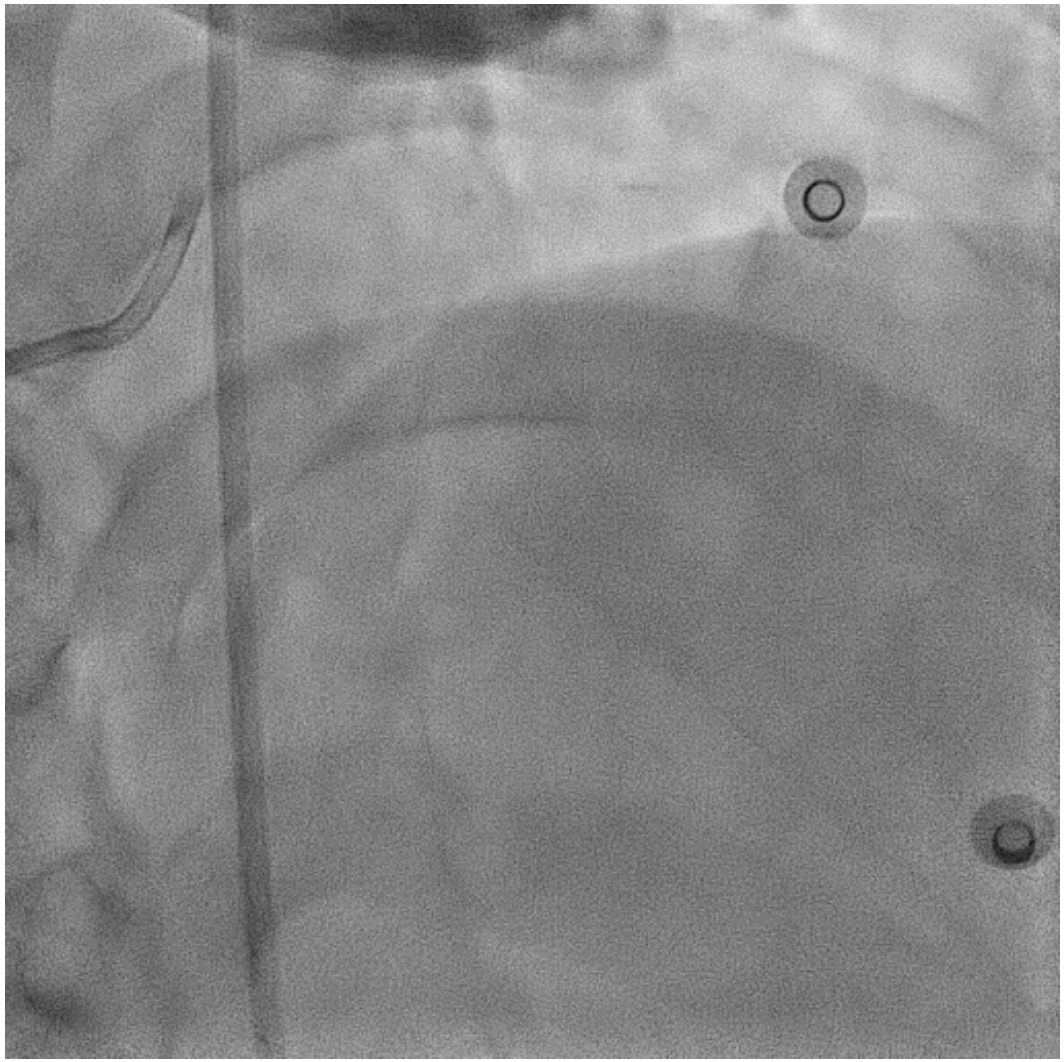


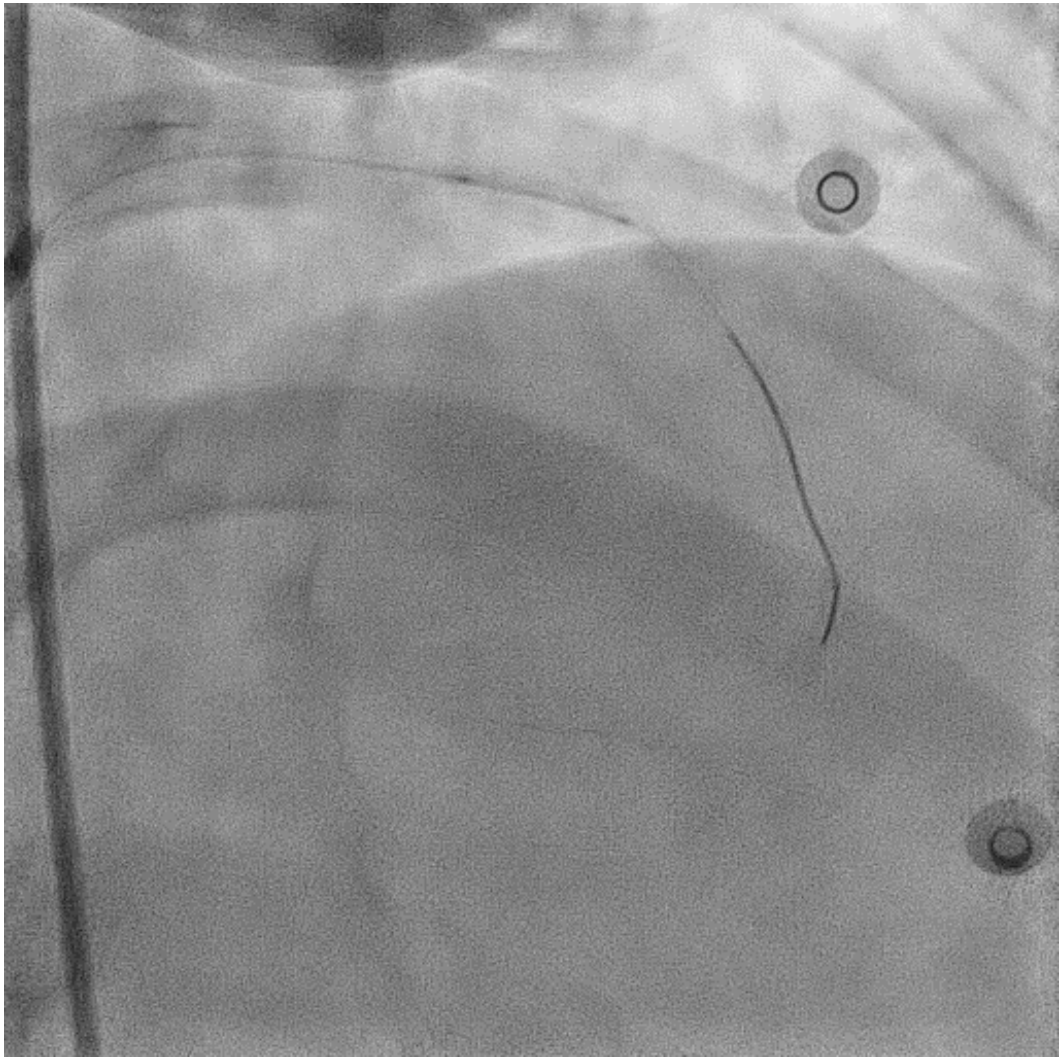


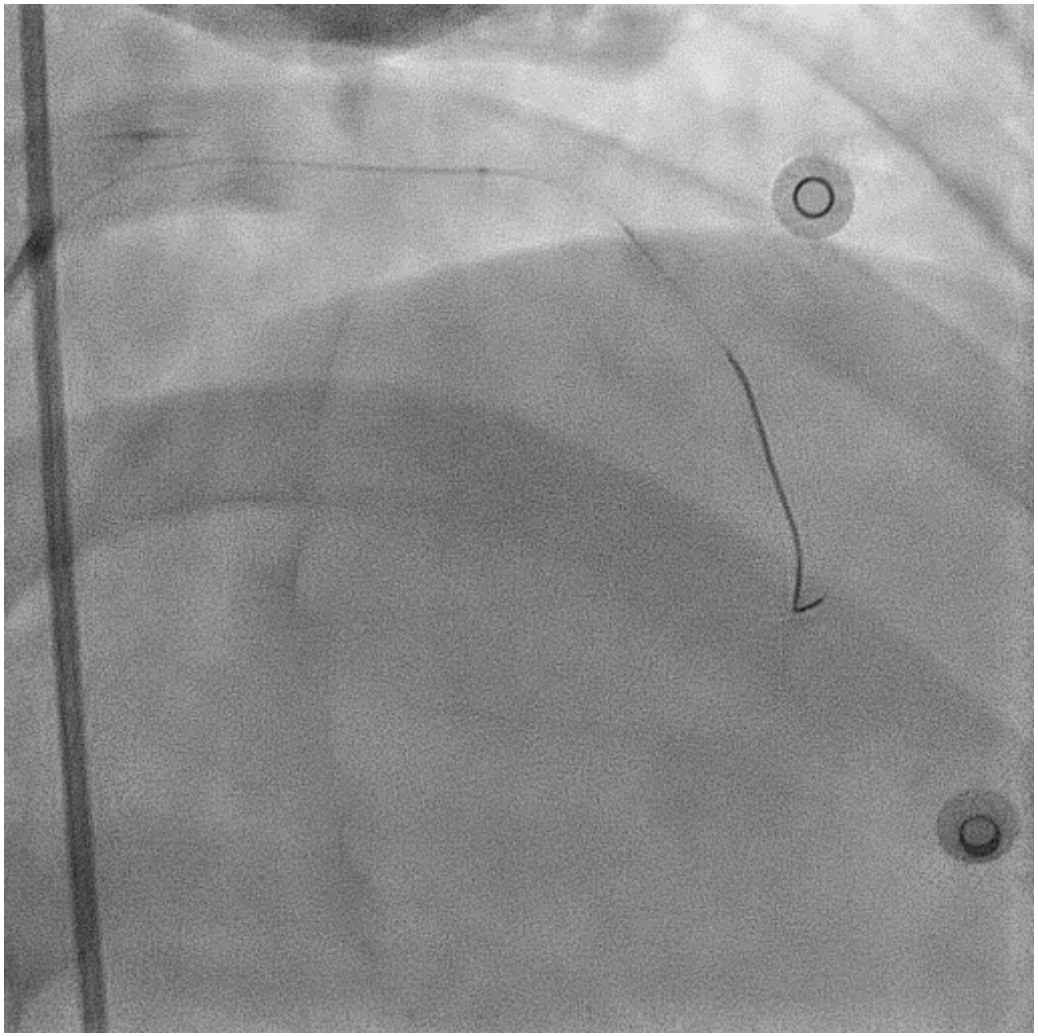
On second day of admission:

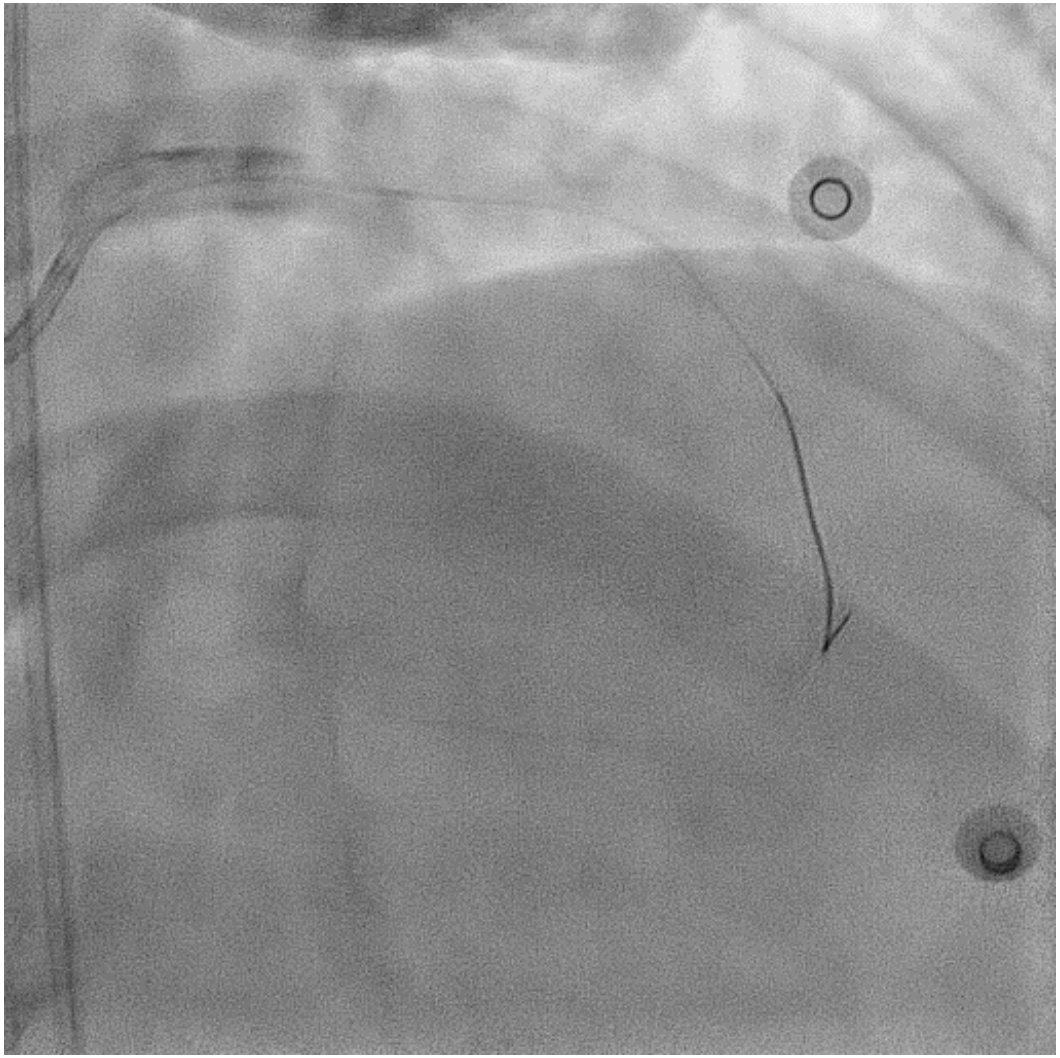
- Acute CP and anterior ST elevation

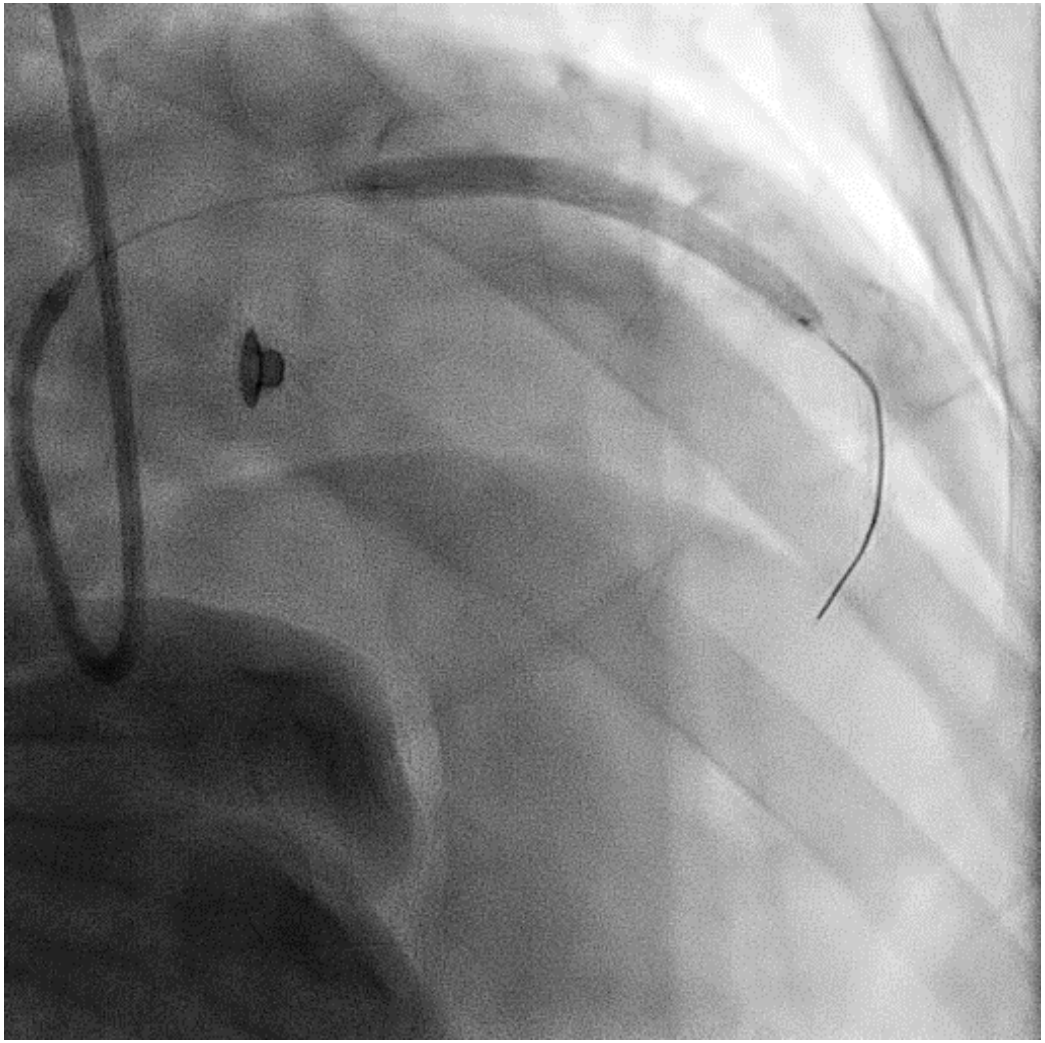


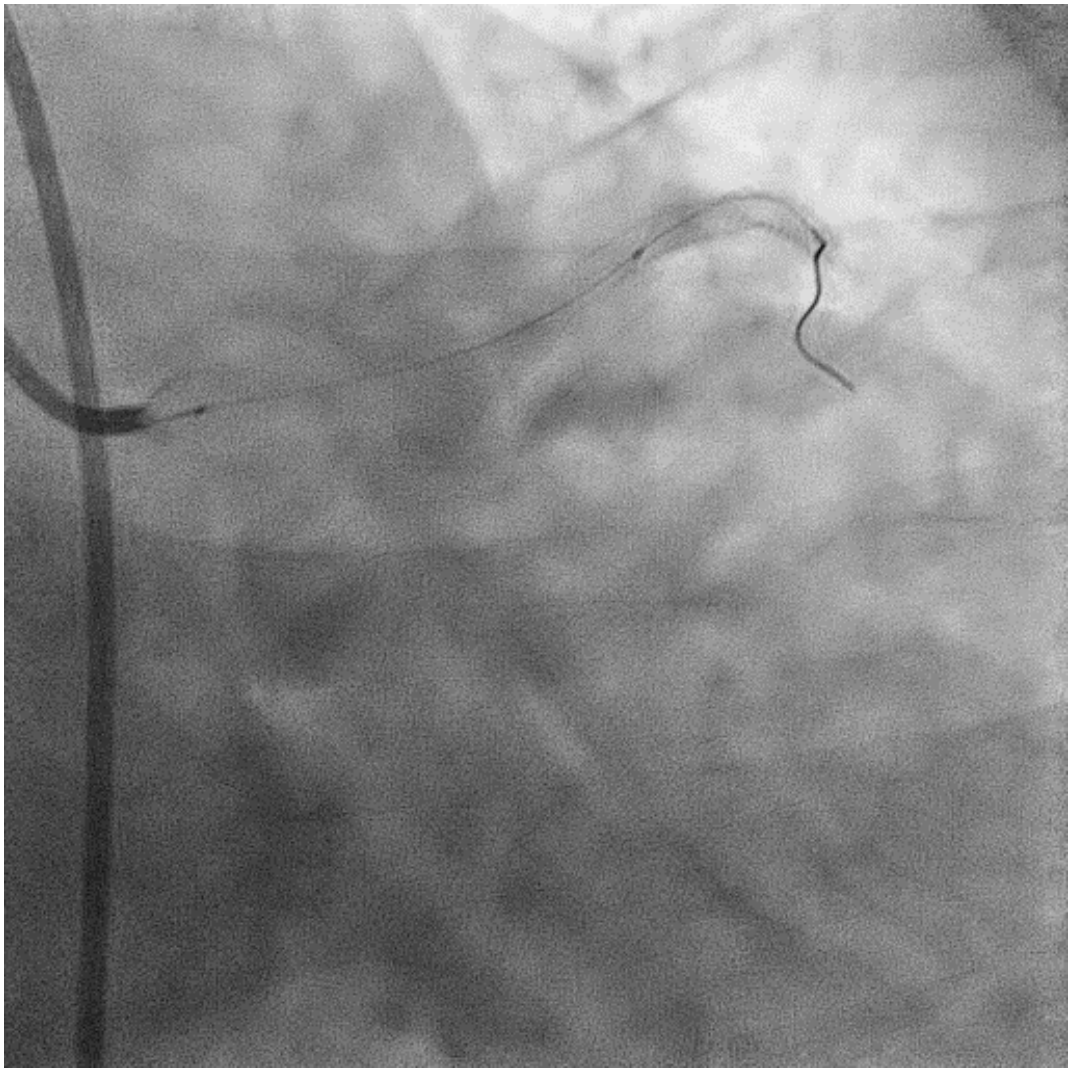


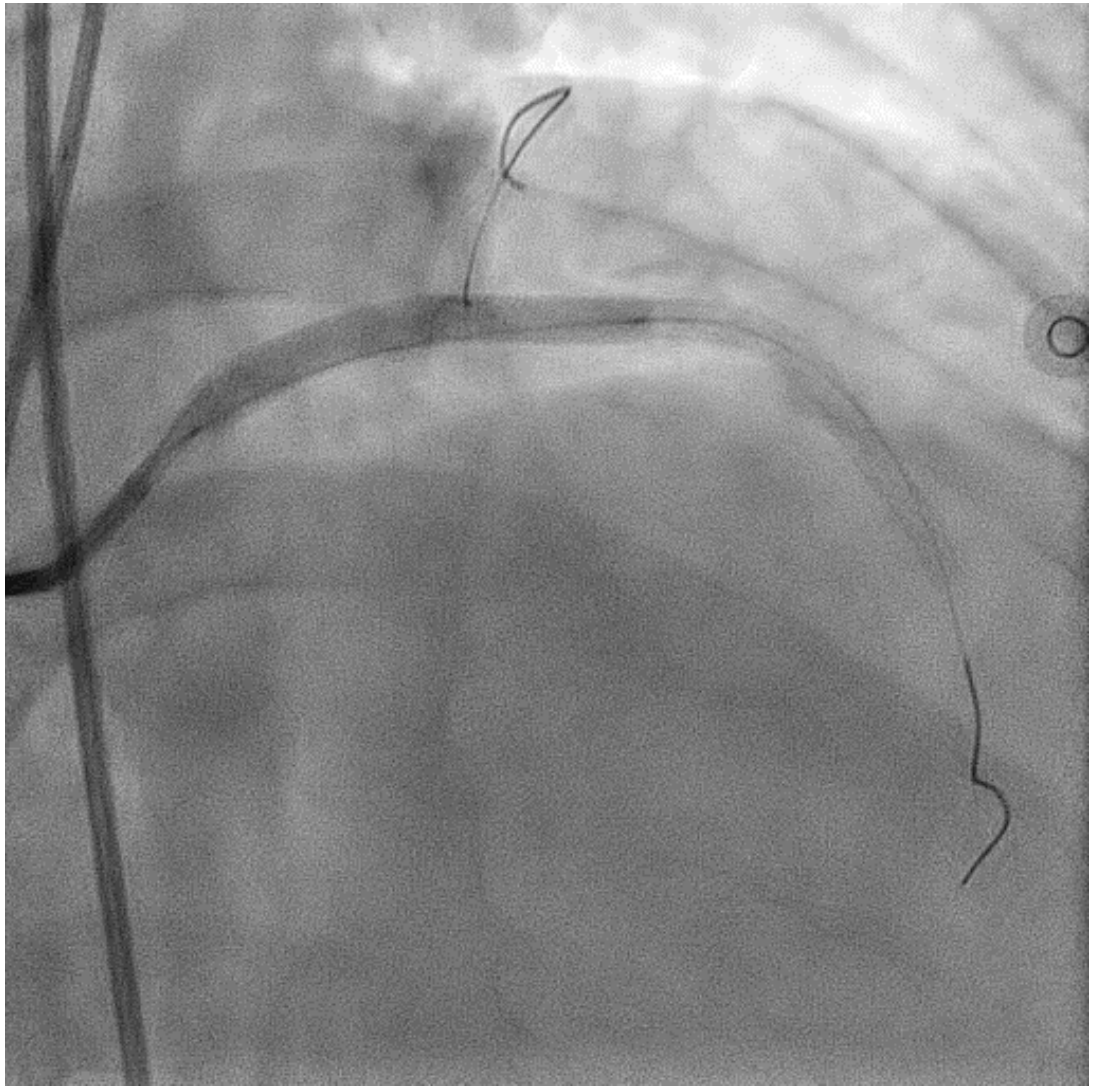


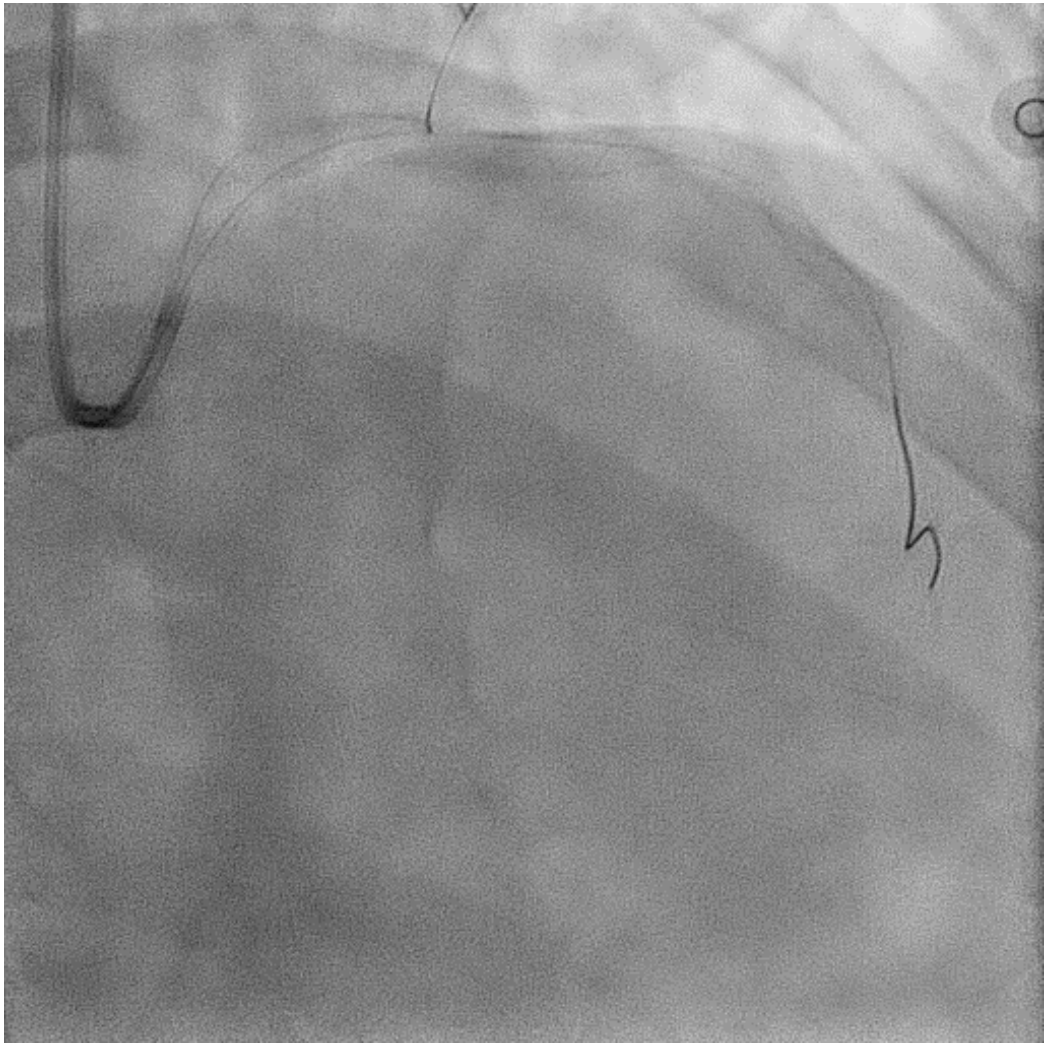


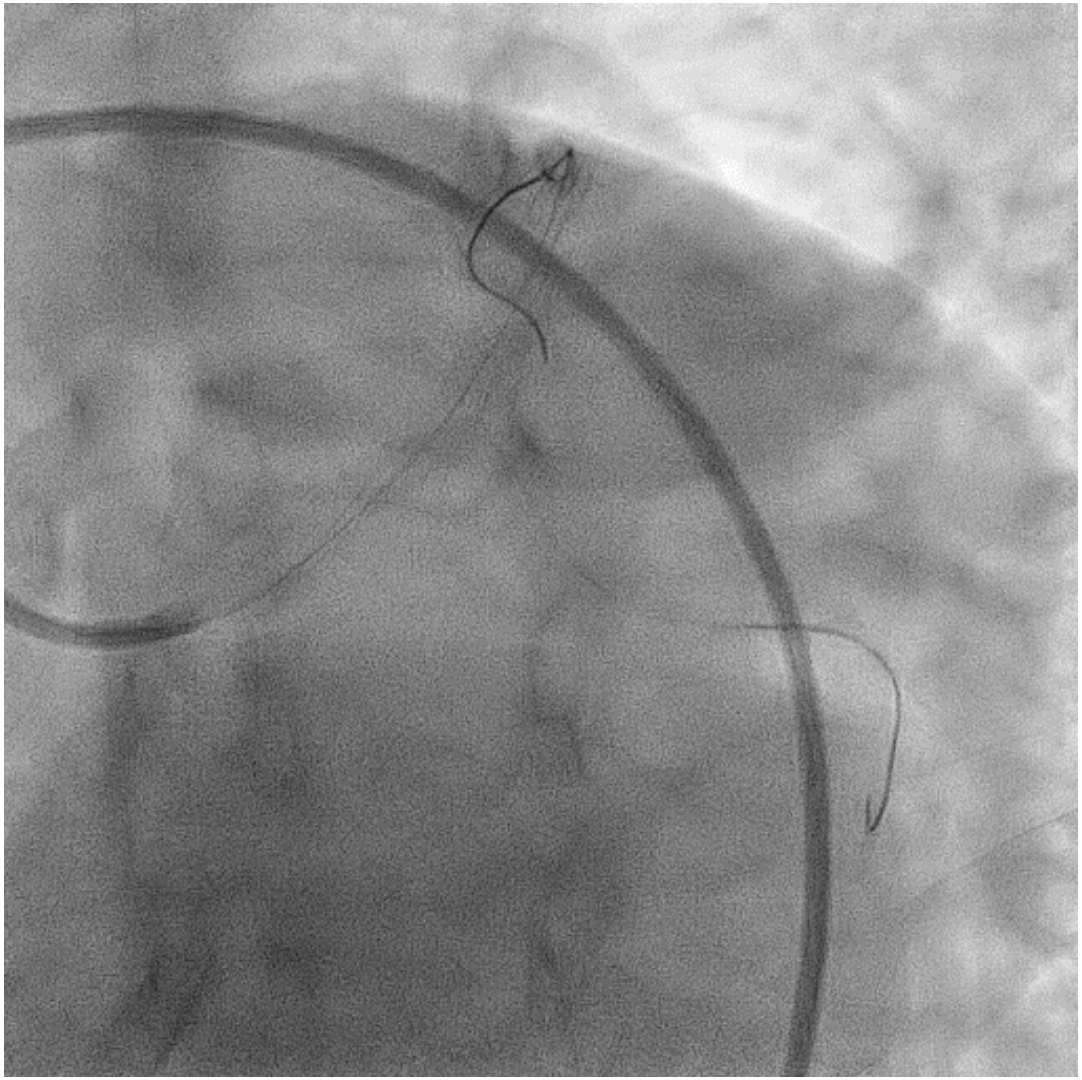






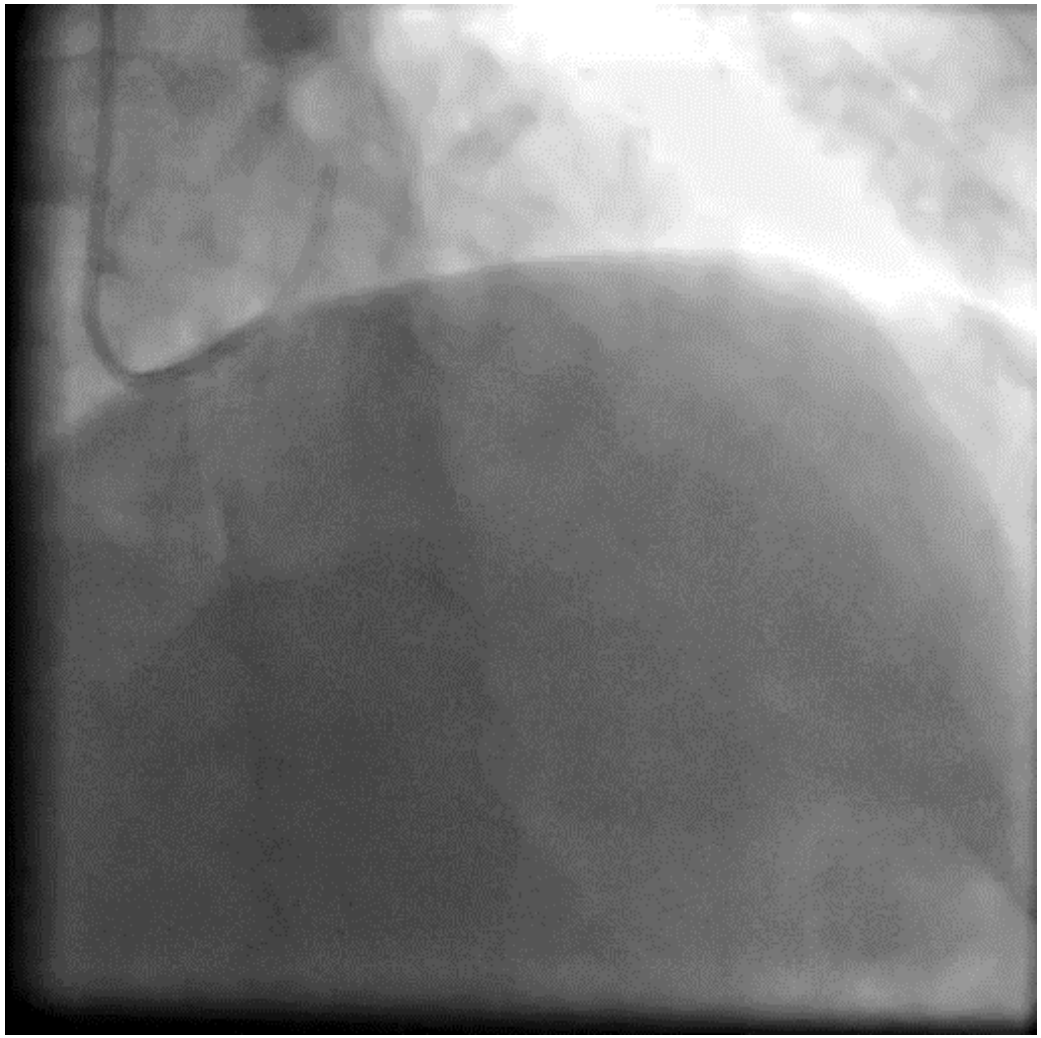


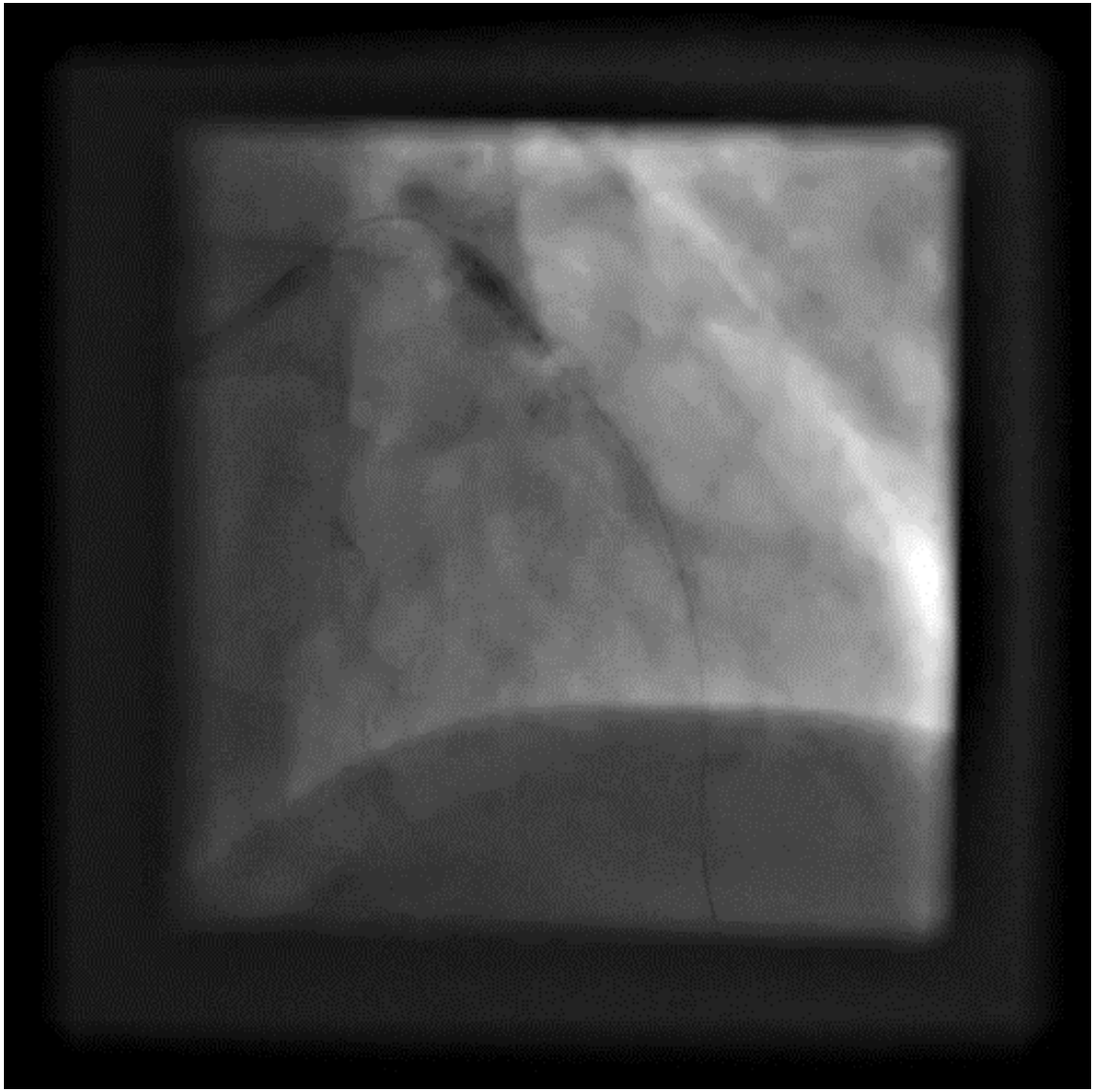


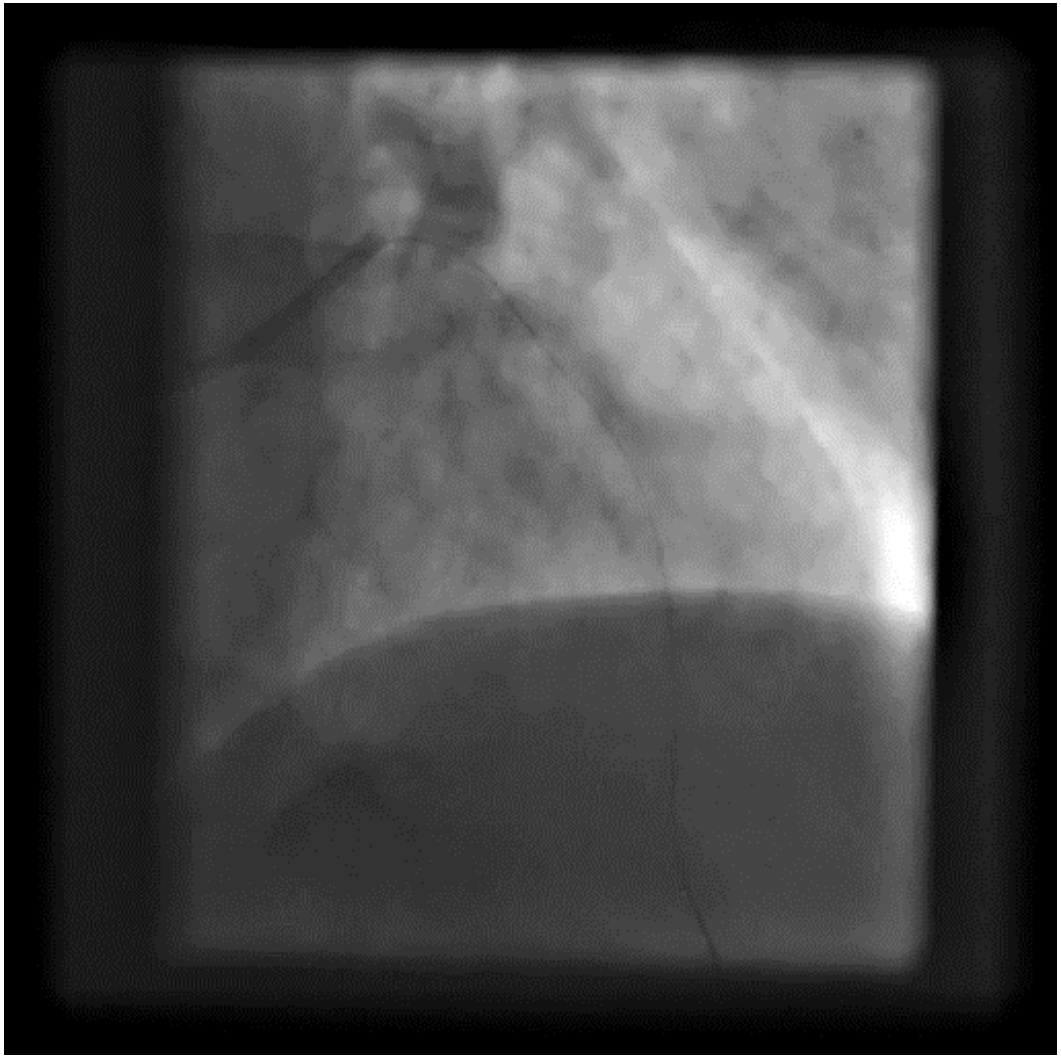


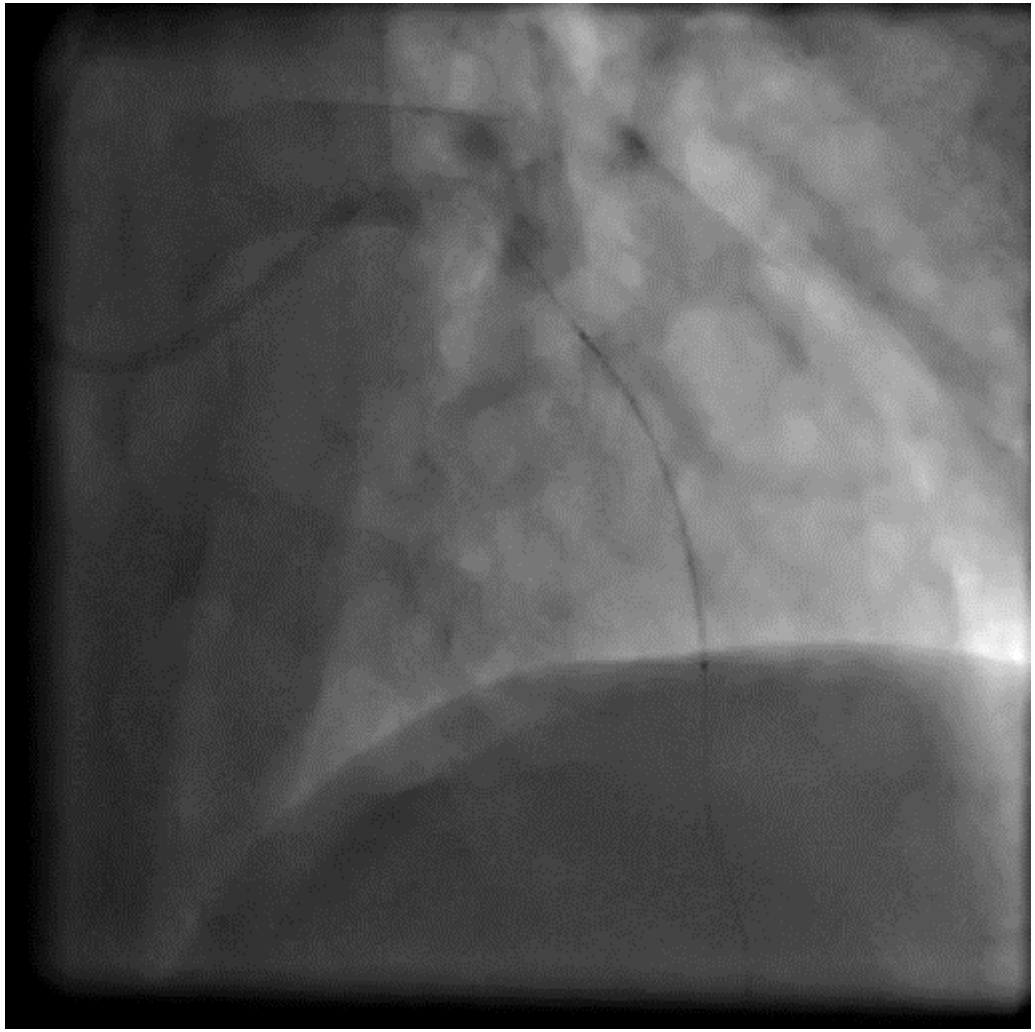
Case 11

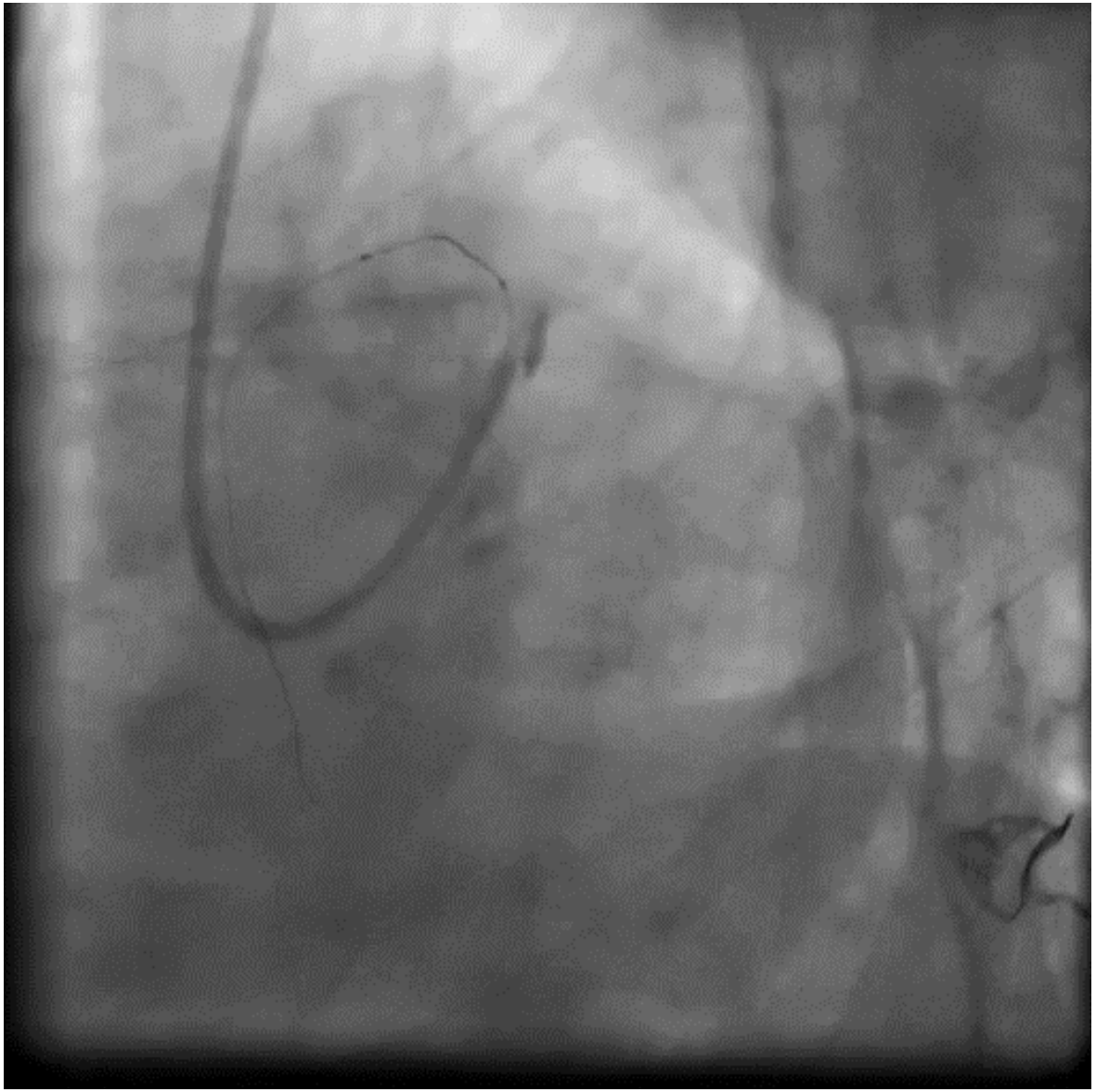
- A 42 -year-old man presented with some episode of at rest chest pain and after routine physical activity.
- Recent car accident
- Heavy smoker

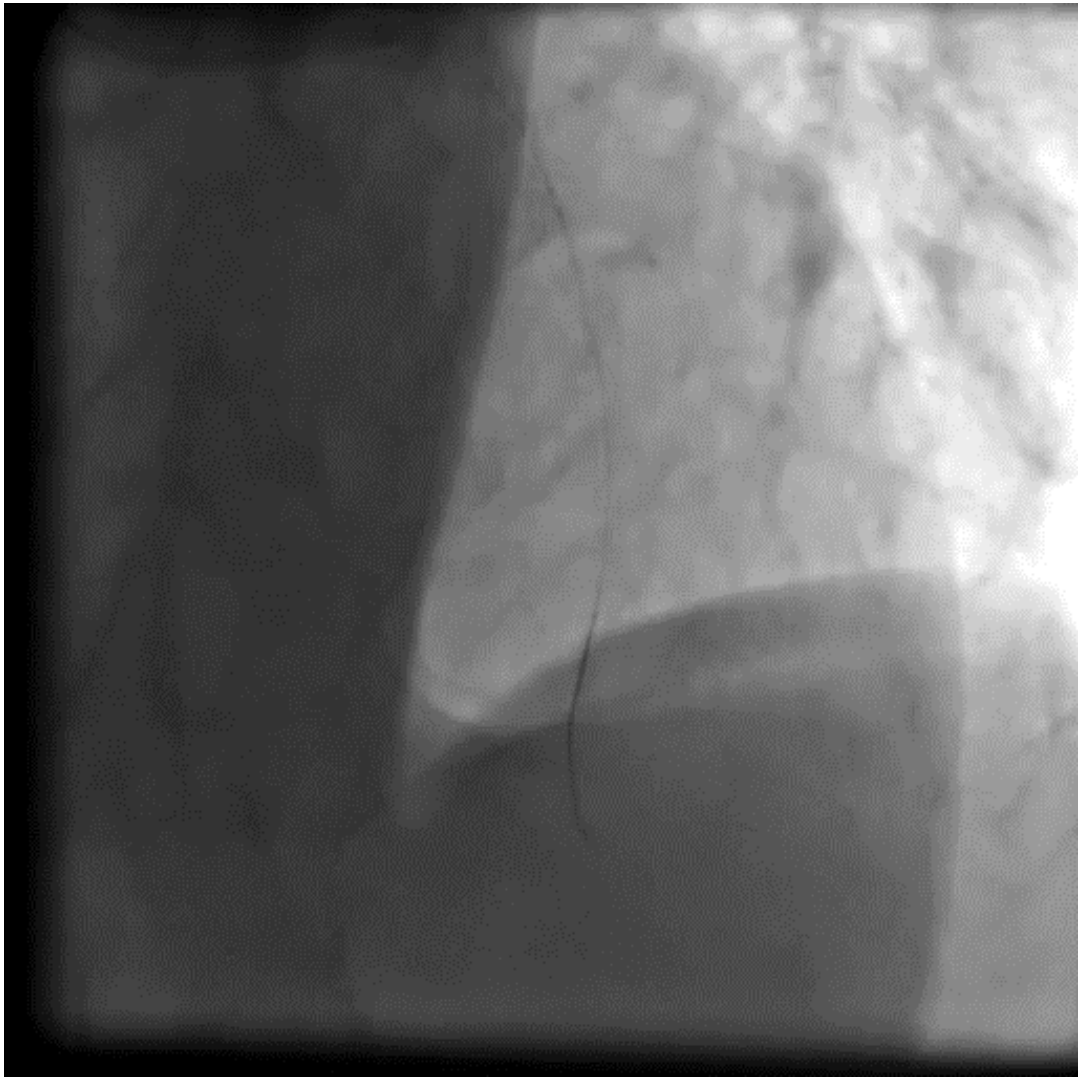












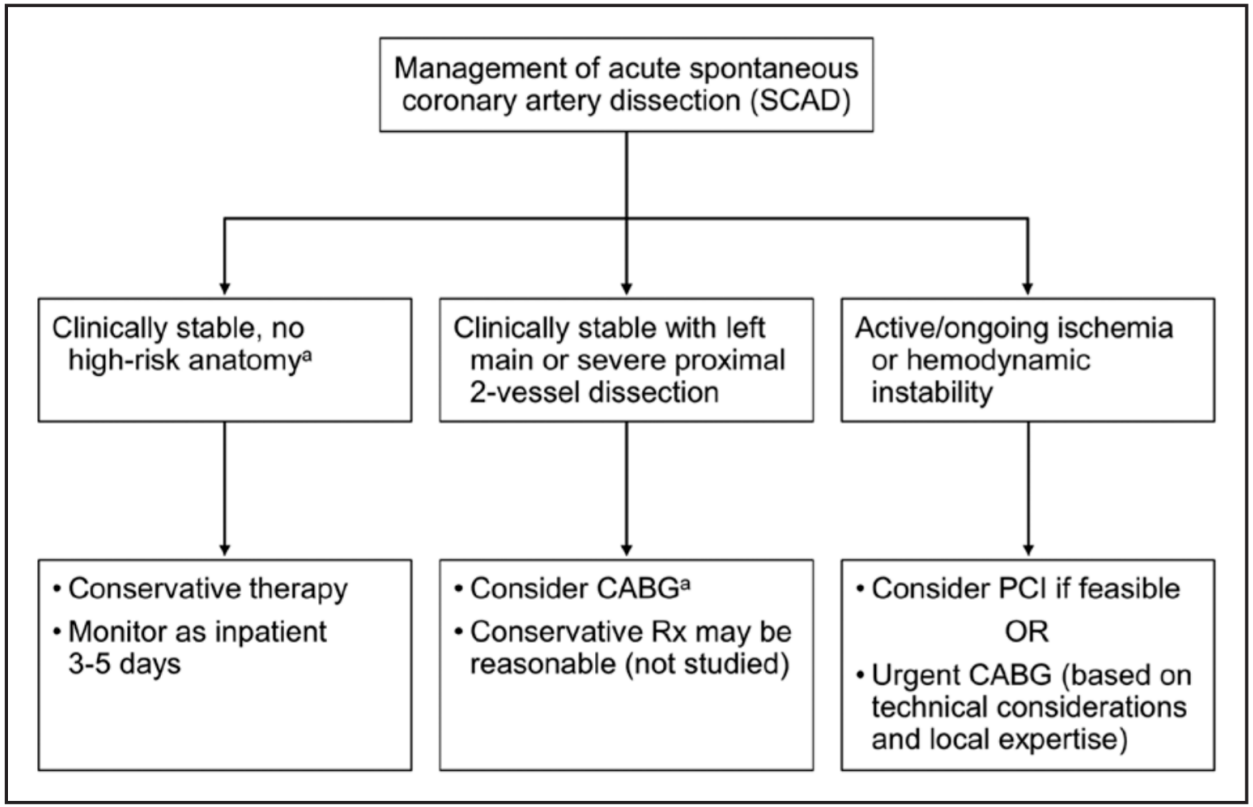


Figure 8. Algorithm for management of acute spontaneous coronary artery dissection.
CABG indicates coronary artery bypass grafting; PCI, percutaneous coronary intervention; and Rx, management. [a]Left main or proximal 2-vessel coronary artery dissection.

Conservative strategy

- no angiographic or clinical predictors of acute worsening have been identified.
- inpatient monitoring for an extended period is typically recommended as part of a conservative strategy for SCAD management.
- Conservative therapy may not be appropriate in high risk patients:
  - ongoing ischemia,
  - left main artery dissection,
  - hemodynamic instability.

Duration of hospitalization

- A prolonged period of in-hospital monitoring (**3–5 days**) is justified as part of a conservative strategy to observe for a small but important (5%–10%) early hazard of dissection extension or new recurrent SCAD.
- If clinical **worsening** occurs despite conservative management (worsening of symptoms together with evidence of ischemia by electrocardiography or significant arrhythmia), **repeat angiography** should be performed and emergency revascularization undertaken to relieve ischemia if feasible.
- Chest pain does not necessarily imply active myocardial ischemia.
  - Chest pain may be a manifestation of vessel wall dissection itself.
  - chest pain alone should not be an indication to pursue emergency revascularization, especially if there is no evidence of ischemia or if the vessel flow is normal.

PCI

- increased risk of complications (53% in mayo clinic study)
- extensions of dissection
  - to the distal arterial segments
  - retrograde dissection into proximal arteries and adjacent branches, including the left main coronary artery.
    - complete PCI may require long coronary stents, which can increase the risk of subsequent in-stent restenosis and stent thrombosis.
- SCAD most frequently affects the distal coronary segments, which may be too small or too distal for stent implantation
- IMH naturally resorbs over time, which can result in subacute and late stent strut malapposition, potentially predisposing to future risk of stent thrombosis.

Optimizing PCI Approaches

- avoidance of
  - deep catheter engagement
  - noncoaxial positioning of catheter tip
  - catheter dampening
  - strong contrast agent injection
- **femoral** access is preferred:
  - a 3-fold higher risk for catheter-induced iatrogenic dissection
- implantation of **long** drug-eluting stents covering in excess of 5 to 10 mm on both proximal and distal edges of the
- **direct stenting** without balloon predilation to avoid additional risks of extension of the IMH
- **balloon angioplasty** alone to restore coronary flow without stenting
- **cutting balloon** fenestration of the IMH to allow decompression of the false lumen blood pool into the true lumen with or without additional stenting (with an undersized balloon
- **multistent** approach by sealing distal and proximal ends first with stents, before stenting the middle, to minimize IMH propagation
- use of **bioresorbable stents** to provide a temporary scaffold because complete resorption of struts occurs within 2 years.

Coronary Artery Bypass Grafting

- a treatment strategy for SCAD :
  - with left main stem or proximal dissections
  - after technical failure of attempted PCI
  - when there is a complication of attempted PCI
  - when ischemia is refractory despite attempted conservative therapy.
- high rate of both venous and arterial conduit failure
  - 11 of 16 graft failures from 11 of 20 patients undergoing follow-up angiography.
  - the result of subsequent healing of native SCAD vessels and competitive flow promoting graft occlusion.
- CABG was not protective against recurrent SCAD events.
- The use of vein grafts may be considered in light of frequent late graft failure and the opportunity to preserve arterial conduits for the future.

- observational data have indicated angiographic “healing” of SCAD lesions in the majority of patients **(70%–97%)**
- Healing : one month
  - Time dependant…
- A minority had persistent dissection on angiography:
  - Unclear reason (very late healing?)

Medical treatment

- alleviate symptoms
- improve short- and long-term outcomes
- prevent recurrent SCAD.

heparin	• benefit by reducing thrombus • risk of bleeding into the IMH or extension of dissection • discontinuation is appropriate once SCAD is diagnosed.
glycoprotein IIb/IIIa inhibitors	• no data to guide the use of
DAPT	• PCI: as guideline • Conservative: increased bleeding risk and no evidence of benefit? 1. at least 1 year after SCAD, regardless of initial management strategy, along with lifelong aspirin use. 2. no or limited use (1–3 months) followed by longer-term aspirin therapy.
ASA	• lifelong

ß-Adrenergic Blockers	• in patients with SCAD who have LV dysfunction or arrhythmias and for management of hypertension. • the use of β-blockers was associated with a hazard ratio of 0.36 for recurrent SCAD in multivariable analysis, a finding strengthening the practice of β-blocker administration after SCAD.
ACEI / ARB	• LV systolic dysfunction • concomitant hypertension.
Statins	• no association between statin use and recurrent SCAD. • not recommended routinely after SCAD • guideline-based indications for primary prevention of atherosclerosis and for the management of patients with established concomitant atherosclerotic disease or diabetes mellitus
Antianginal Therapy	• not a role for the routine use of antianginal therapy for either the index SCAD hospitalization or long term • Chest discomfort is common in outpatients after SCAD, and for patients who are not candidates for revascularization or who have evidence suggesting coronary vasospasm or coronary microvascular dysfunction, relief of ischemia and symptoms may be achieved with nitrates,calcium channel blockers, or ranolazine

pregnancy-associated SCAD

- third trimester or early postpartum period
  - although SCAD has been reported as early as 5 weeks of gestation and up to several months to a year or more postpartum, particularly in women who are still lactating
- have a poorer prognosis than women with SCAD unrelated to pregnancy.
- Patients with pregnancy-associated SCAD:
  - Younger
  - more likely to present with ST-segment– elevation MI (50% versus 36%; P=0.013) and left main and multivessel dissections
  - had poorer LV function immediately and at follow-up
  - less likely to have concurrent FMD.

PREGNANCY-ASSOCIATED SCAD: DIAGNOSIS AND SHORT-TERM MANAGEMENT

- The majority of pregnancy-associated SCADs occur in the first 4 weeks after delivery but SCAD has been reported during virtually all stages of pregnancy.
- Management is largely the same…
  - Careful angiography
  - Conservative management unless:
    - Ongoing ischemia
    - Hemodynamic instability
    - High risk anatomy

EVALUATION AND MANAGEMENT OF CHEST PAIN SYNDROMES AFTER SCAD

- the collective experience suggests that chest pain is extremely common after SCAD, occurring in more than **half** of outpatients.
- The differential diagnosis for patients who have chest pain syndrome after SCAD is similar to that in patients after ACS, with the additional consideration of extension or recurrent coronary dissection.
- If patients have more classic exertional symptoms, then diagnostic testing such as an exercise treadmill test, stress echocardiography, or perfusion imaging can be performed.
- Frequently after SCAD, patients experience **nitrate responsive chest pain**, often at rest or with mental stress, but have no inducible ischemia with even high levels of exercise.
- Premenopausal women may report chest pain at variable but predictable times of their menstrual cycle.
- The frequency and severity of chest pain have been observed to decrease over time, a result that may reflect vessel healing or resolution of stress, anxiety, and depression.

DIAGNOSIS OF SCAD-ASSOCIATED EXTRACORONARY ARTERIOPATHIES

- complete vascular physical examination with palpation and auscultation of the abdominal aorta, cervical carotid arteries, and peripheral arteries of the upper and lower extremities.
- A diminished pulse, side-to-side asymmetry, or bruit may be indicative of stenotic or dissected arteries, and widened or bounding pulse may be indicative of aneurysmal disease.
- the most commonly involved vascular beds:
  - are the renal arteries (79.7%)
  - extracranial carotid arteries (74.3%).
  - intracranial aneurysm in 14% to 23%.
- vascular imaging from the brain to pelvis should be considered in all patients, similar to current practice for FMD.

Recurrence

- At an intermediate-term follow-up of 2 to 3 years, major adverse cardiac events were reported in 10% to 30% of cases, mostly caused by recurrent MI from recurrent SCAD, reported in 15% to 22% of patients.
- In the Mayo Clinic series, SCAD recurred in **17%** of patients (15 of 87) at a median time to the second episode of 2.8 years, and the 10-year Kaplan-Meier–estimated risk of recurrence was **29.4%**
- only **severe coronary tortuosity** has been identified as a risk factor for recurrence.
- Coronary tortuosity was also shown to be a coronary manifestation of FMD

SOME CASE FROM:

- Tehran Heart Center SCAD registery.
- Imam Khomeini hospital complex.
- Dr Fateme Baharvand (interventional cardiologist)
- Dr Farshad sadri (interventional cardiologist)


YJC / Faezeh Kaboli