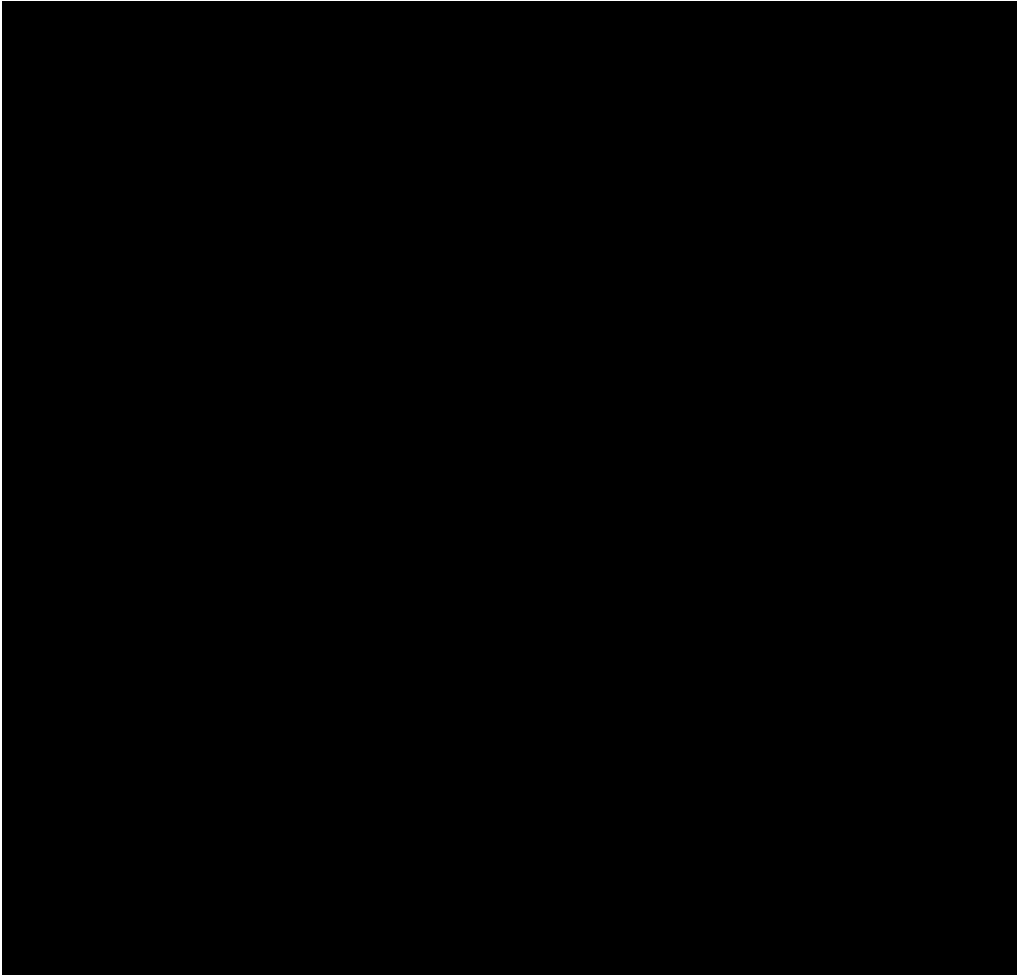


Coronary Angiogram and Angioplasty

How, When and Why?



Dr.Sudhakar Sarker
MBBS,MD-Cardiology
Fellow of ESC,SCAI,APSIC
Associate Professor (CC)
Green Life Medical College

First Cardiac Catheterization (1929)

Dr. Werner Forssmann (1904–1979) was a **German physician** who won the **1956 Nobel Prize** for inventing and developing [cardiac catheterization](#). He is most **famous** for performing a daring, unauthorized **self-experiment in 1929** where he inserted a catheter directly into his own heart. This revolutionary act laid the foundation for modern interventional cardiology, which now saves millions of lives daily through procedures like angiograms, stenting, and angioplasty



First Coronary Angiogram (1958)

The first selective coronary angiography was performed **unintentionally** by pioneer **American cardiologist** known as **Frank Mason Sones Jr.** on October 30, 1958 at the Cleveland Clinic. This accident occurred when a catheter intended for an **aortic injection** slipped into the **right coronary artery**, delivering contrast media directly to it and providing the first visualization of a coronary artery in a **26-year-old patient with rheumatic heart disease**.



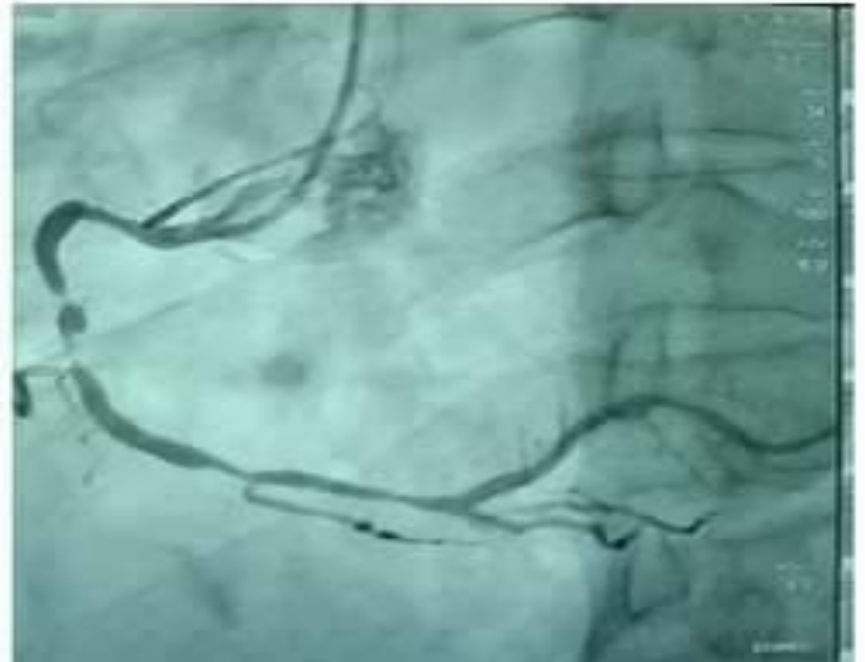
First Coronary Stenting (1986)

The world's first human coronary stenting was performed in **1986** by **French cardiologist Jacques Puel** in Toulouse, France, followed closely by **Swiss cardiologist Ulrich Sigwart** in Lausanne, Switzerland



Coronary Angiogram (CAG)

Coronary angiogram (CAG) is a procedure that uses a special dye (**contrast material**) and **X-Ray** to see how contrast material filled blood flows through the coronary arteries.

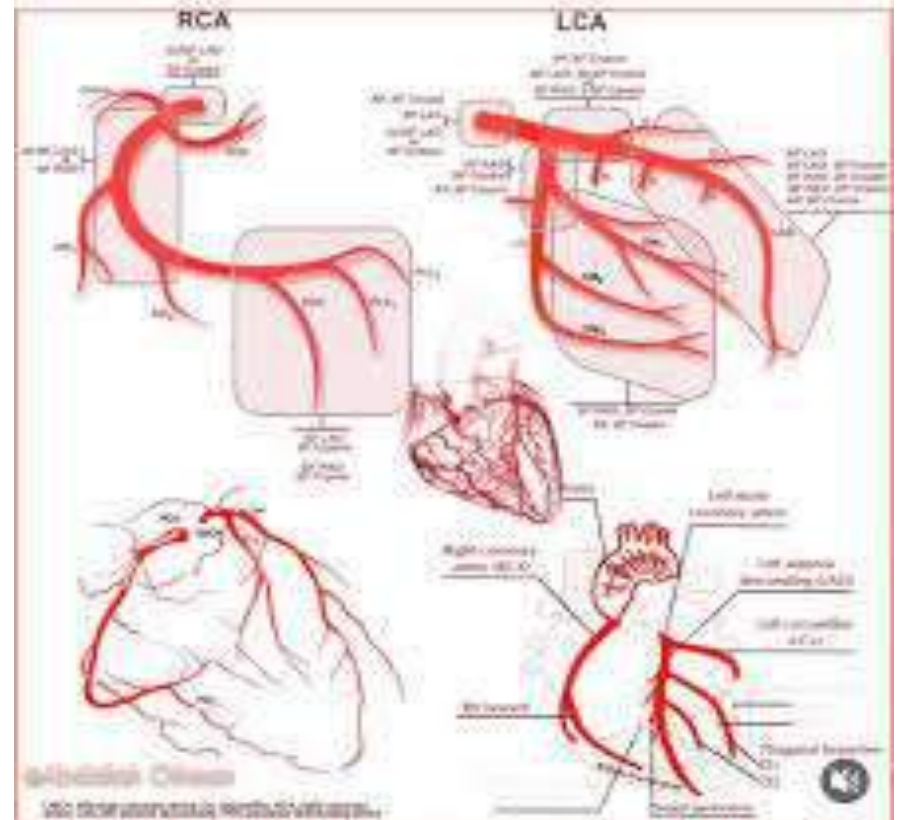
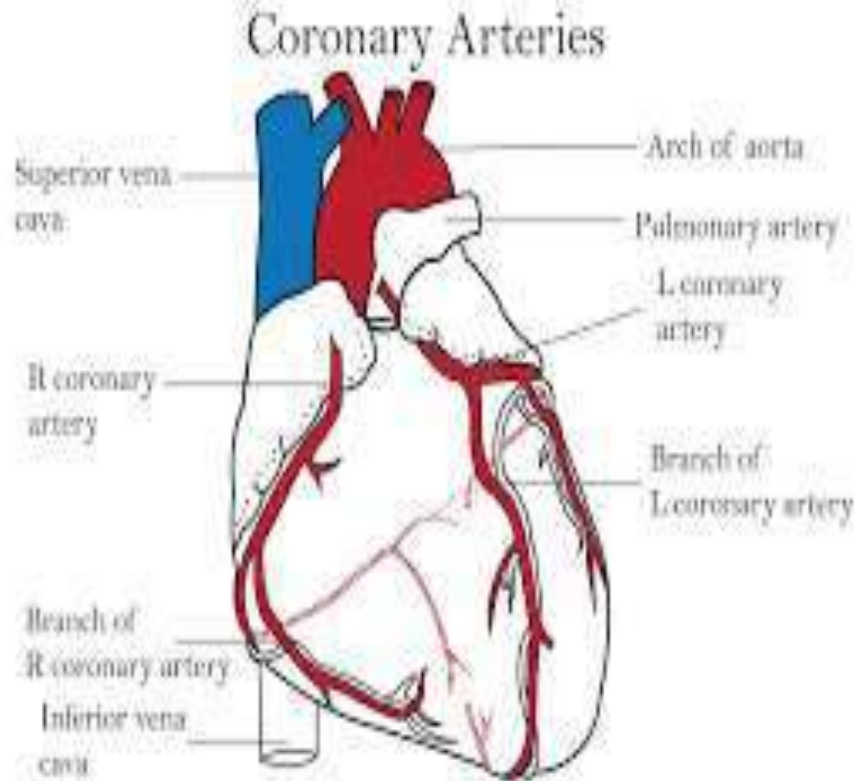


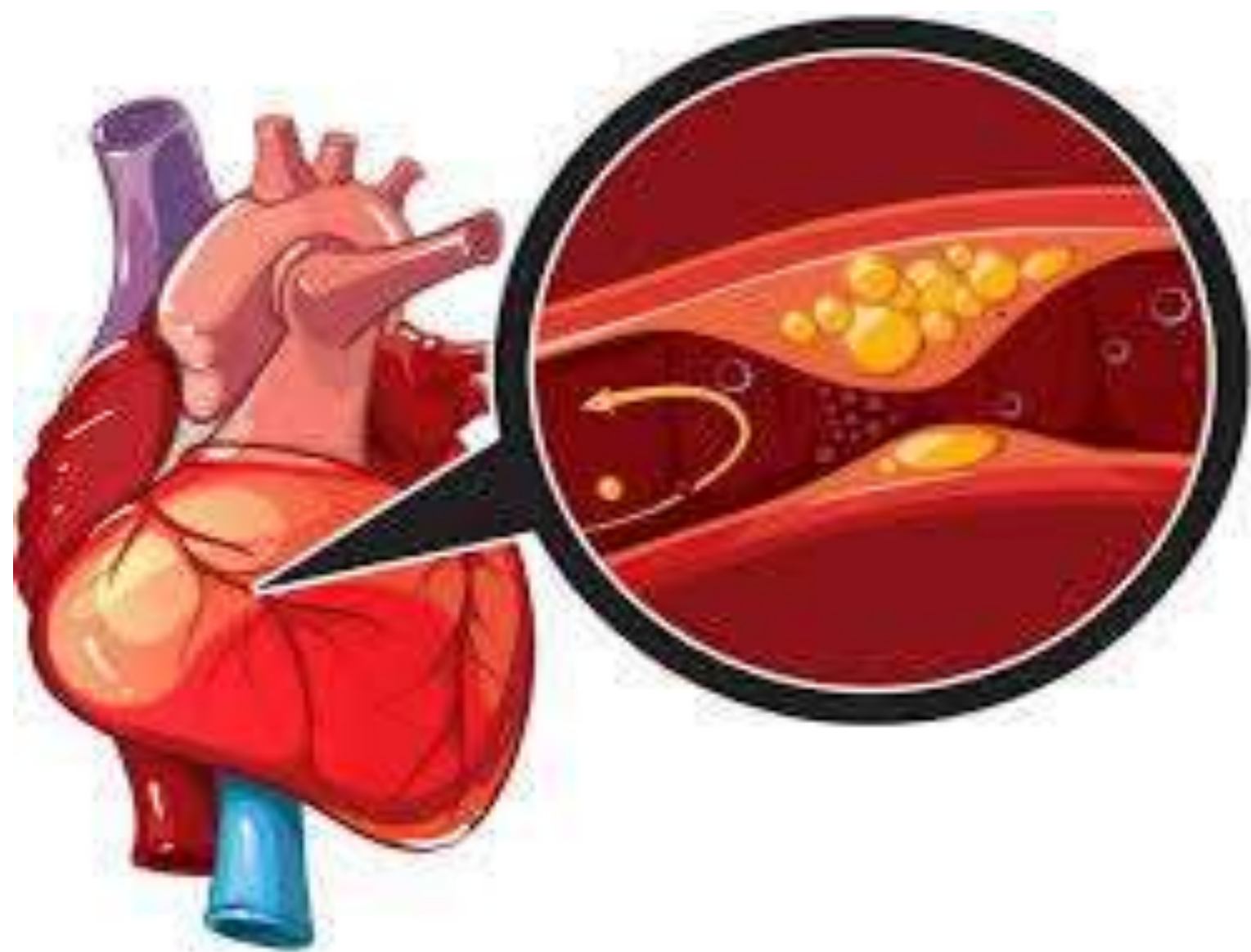
Importance of CAG

- CAG is the “Gold standard” investigation for evaluation of coronary artery disease (CAD)
- Used to identify the exact location and severity of CAD
- To plan next step of management
(Only medications / PCI /CABG)



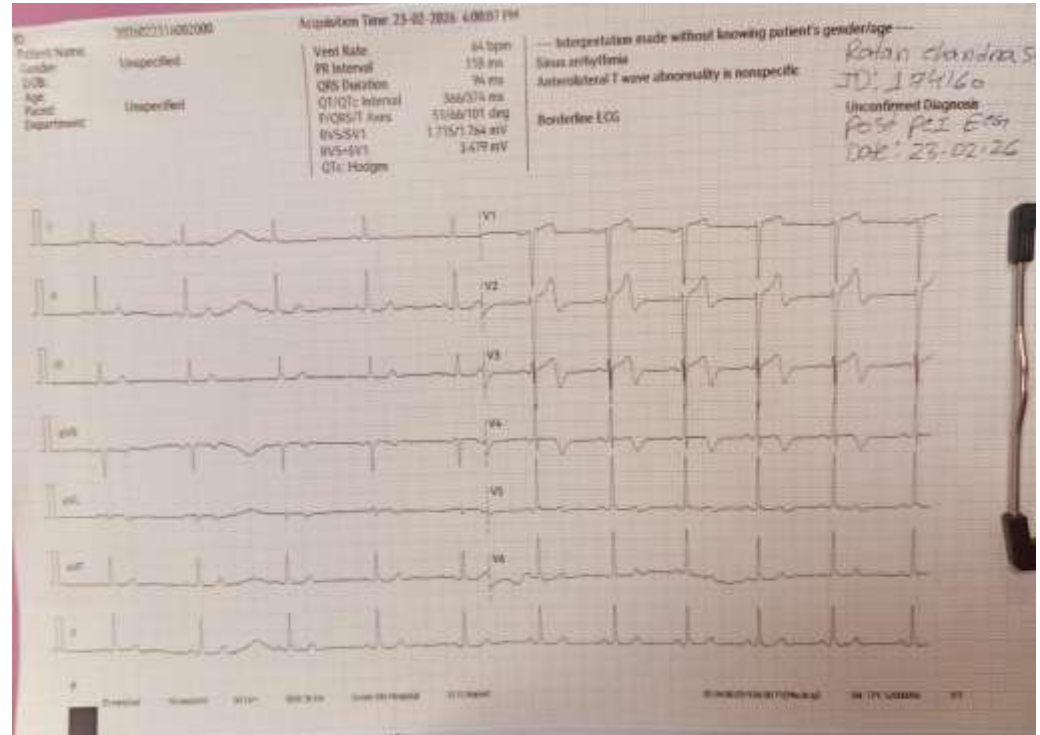
Coronary anatomy





Common investigations to assess IHD

- ECG
- Echocardiogram
- ETT
- CT-Coronary angiogram
- Conventional coronary angiogram (**Gold standard**)



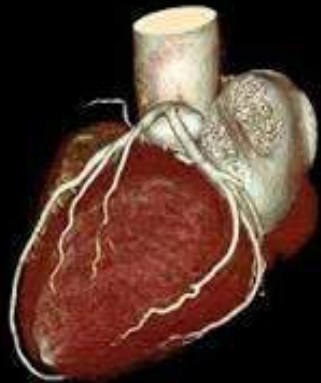
CT coronary angiogram

- **Preparation:** IV line inserted by a **nurse**. Heart rate should be around 60/min.
- **Dye Injection:** An **iodine-based contrast dye** is injected through the IV line.
- **CT Scan:** **Technologist** will capture 3D pictures of coronary arteries. Requires only 10-15 seconds.
- **Reporting:** Done by **Radiologist** later-on

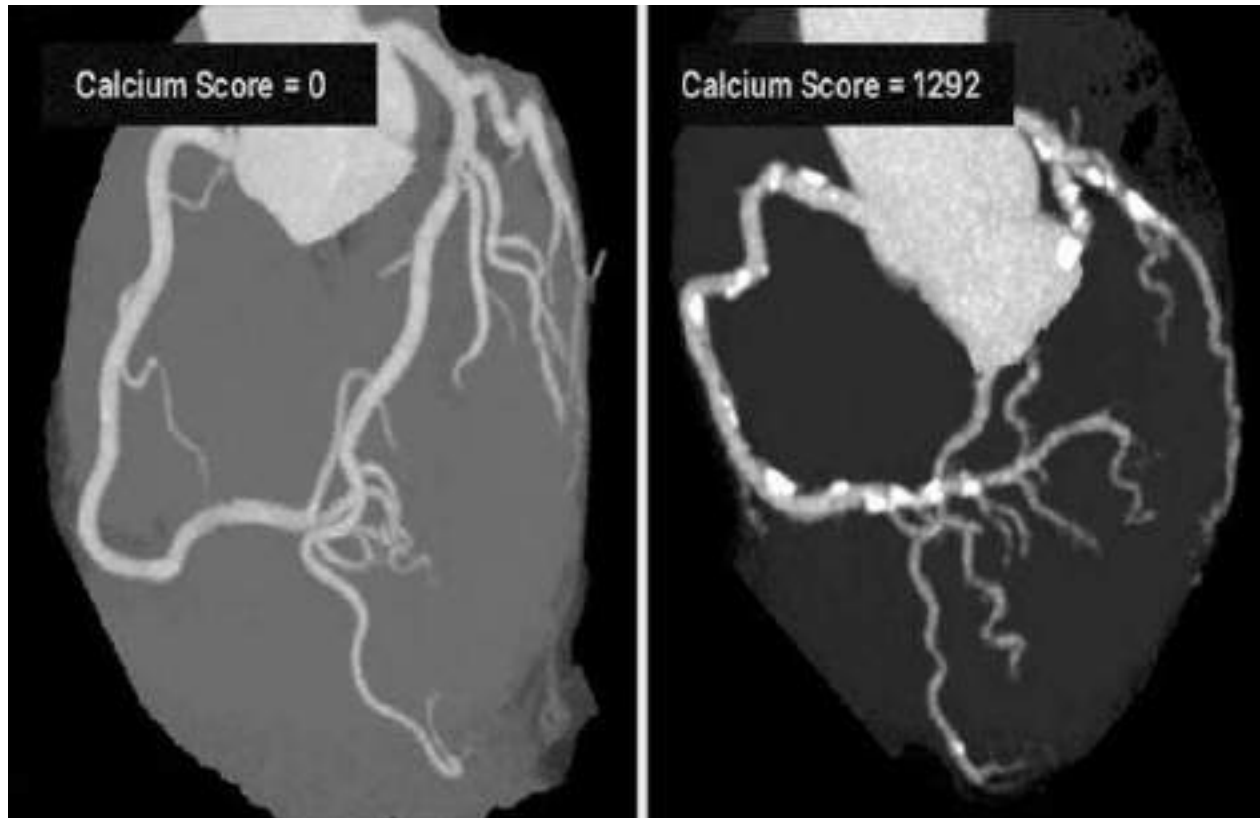
CT CORONARY ANGIOGRAM



KUALA LUMPUR PRIVATE HOSPITAL
KUALA LUMPUR SPECIALIST HOSPITAL



Calcium score



Risk of Major Adverse Coronary Events (MACE) by CACS Agatston Scale

0	No identified calcium deposits
1-99	Mild calcium deposits, low risk
100-399	Moderate calcium deposits, moderate risk
400-999	Severe calcium deposits, high risk
> 1000	25% chance of myocardial infarction within one year

CT CAG vs Conventional CAG

	CT Coronary Angiography	Conventional Coronary Angiography
Invasive	No	Yes
Attendance time	1 – 2 hours	Minimum 5 – 7 hours
Diagnostic Use	Rules out significant coronary artery disease	Accurately shows severity of artery narrowings
Vessel Wall Narrowing	Shows vessel wall as well as the inside of the artery	Focuses on the inside of the artery
Intervention	Stenting treatment of narrowings not able to be done with this technology.	Stenting treatment of narrowings can be done
Contrast dye	Yes	Yes
X-ray used	Yes	Yes

Indications

- Acute MI
- Unstable angina
- Chronic stable angina on medications
- Patients with risk factors with **Positive stress test**
- Chronic heart failure/ Unexplained LV dysfunction
- Cardiac arrest surviveour
- Post CABG with ischemic symptoms
- Structural heart disease waiting for surgery (Age >40 years)
- To assess perioperative cardiac risk before non cardiac surgery

Contraindications

- Coagulopathy
- Active bleeding
- Malignant hypertension
- Acute renal failure
- Advanced CKD (eGFR<30)
- Severe anemia
- Electrolyte imbalance
- Active infection
- Decompensated heart failure
- Acute or unstable other systemic illness

Contrast agent



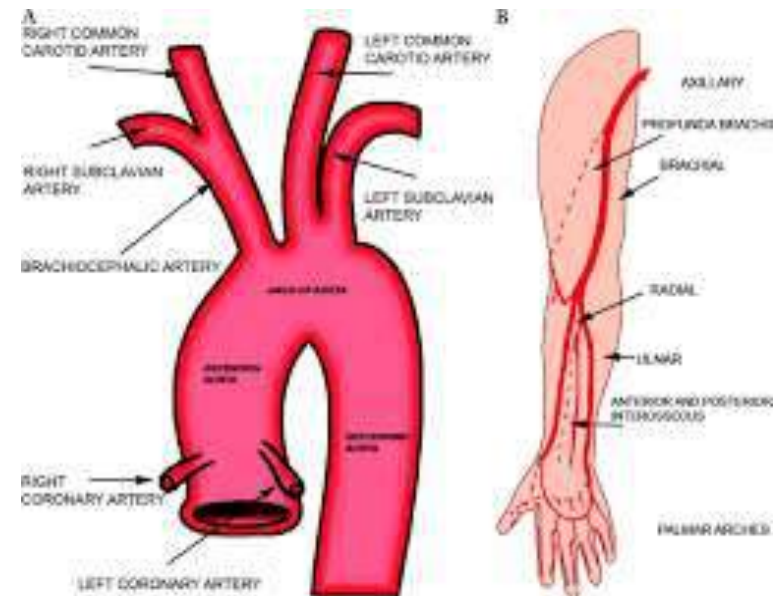
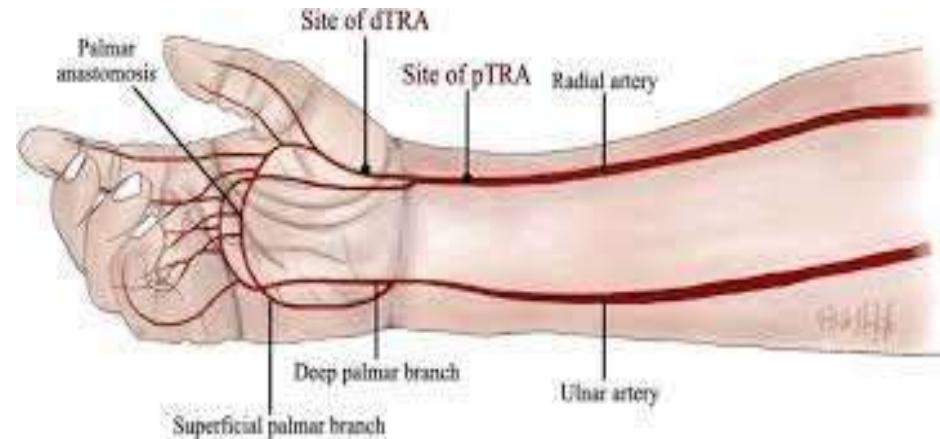
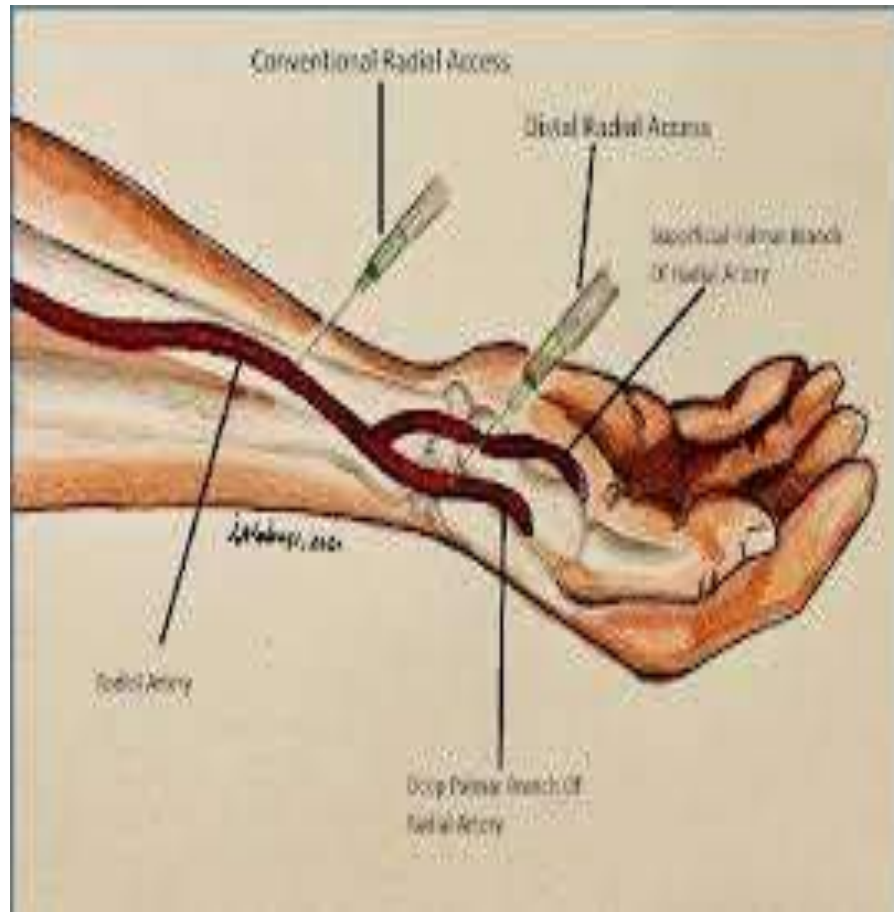
Iodine-Based Contrast

- High-osmolar contrast media (HOCM): Ionic
Osmolality :1400-2000
- Low-osmolar contrast media (LOCM): Iohexol/Iopromide
Osmolality :600-800
- Iso-osmolar contrast media : Iodixanol (Suitable for CKD)
Osmolality :300

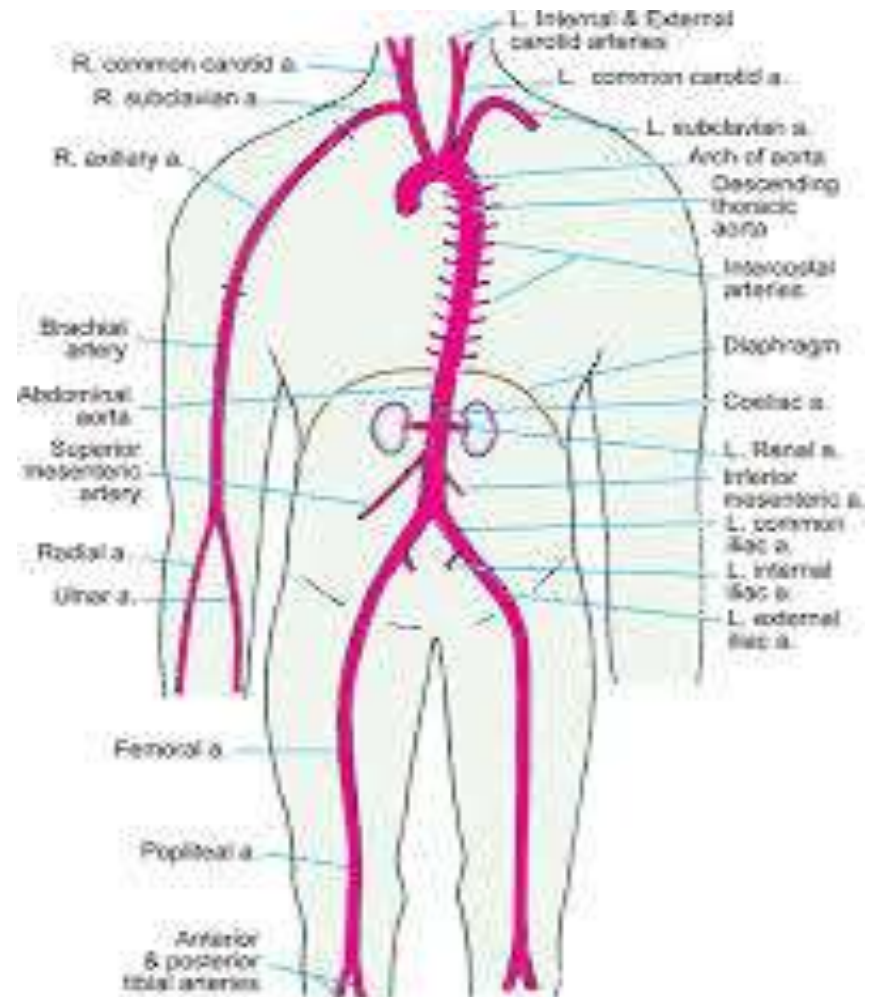
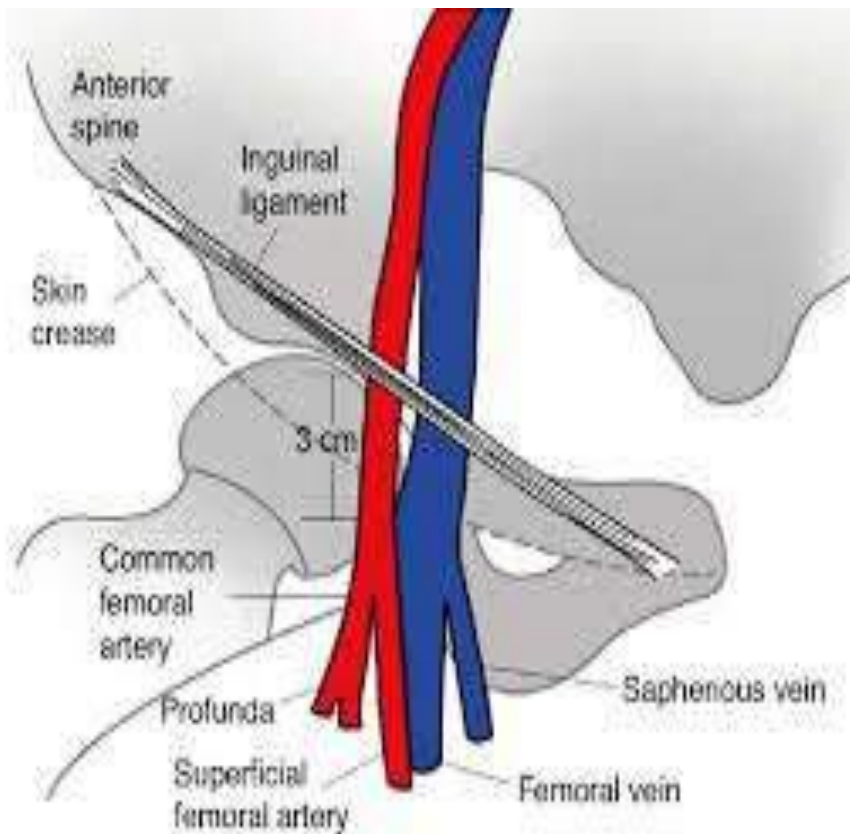
Route of CAG

- Radial/Ulnar artery
- Femoral artery

Radial/Ulnar route



Femoral route



Complications are less in Radial route

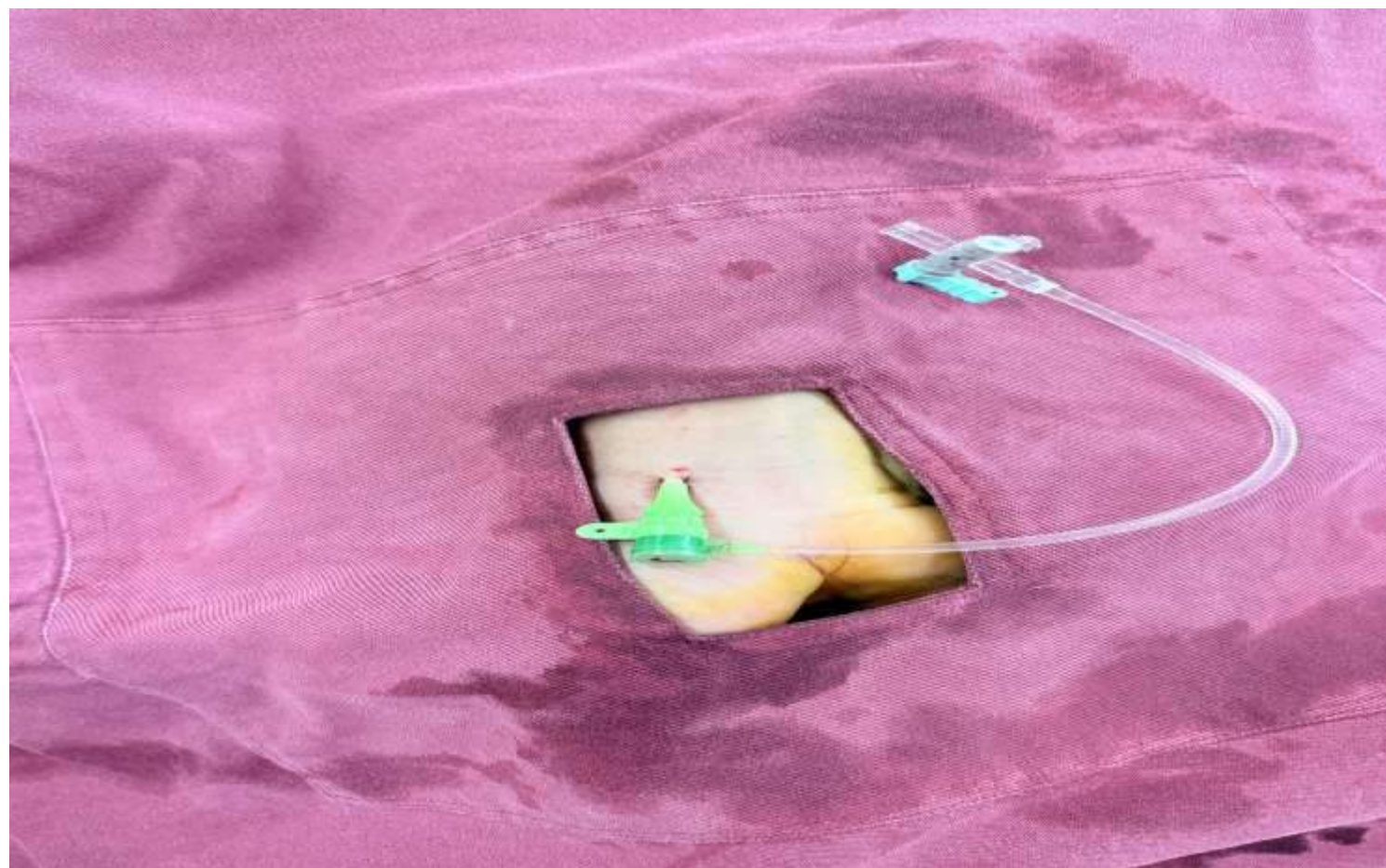
- Less bleeding
- Less haematoma
- Comfortable for patient
- Early mobilization and can be discharged after 4 hours of procedure

Radial route
Class I indication

Pre procedure

- Fasting for 4-6 hours
- Loading dose of antiplatelets
- Inj. Ceftriaxone 1 gm
- Cleaning and shaving of operative area
- Local anesthesia
- Arterial cannulation and IV heparin 5000 unit

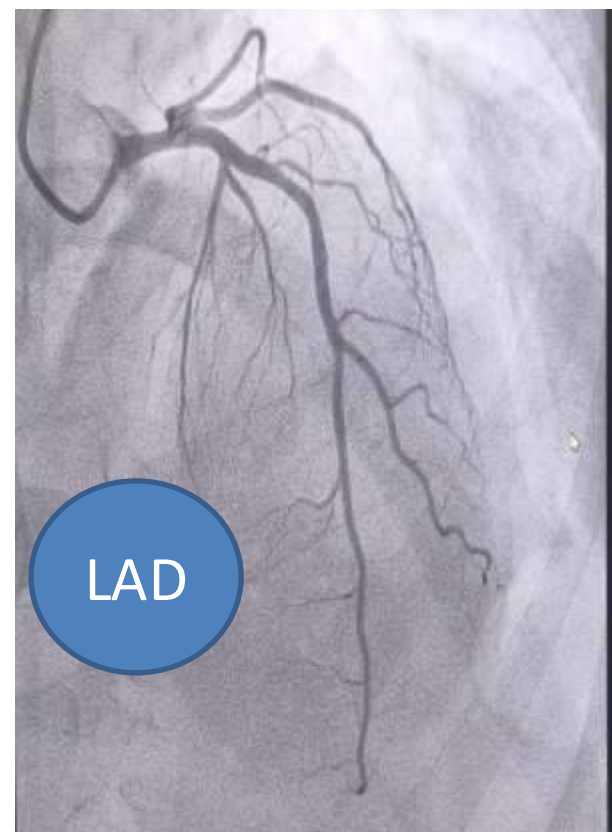
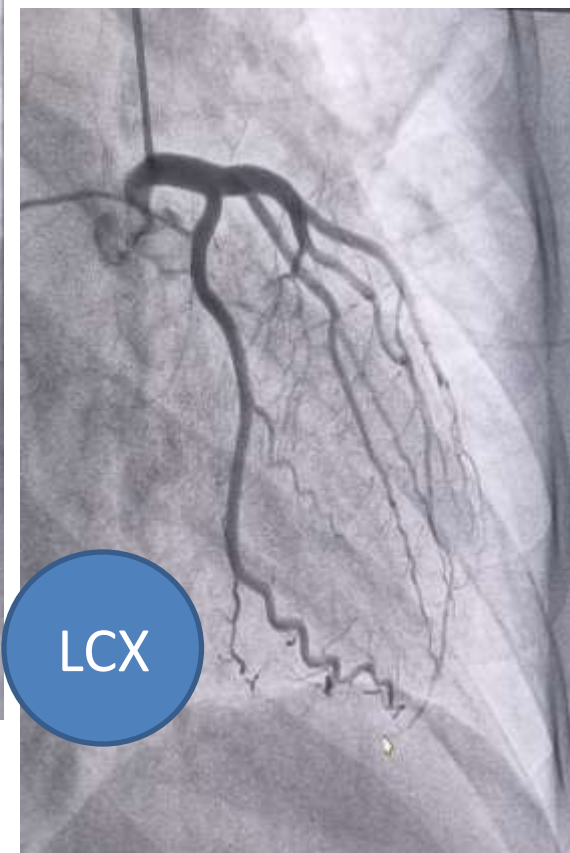
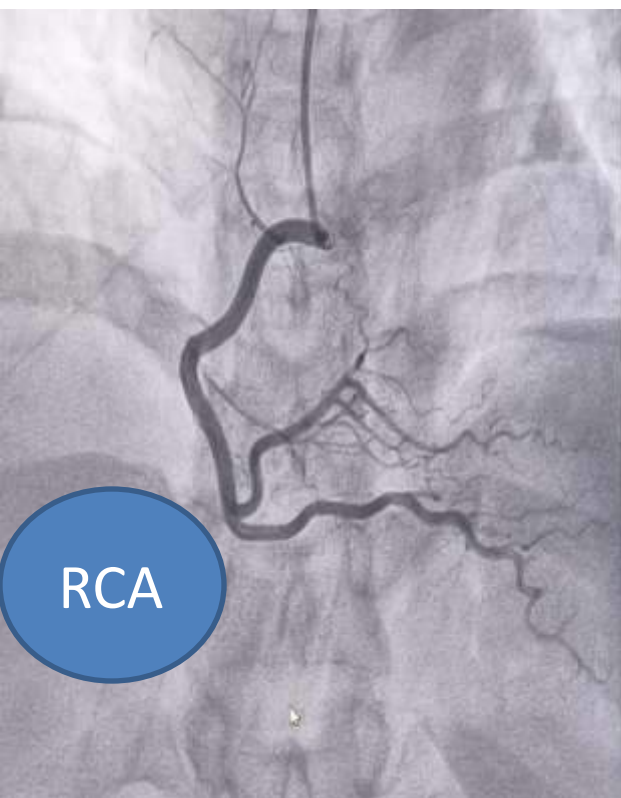




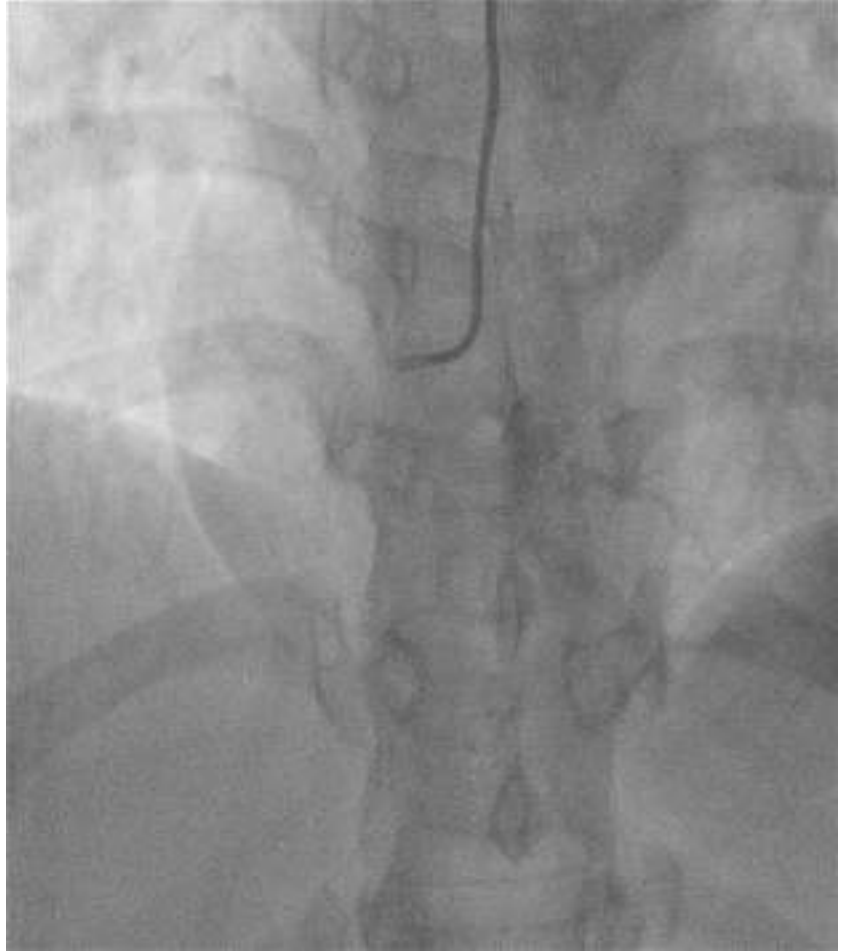
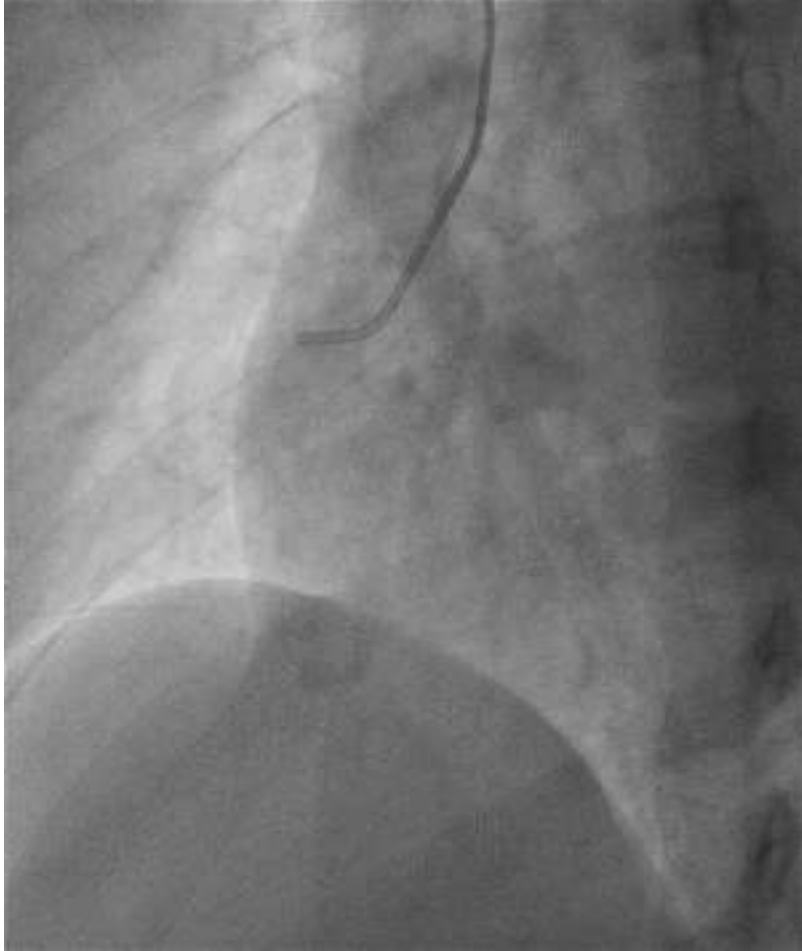


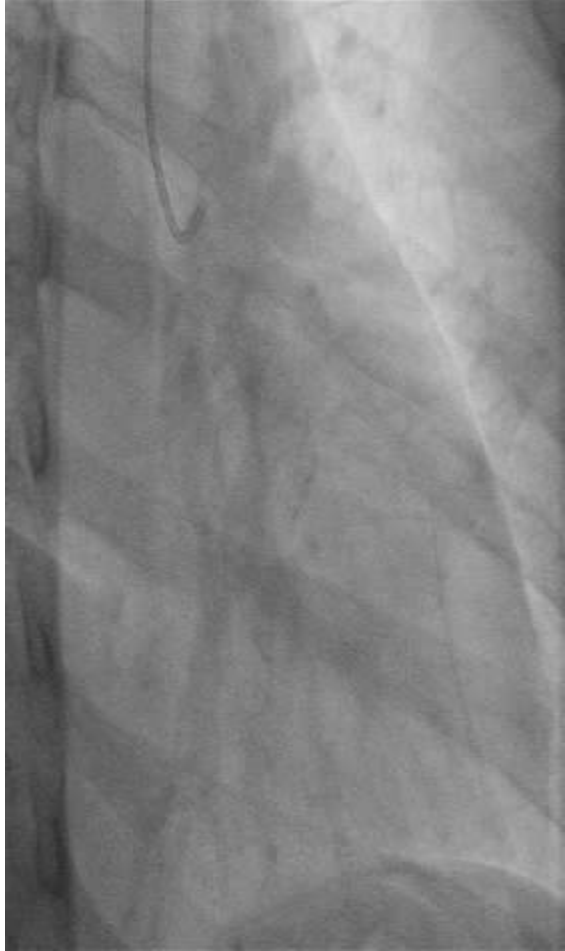


Normal CAG









Correlation of coronary block with symptoms

- Stable angina  >50% but < 90% block
- Unstable angina  90-99%
- Non ST elevation MI  90-99%
- ST elevation MI  100% block

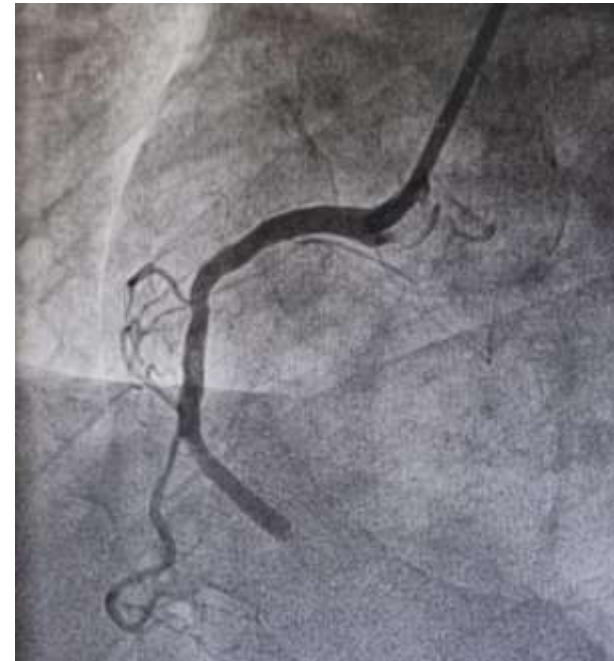
Stable
angina



Unstable
angina/NSTEMI

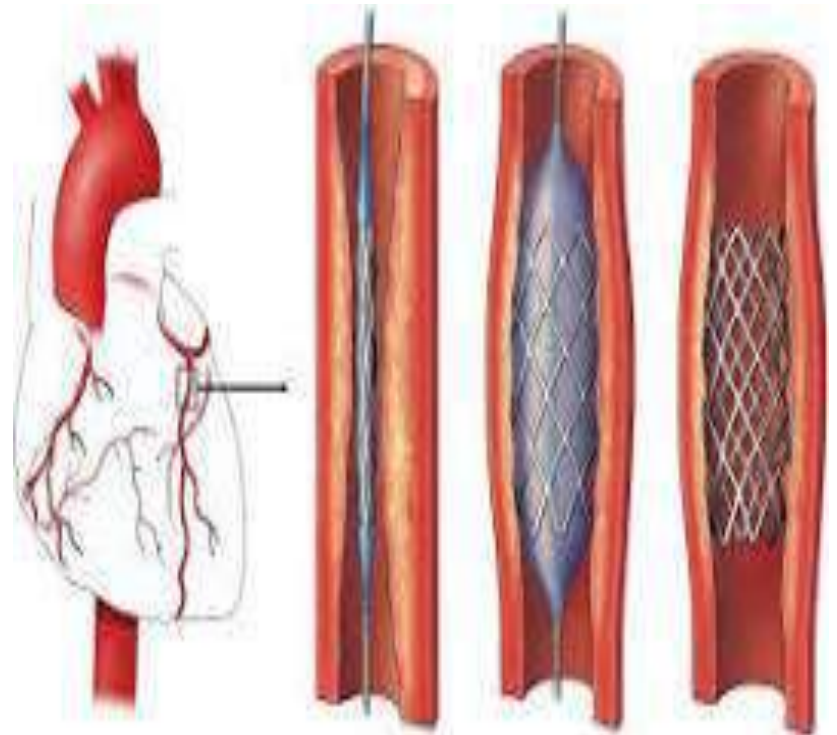


STEMI
Inferior



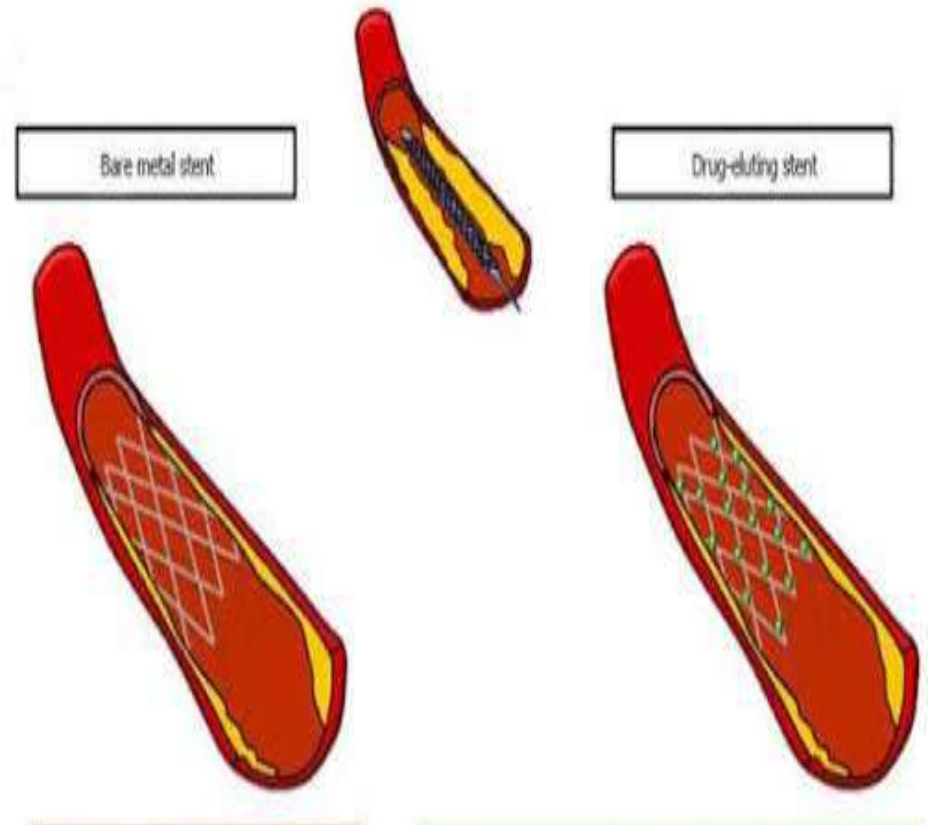
Percutaneous Coronary Intervention (PCI)

- Same setting/ Next setting
- Same route
- Under local anesthesia

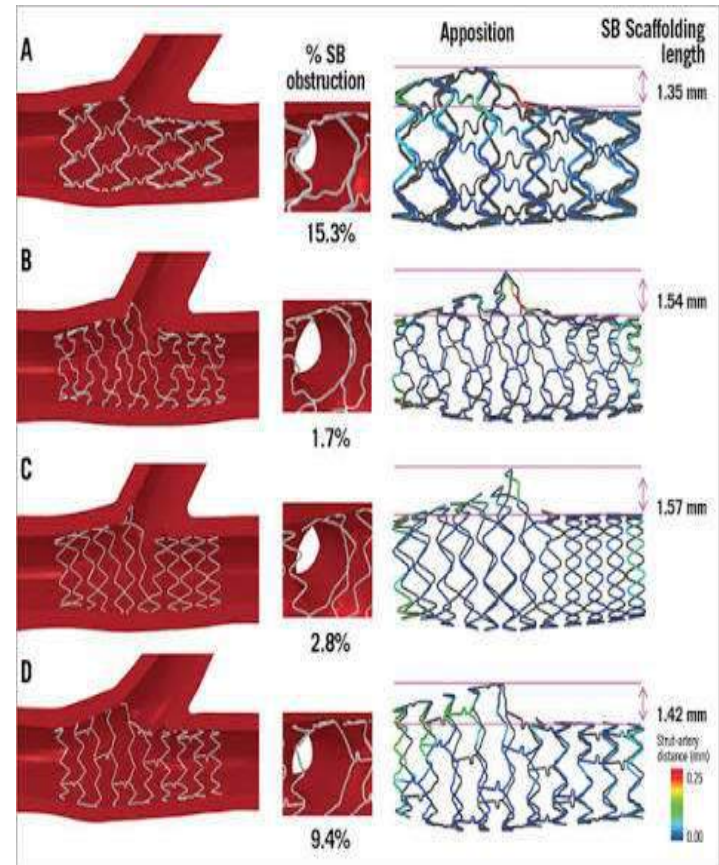
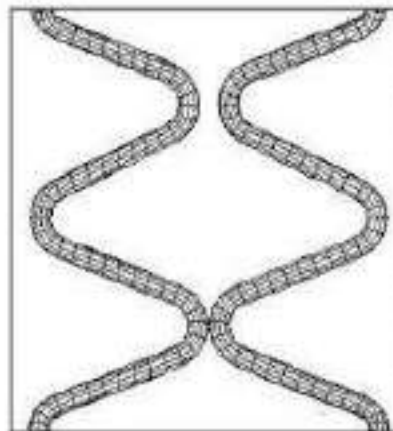
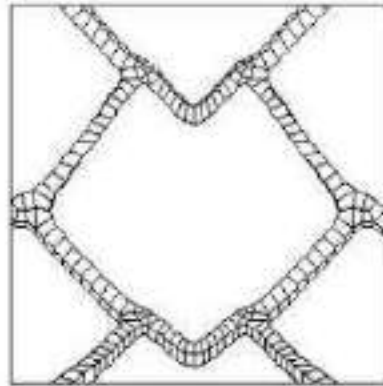


Types of coronary stents

- Bare metal stent (BMS)
- Drug eluting stent (DES)
 - First generation (**Sirolimus**)
 - 2nd generation (**Zotarolimus**)
 - 3rd generation (**Evarolimus**)



Stent is made by cobalt chromium mesh coated with drugs



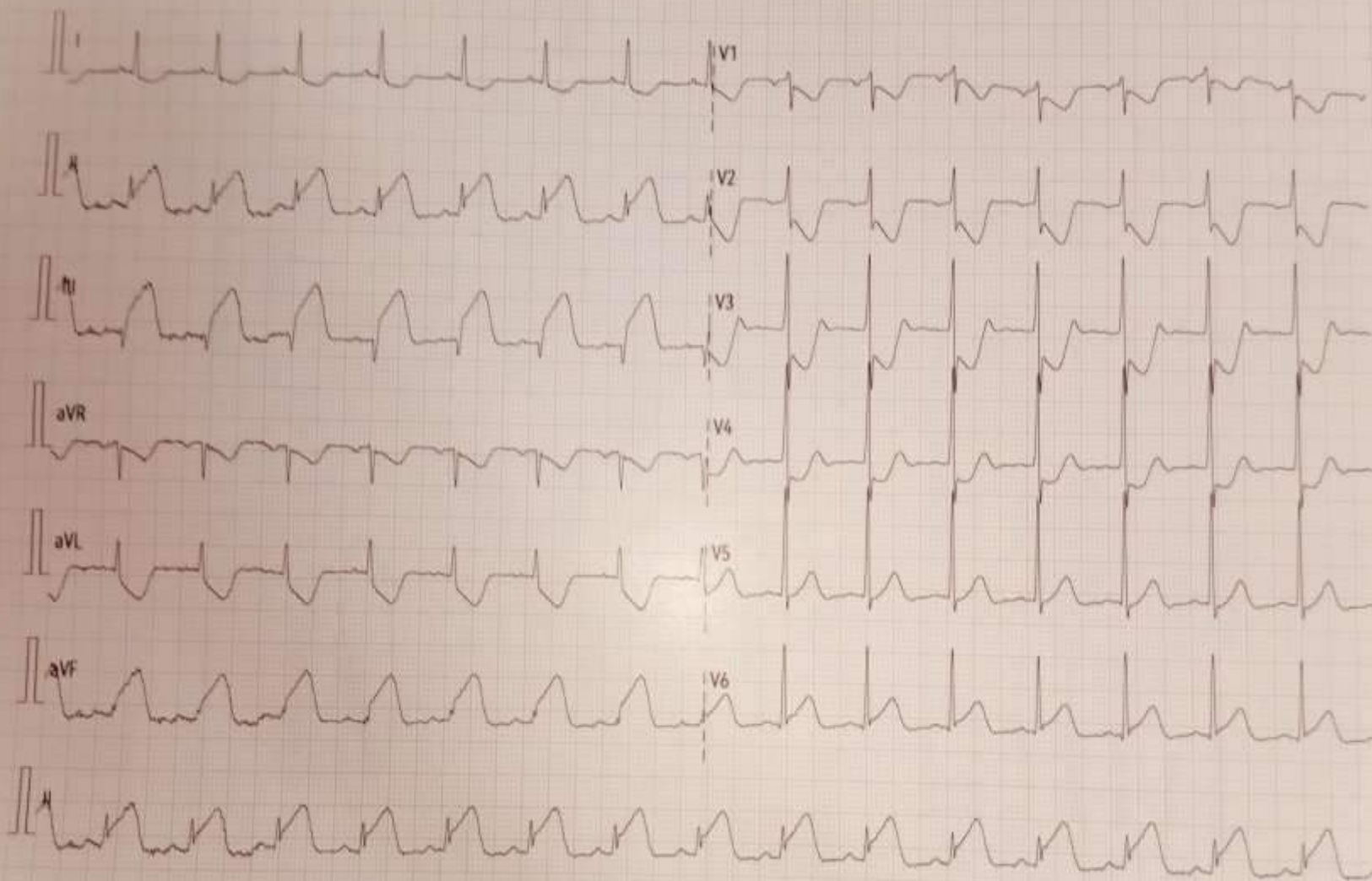
Case scenario and management

- A 50-year-old gentleman presented with sudden severe central chest pain with profuse sweating and vomiting
- He was non diabetic, normotensive, chain smoker
- Pulse :100/min, BP:70/50 mmHg, lung was clear

RV5/SV1 1.832/0.559 mV
RV5+SV1 2.391 mV
QTc: Hodges

Abnormal ECG

Unconfirmed Diagnosis



25 mm/sec

10 mm/mV

60 Hz

BDR 35 Hz

Green life Hospital

ECG Report

01.04.00.01/V06.00.11(Monday)

SN: TP1-52000096

1/1

Acute Inferior STEMI with
posterior extension with
cardiogenic shock

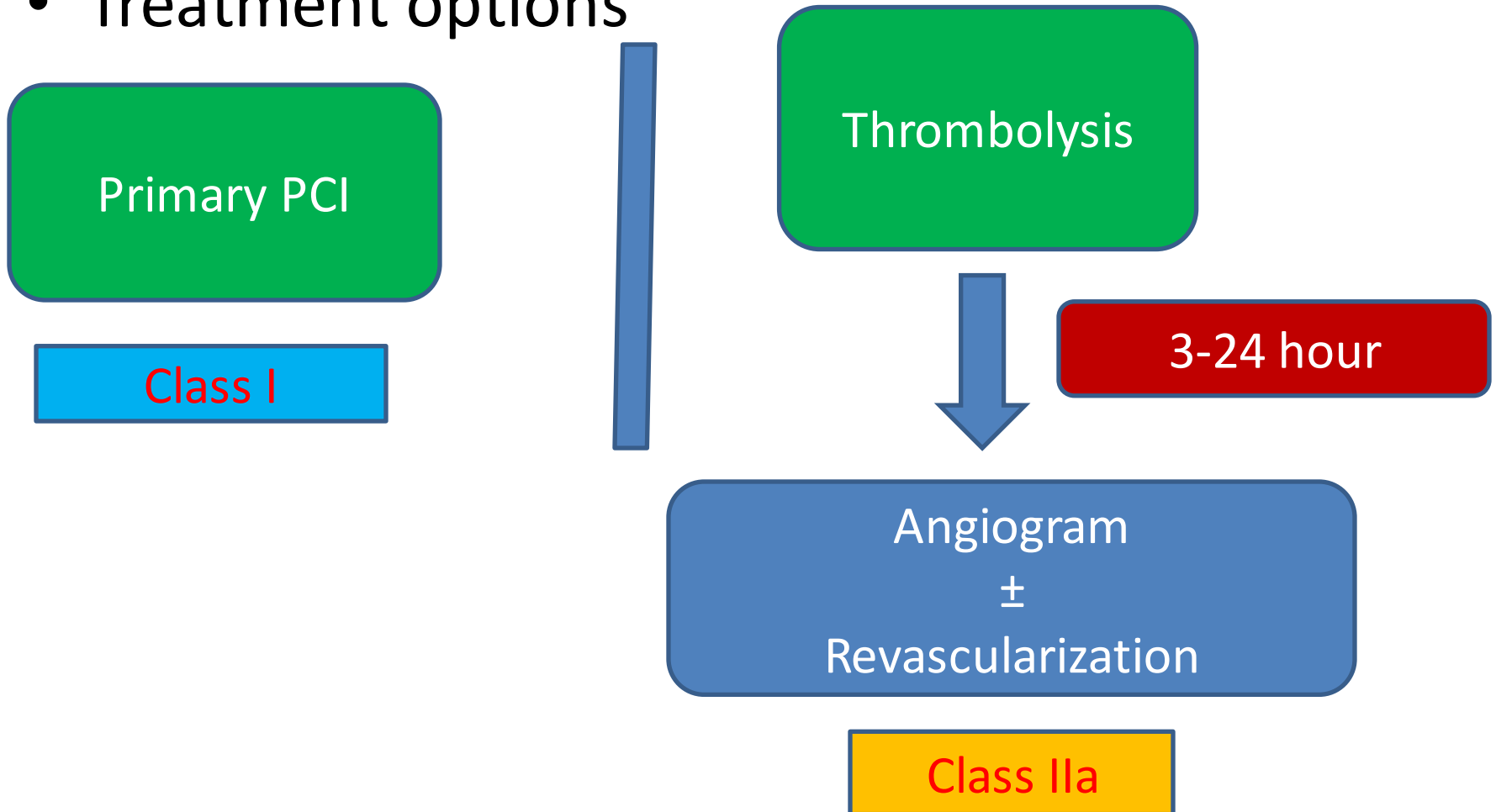
Management

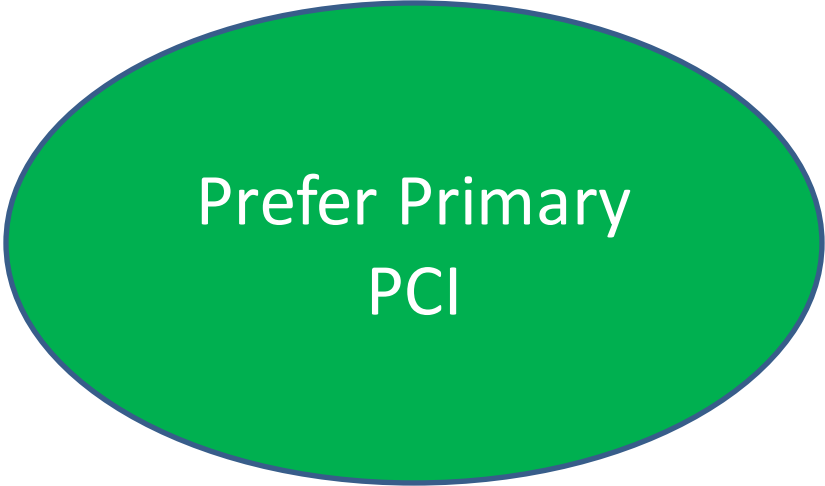
- Loading dose was given
 - ❖ Aspirin 300 mg
 - ❖ Ticagrelor 180 mg
 - ❖ Rosuvastatin 40 mg
 - ❖ Pantonix 40 mg
- Oxygen inhalation, Inotrope started
- Inj.Enoxaparin 30 mg I/V was given

Reduce mortality
by 25%

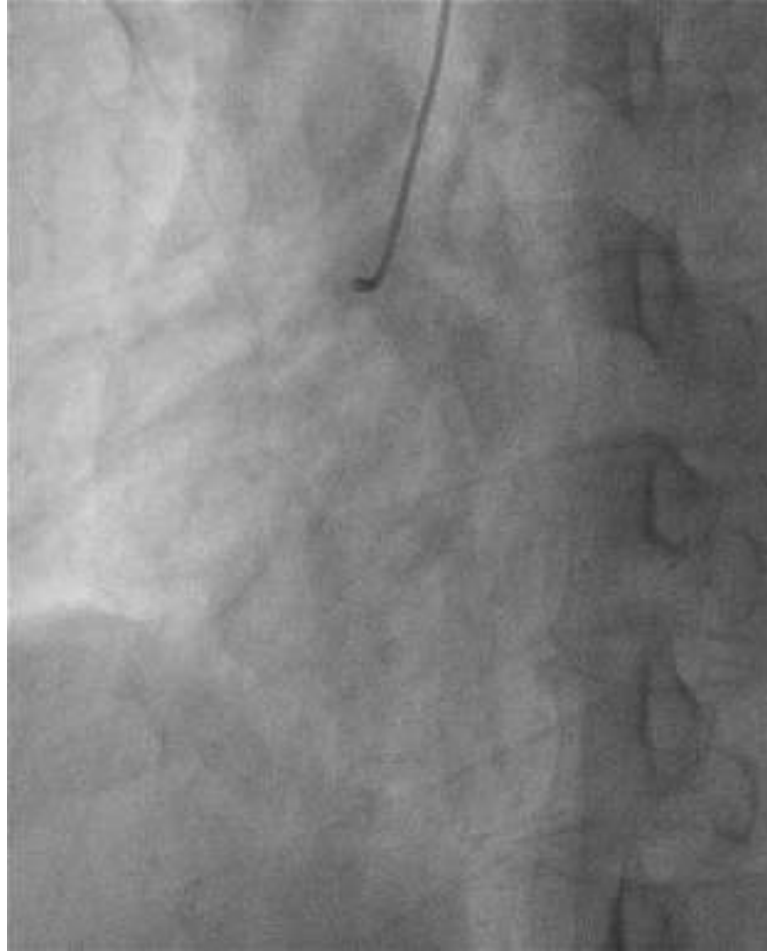
Patient party was counselled

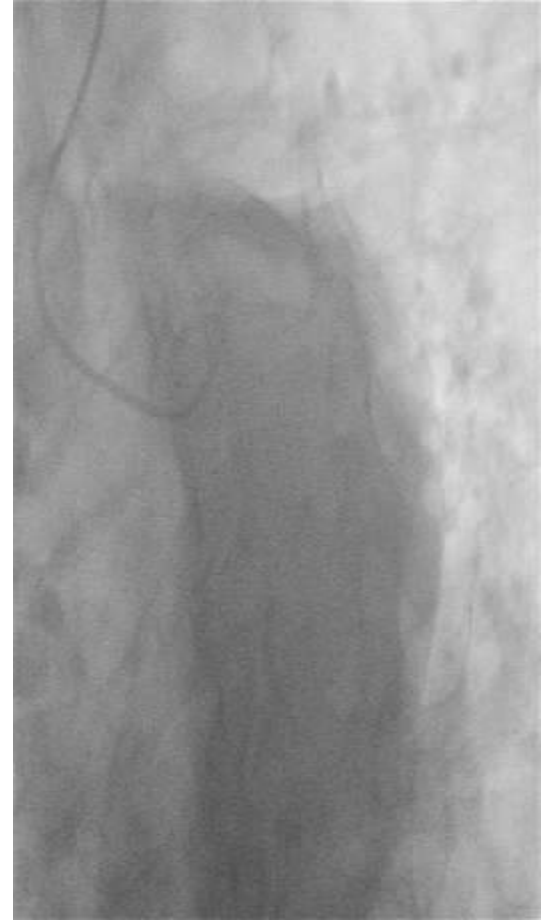
- Treatment options

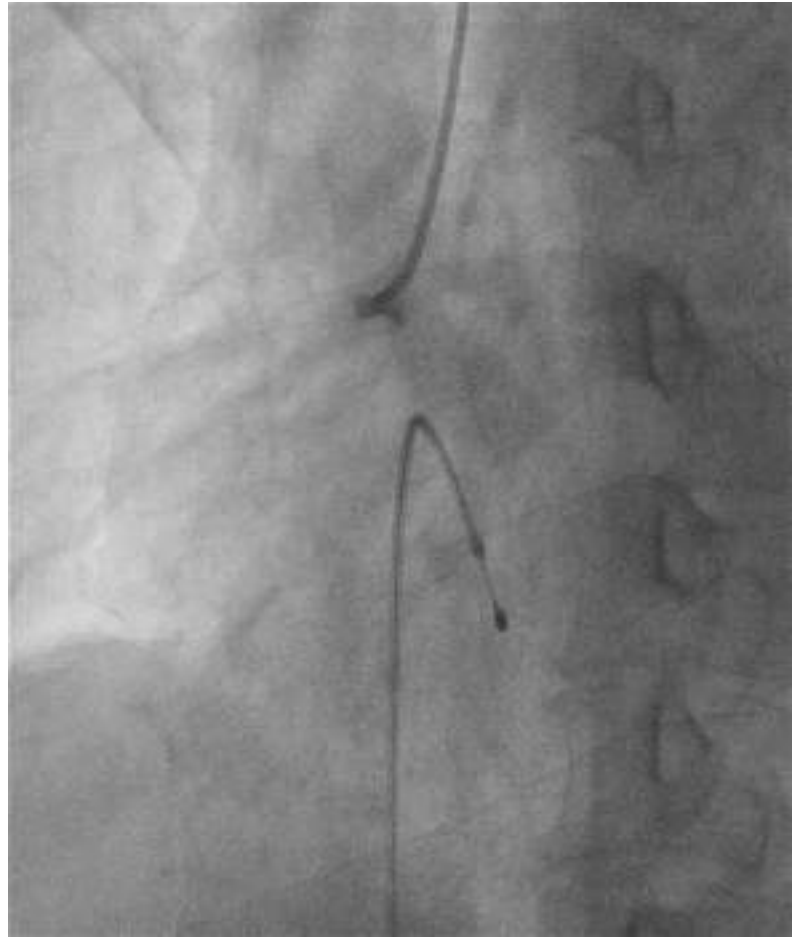
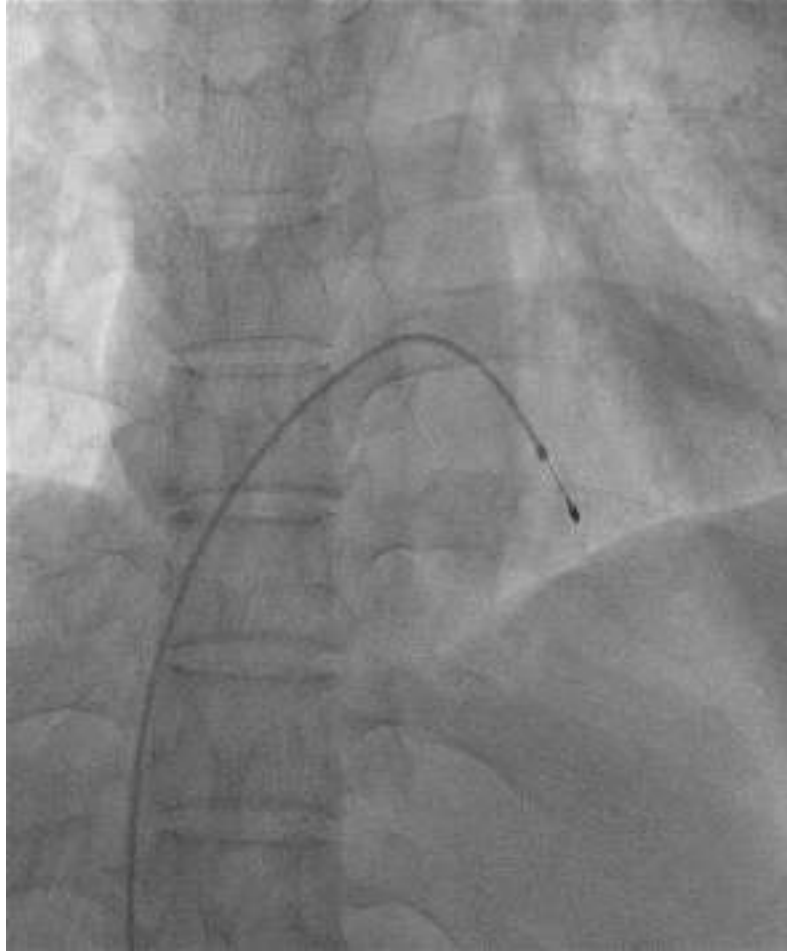


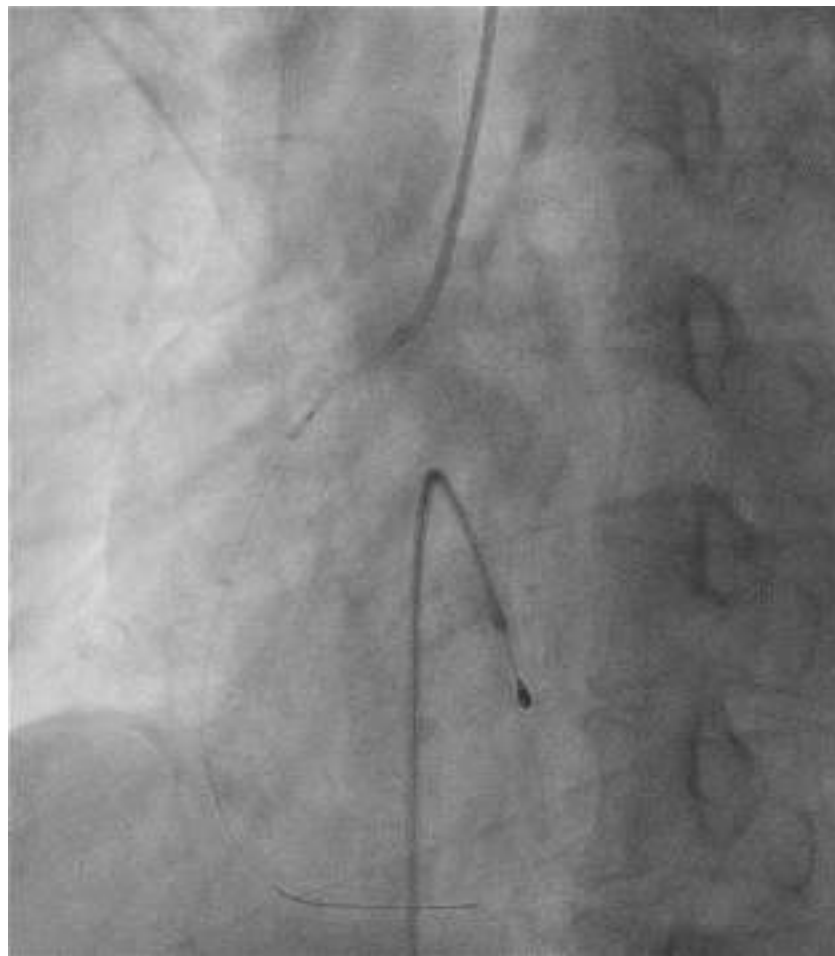
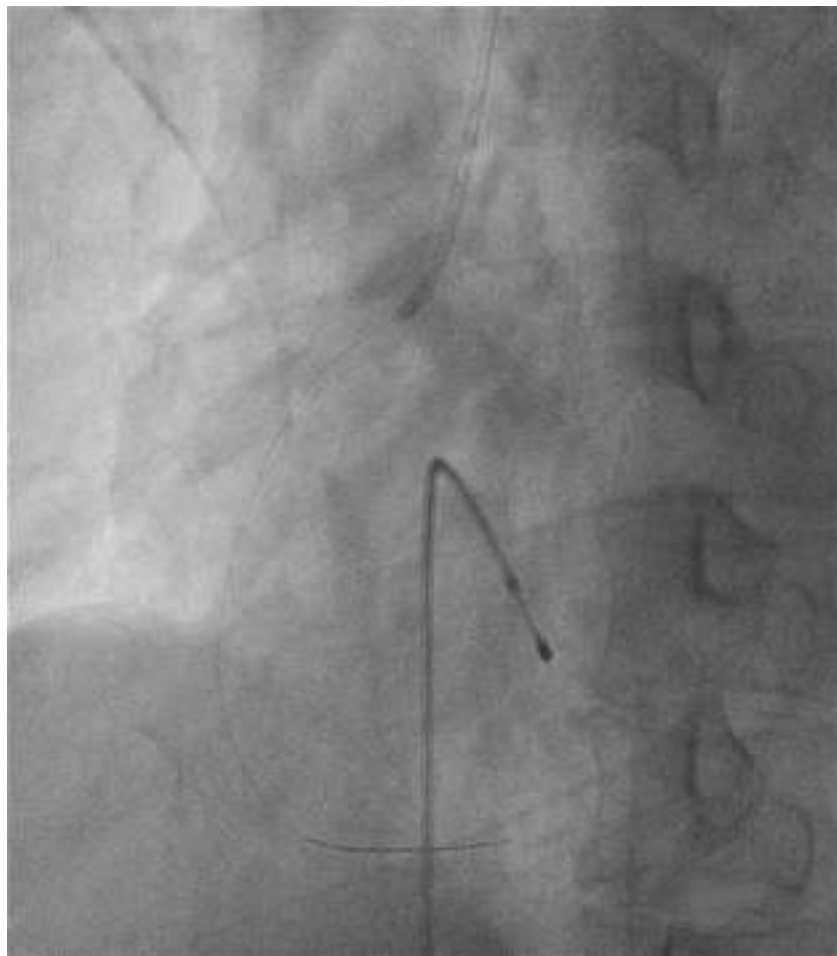


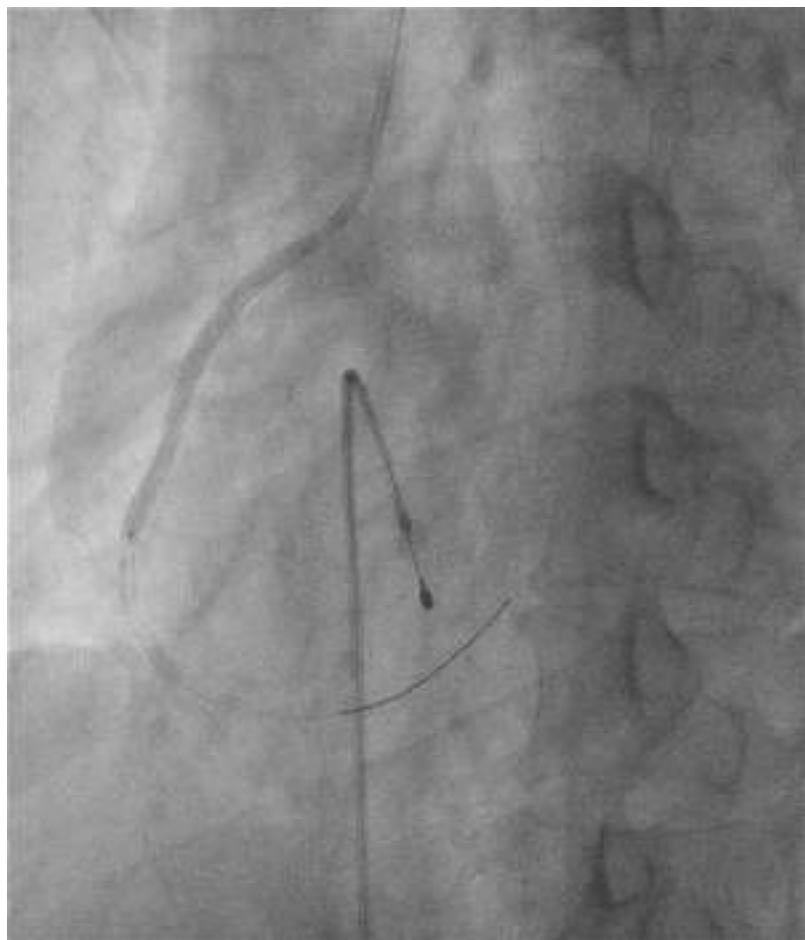
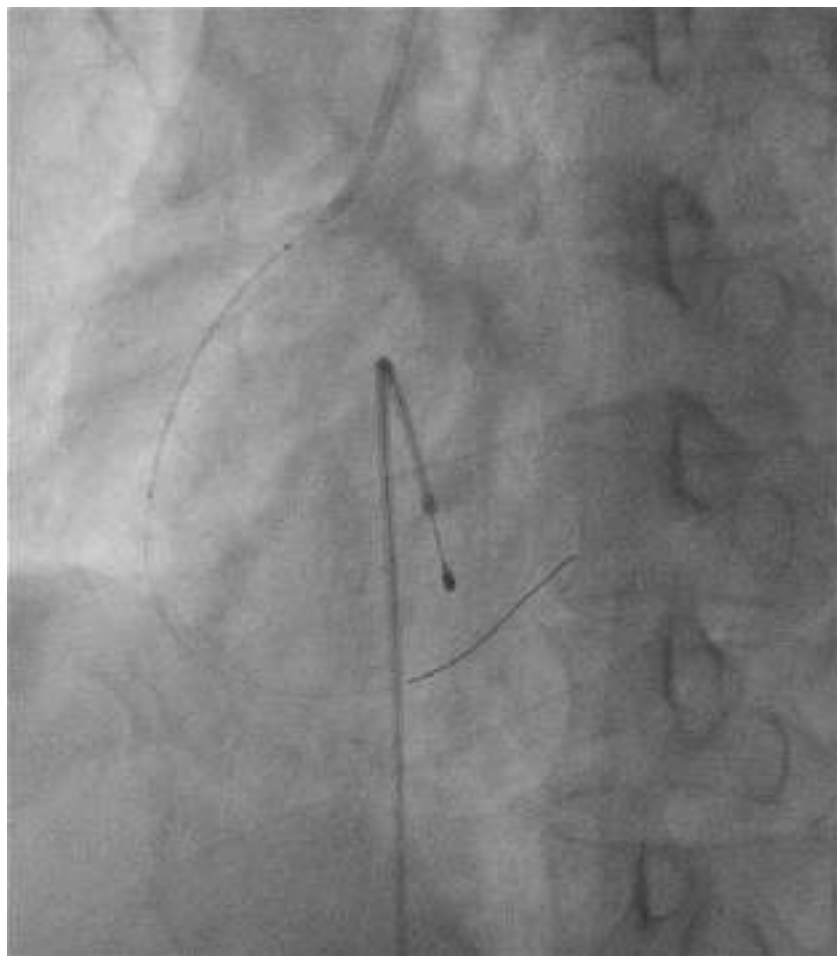
Prefer Primary
PCI

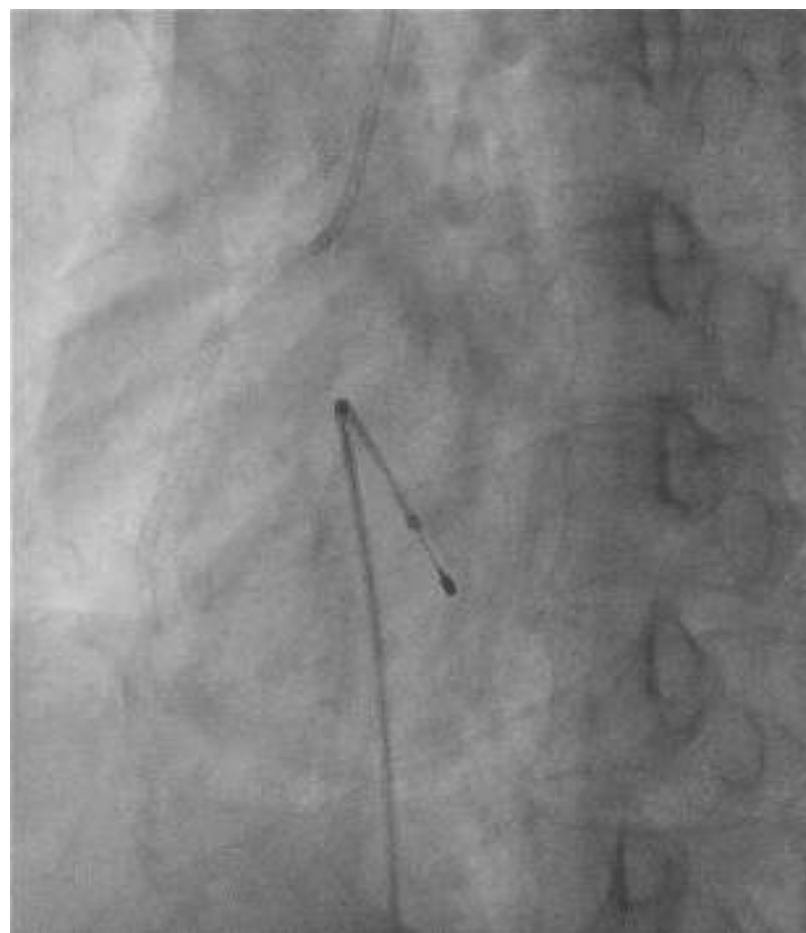
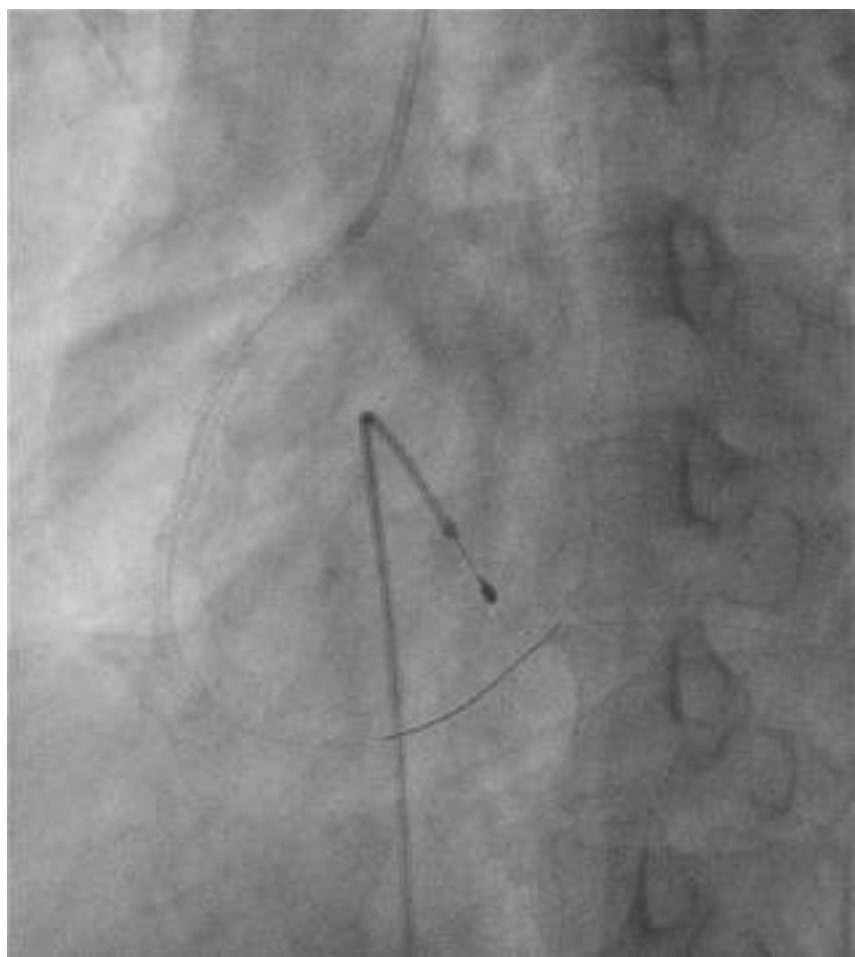


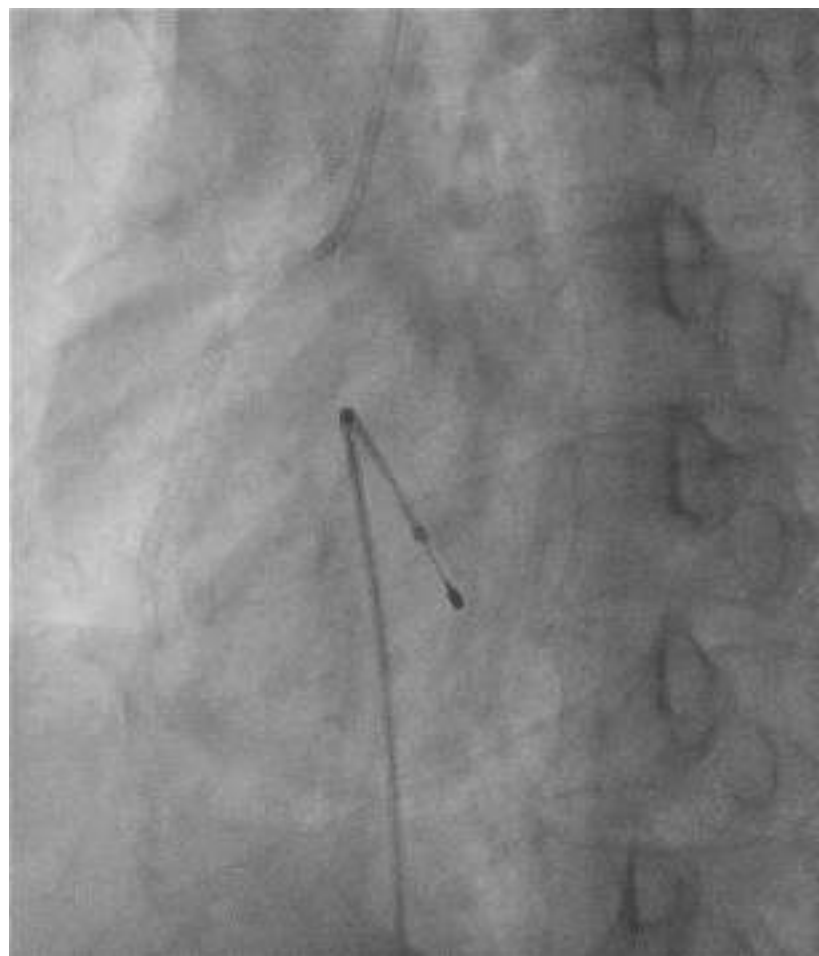
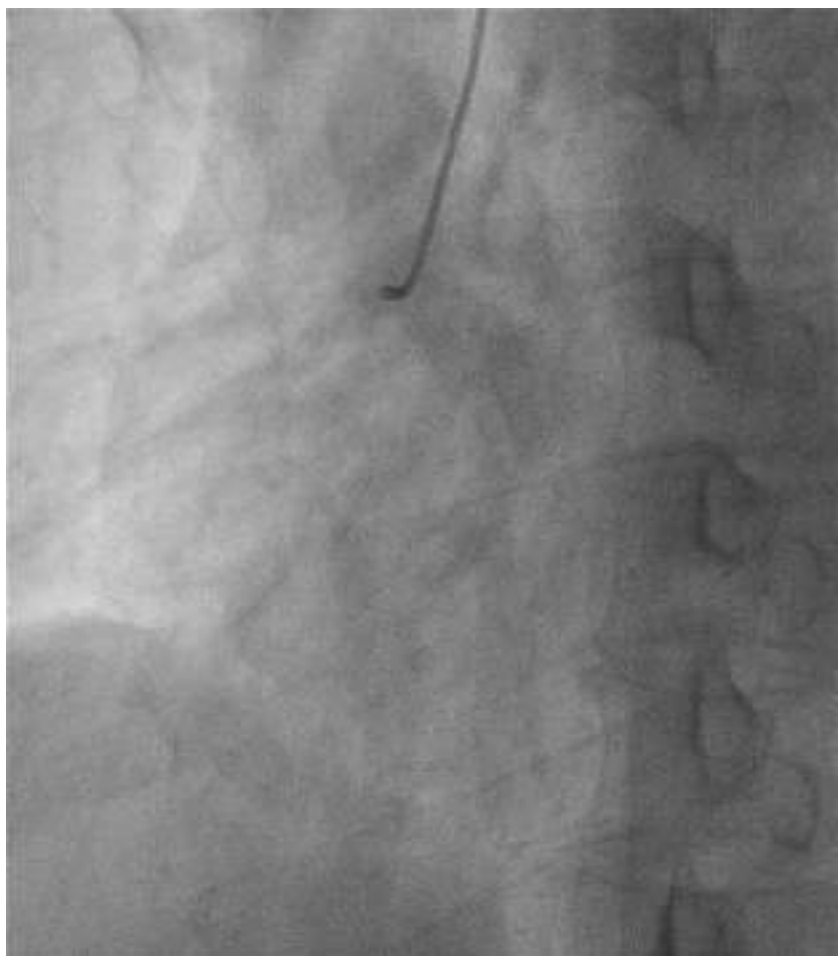










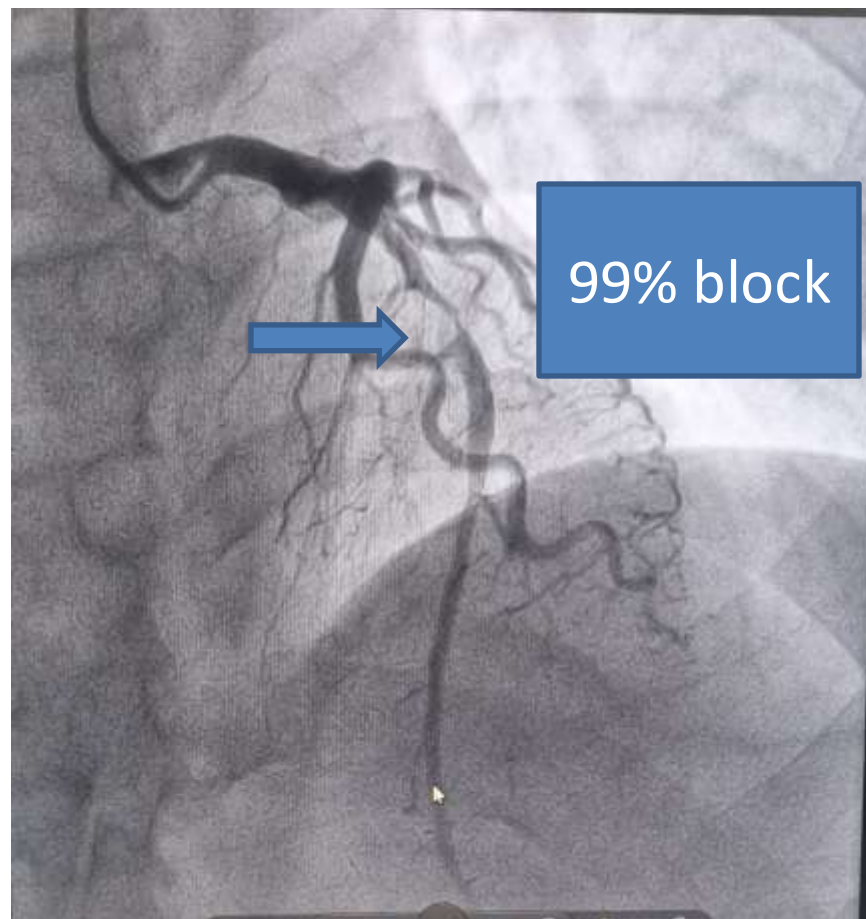
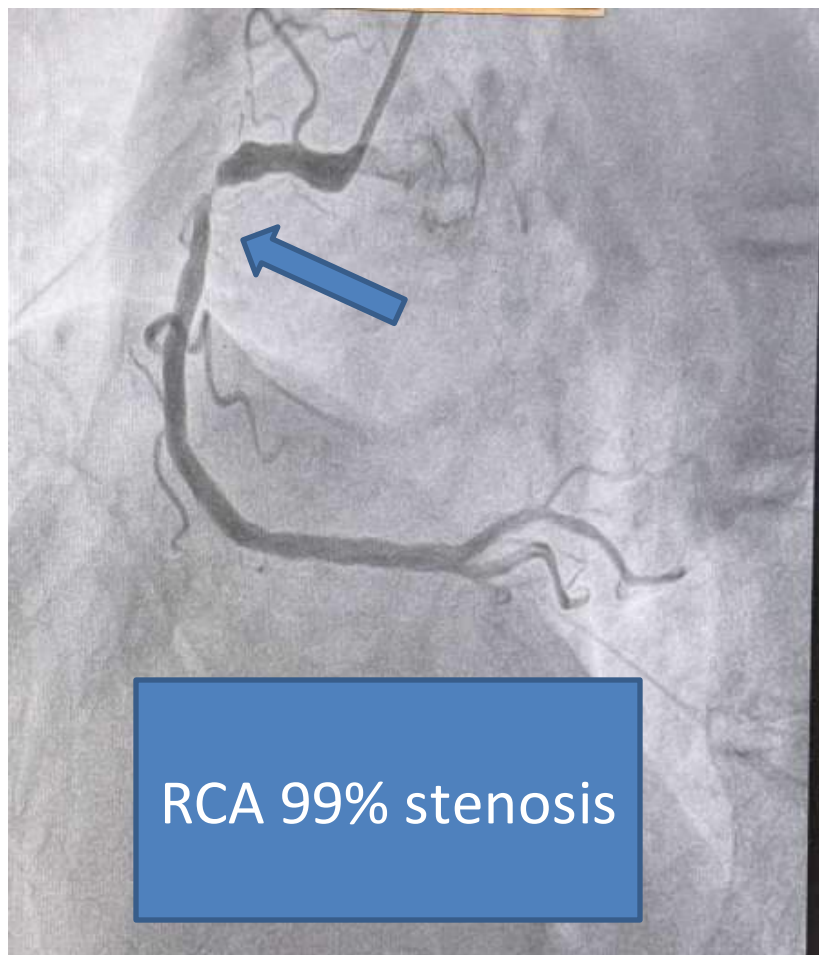


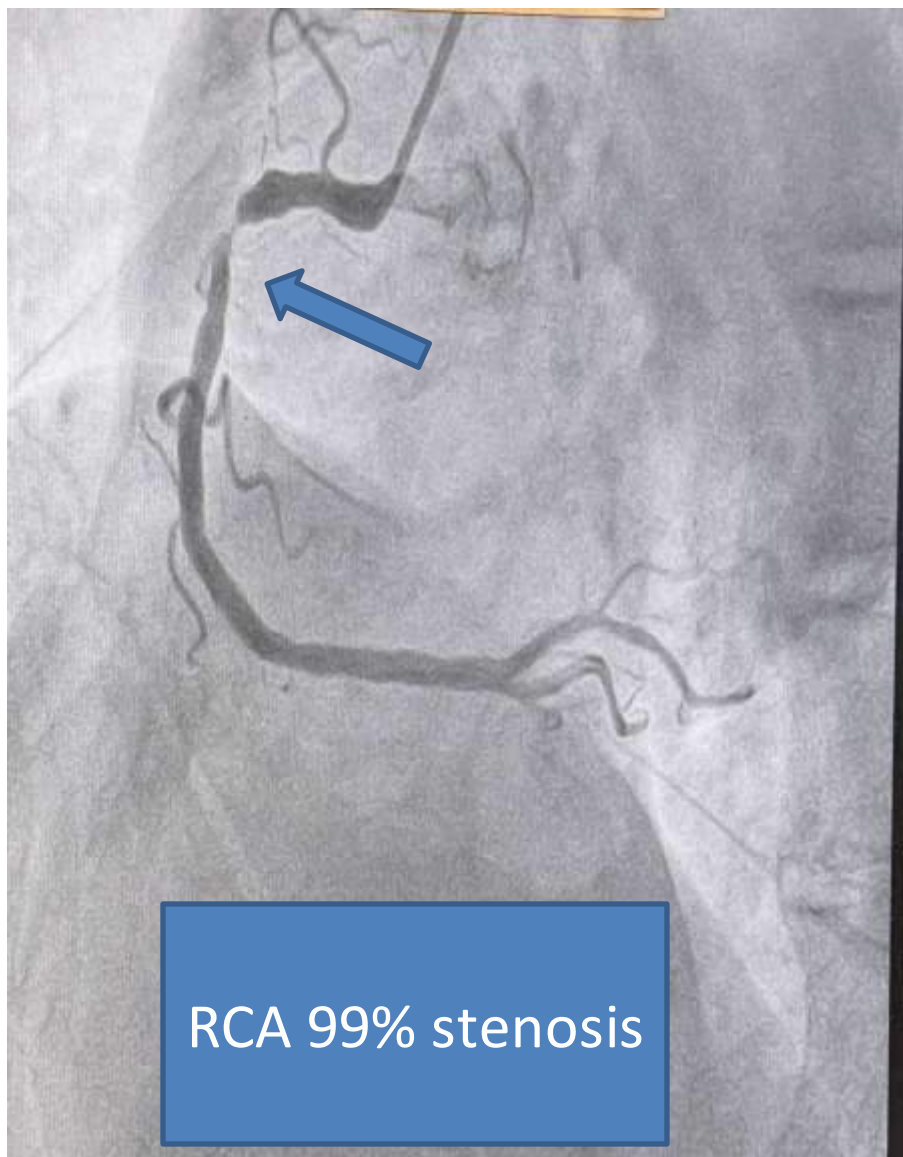
A 65-Year-Old lady was admitted for hysterectomy

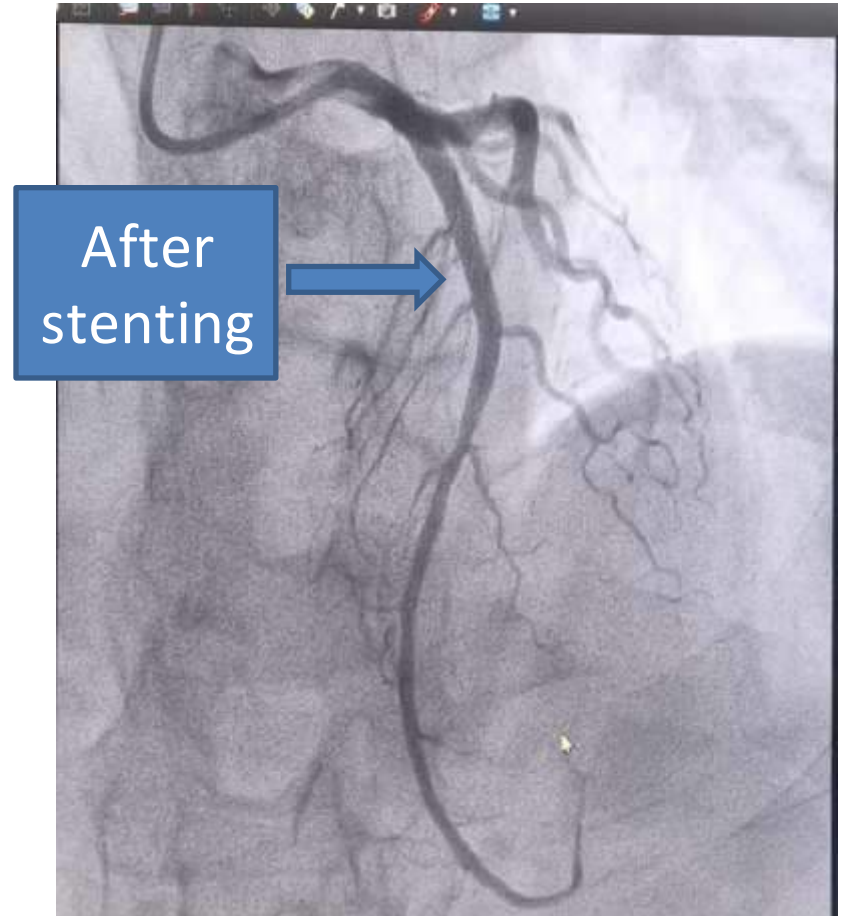
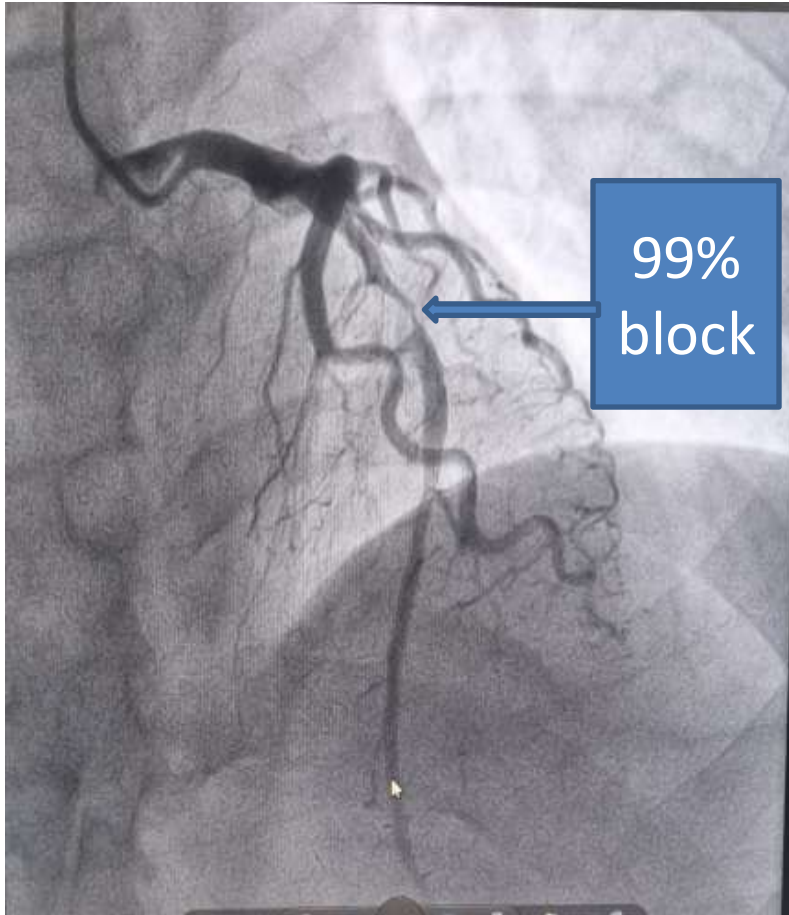
- She was non diabetic, normotensive, no F/H of IHD
- Complained chest pain with chest heaviness on minimal exertion relieved by S/L nitrate and rest
- All baseline investigations including ECG, Echo, S. troponin were normal
- Surgeon and patient party were waiting for operation

Next?

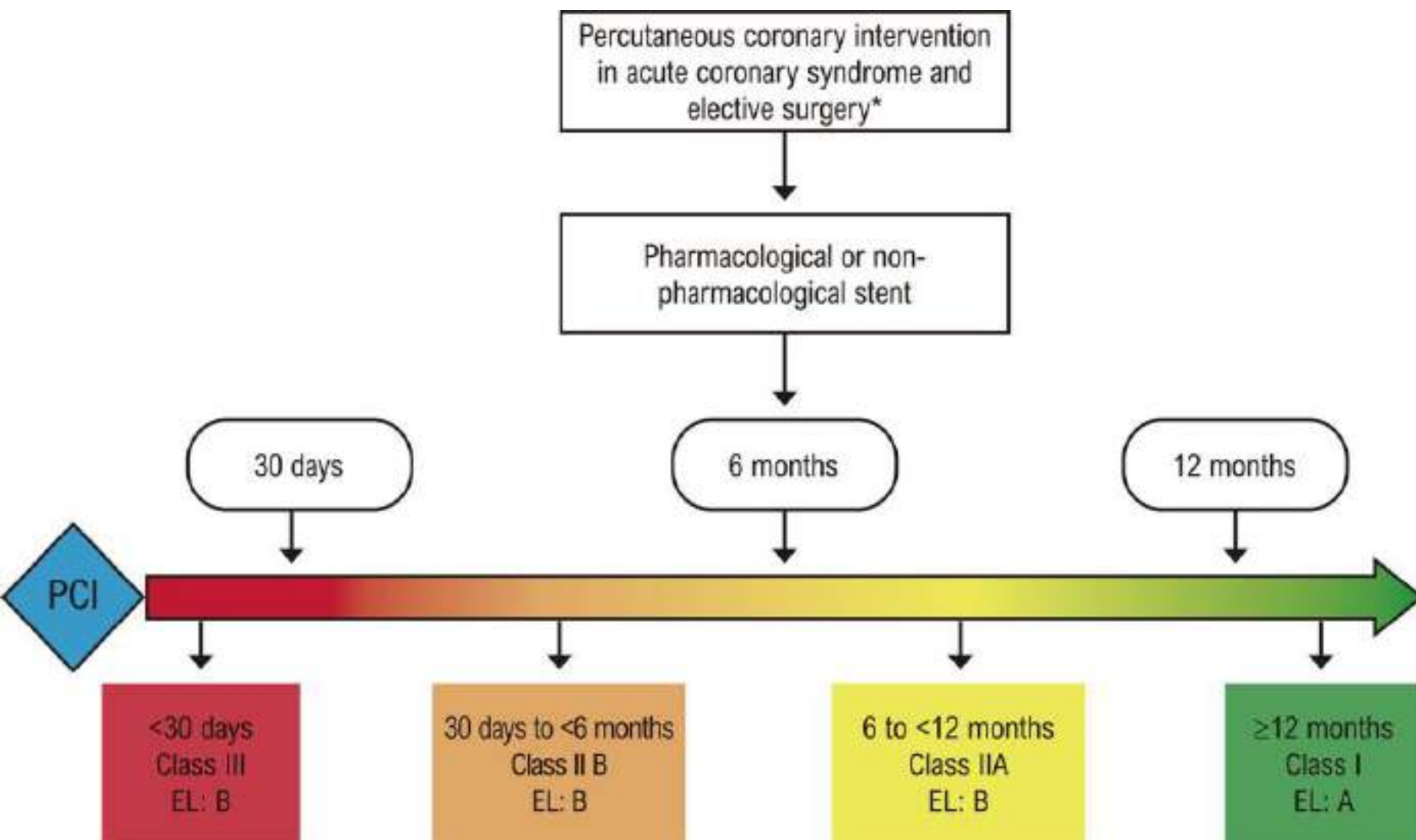
CAG











REF:Update of the Brazilian Society of Cardiology's Perioperative Cardiovascular Assessment Guideline: Focus on Managing Patients with Percutaneous Coronary Intervention – 2022

Intervention in Post CABG patient

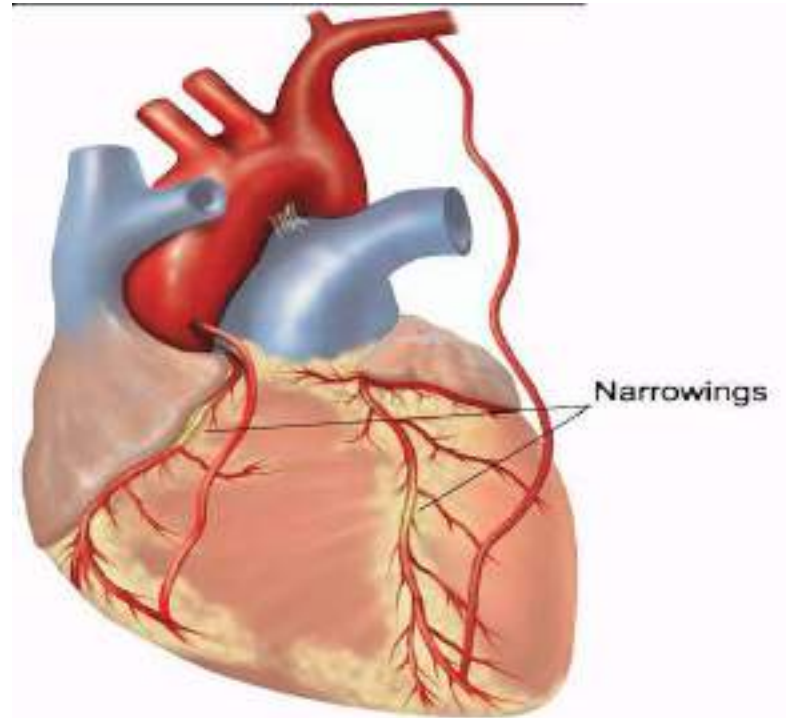
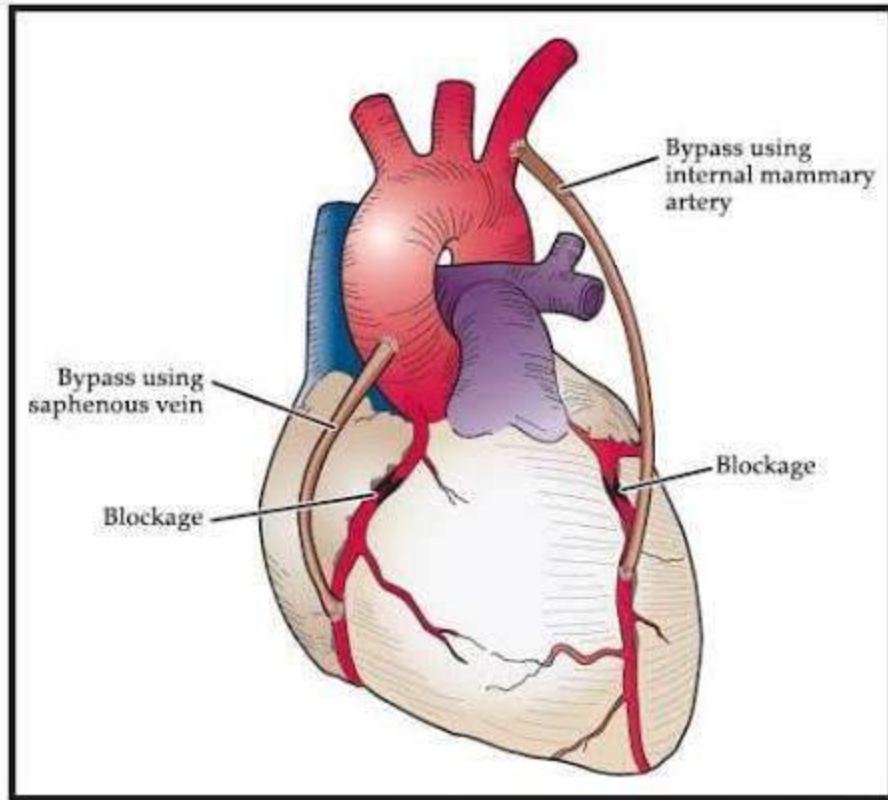


Figure 1
Grafts bypassing narrowings in the coronary arteries

- A 72-year-old lady diabetic, hypertensive underwent CABG in 2015
- Now presented with acute severe central chest pain and sweating
- ECG showed ST segment depression
- LVEF was 60%, No wall motion abnormality
- Troponin I was raised, other baseline investigations were normal



NSTEMI



Planned for
CAG

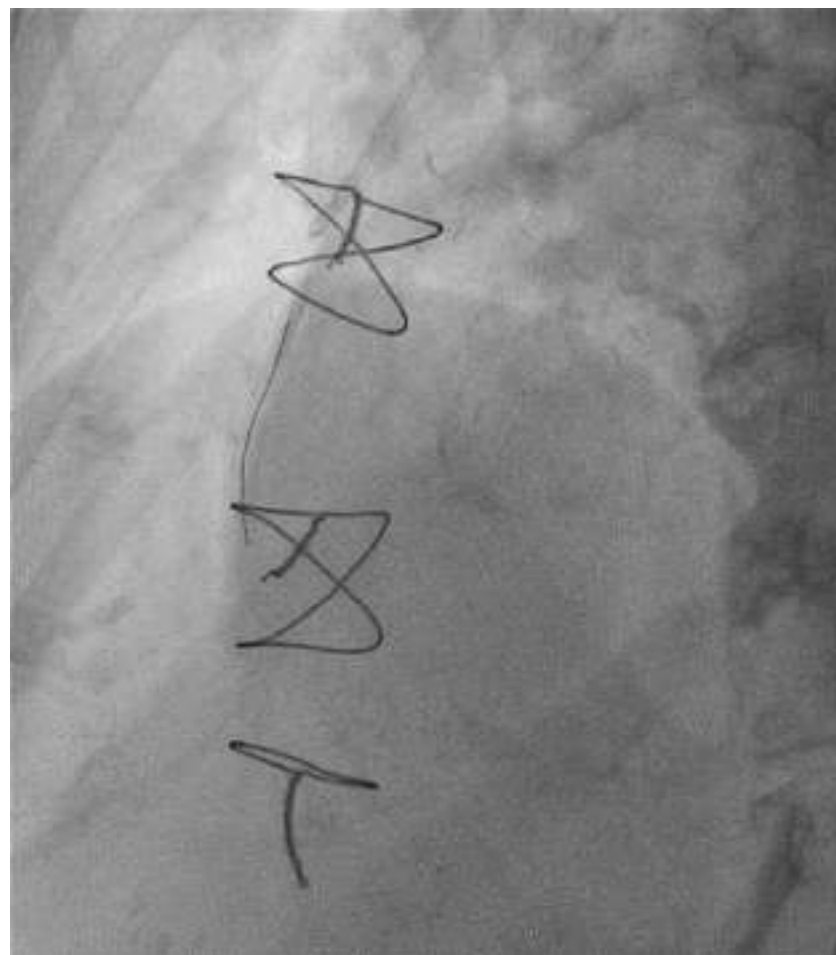
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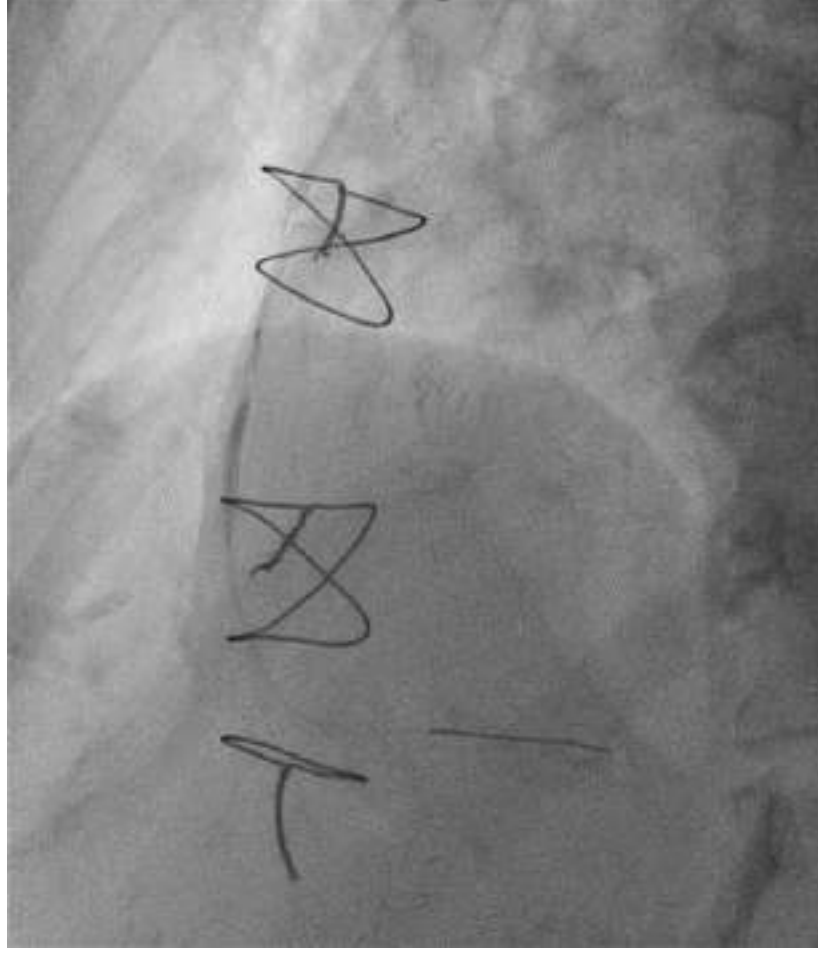
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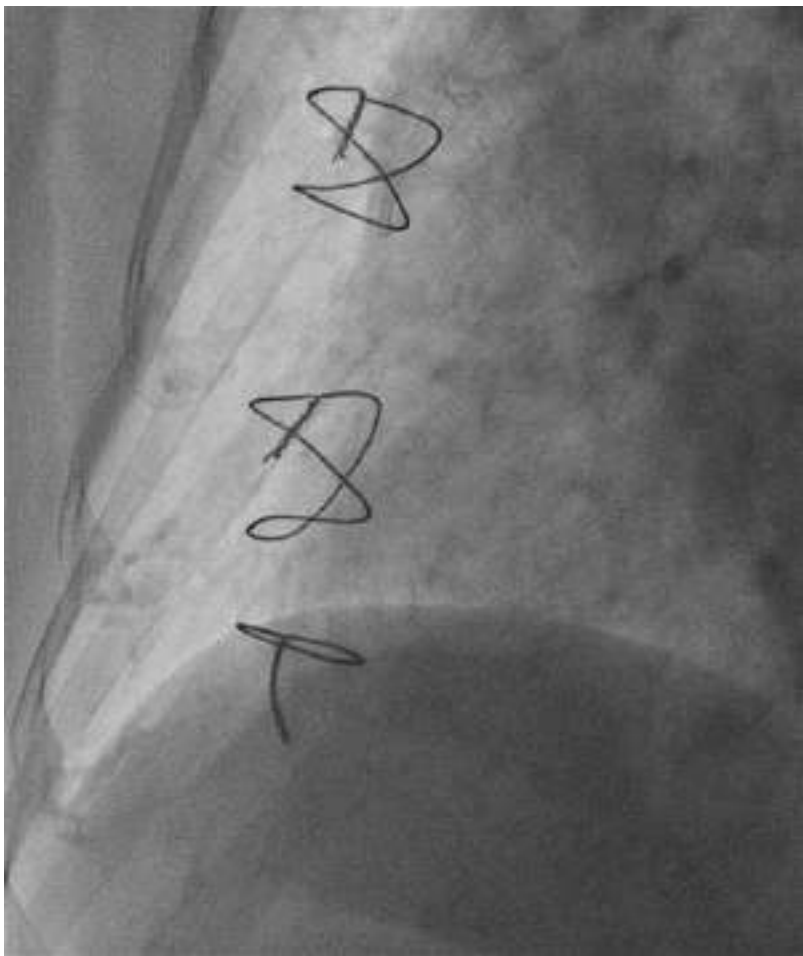
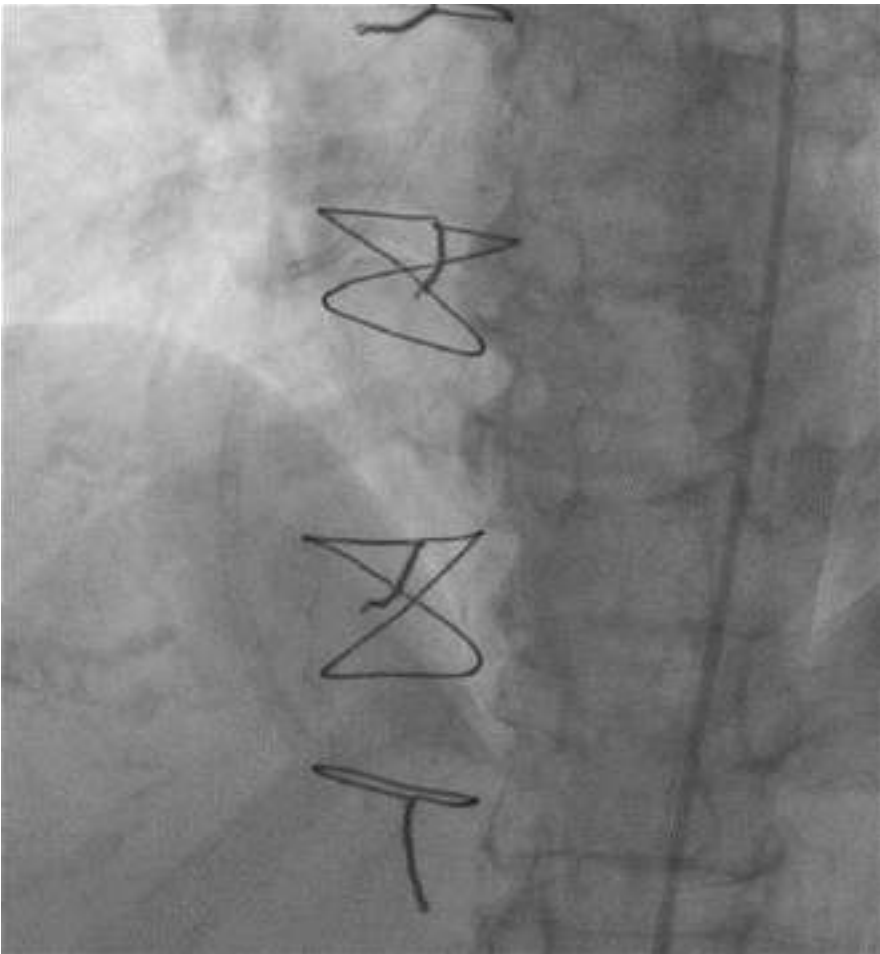
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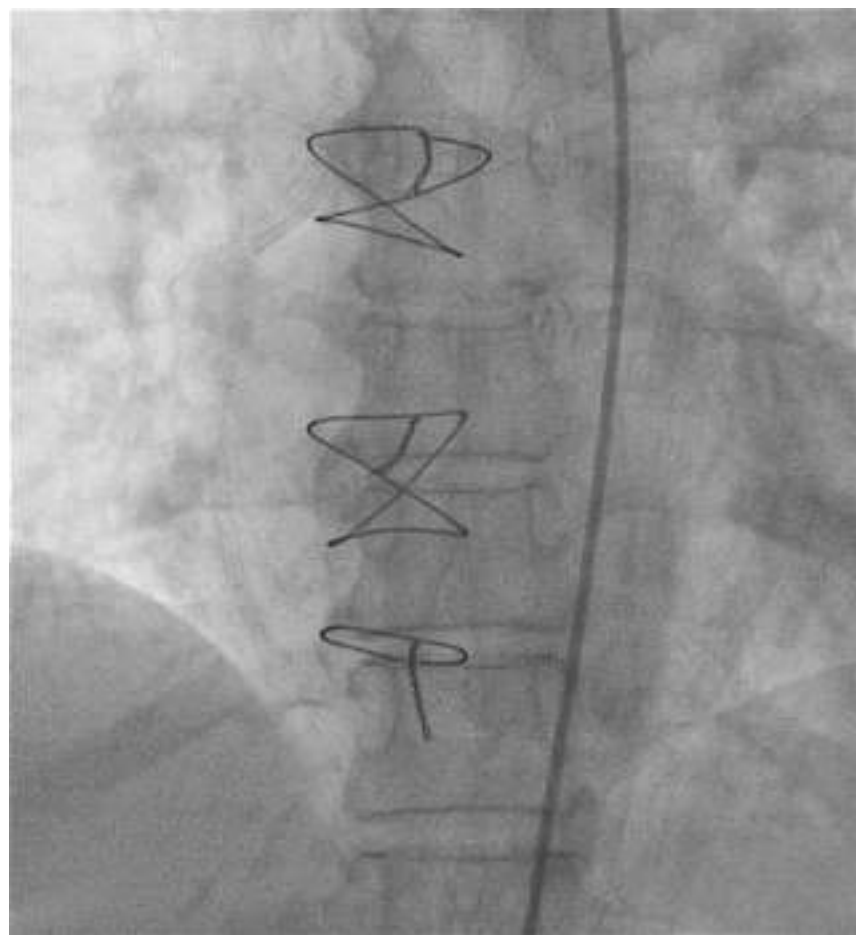
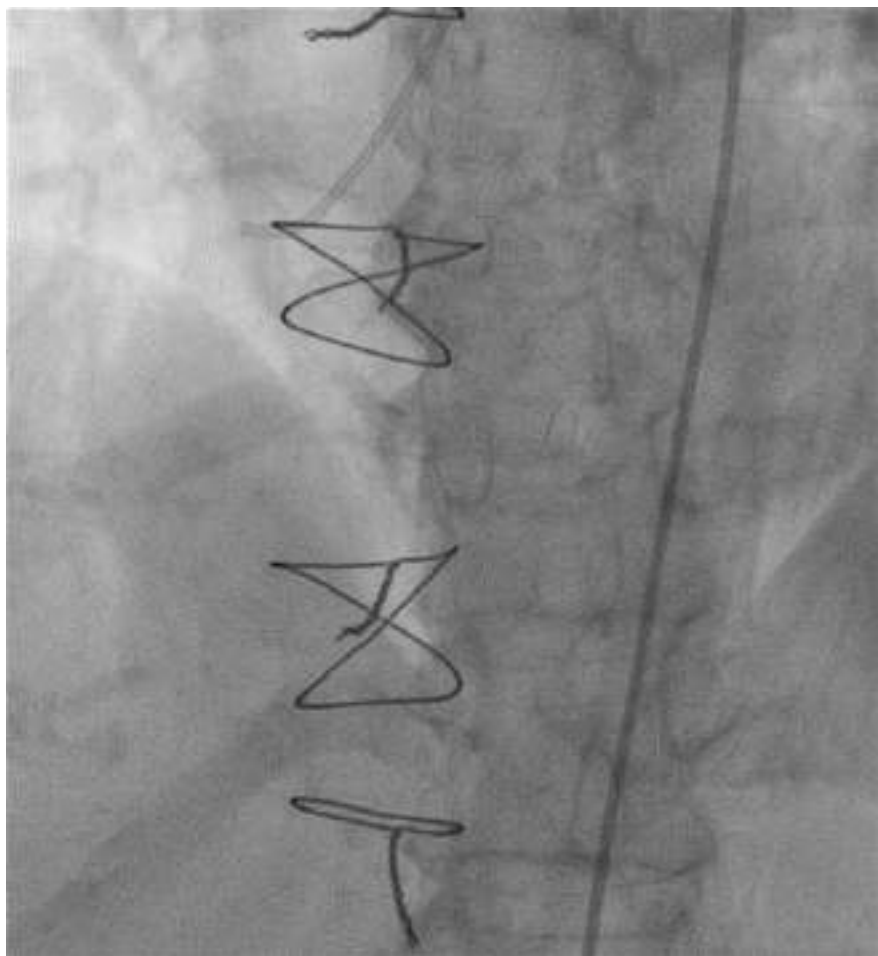
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Life long treatments

- **Antiplatelets**

- Aspirin, Clopidogrel, Ticagrelor, Prasugrel

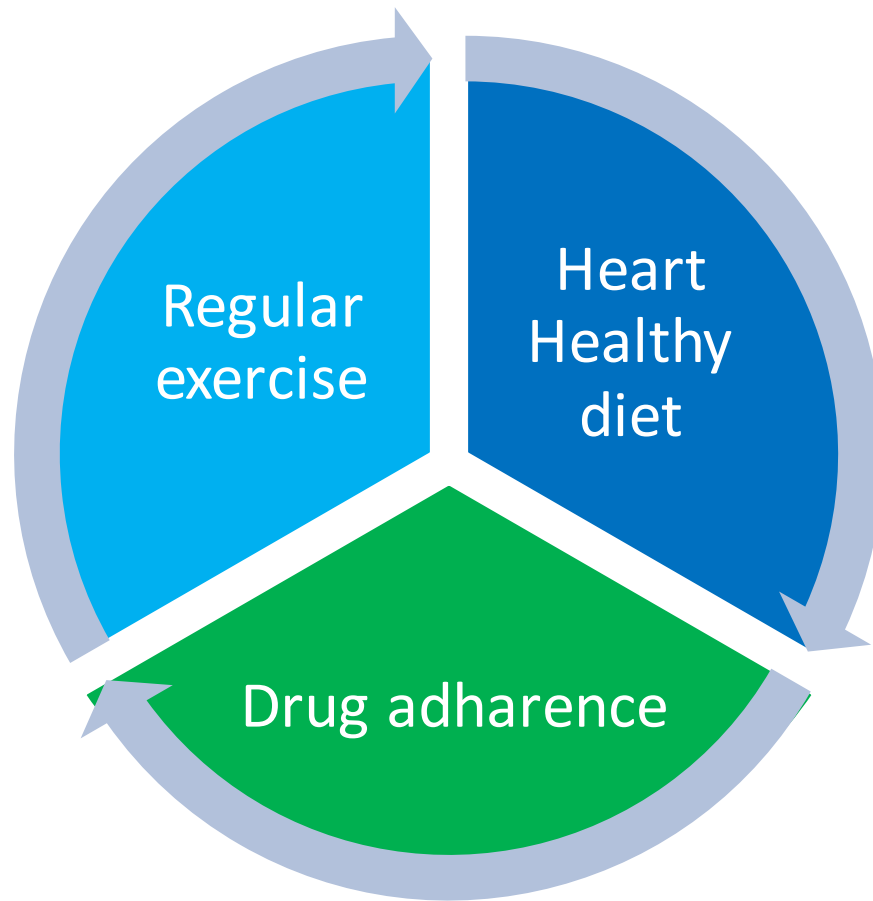
- **Statins (Target LDL < 55 mg/dl)**, after recurrent MI or recurrent PCI target LDL < 40 mg/dl

- **Anti Ischemic**

- Nitrate, Beta blocker, Trimetazidine, Ranolazine, Ivabradine

- **Treatment of other comorbidities**

- DM, HTN, BA, CKD







USE ♥ KNOW ♥

Let's embrace the power of knowledge to keep the world's biggest killer at bay.

WORLD HEART DAY
 Facebook | @WorldHeartDay
 #WORLDHEARTDAY2016




What scares you more?
*Shark attacks kill 6 people every year globally.
 Cardiovascular disease kills 21.5 million people.*

USE ♥ KNOW ♥

WORLD HEART DAY
 Facebook | @WorldHeartDay
 #WORLDHEARTDAY2016




*Lifestyle changes can help us manage
 and prevent cardiovascular disease.*

USE ♥ KNOW ♥

WORLD HEART DAY
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 #WORLDHEARTDAY2016



ARE YOU AT RISK OF ♥?

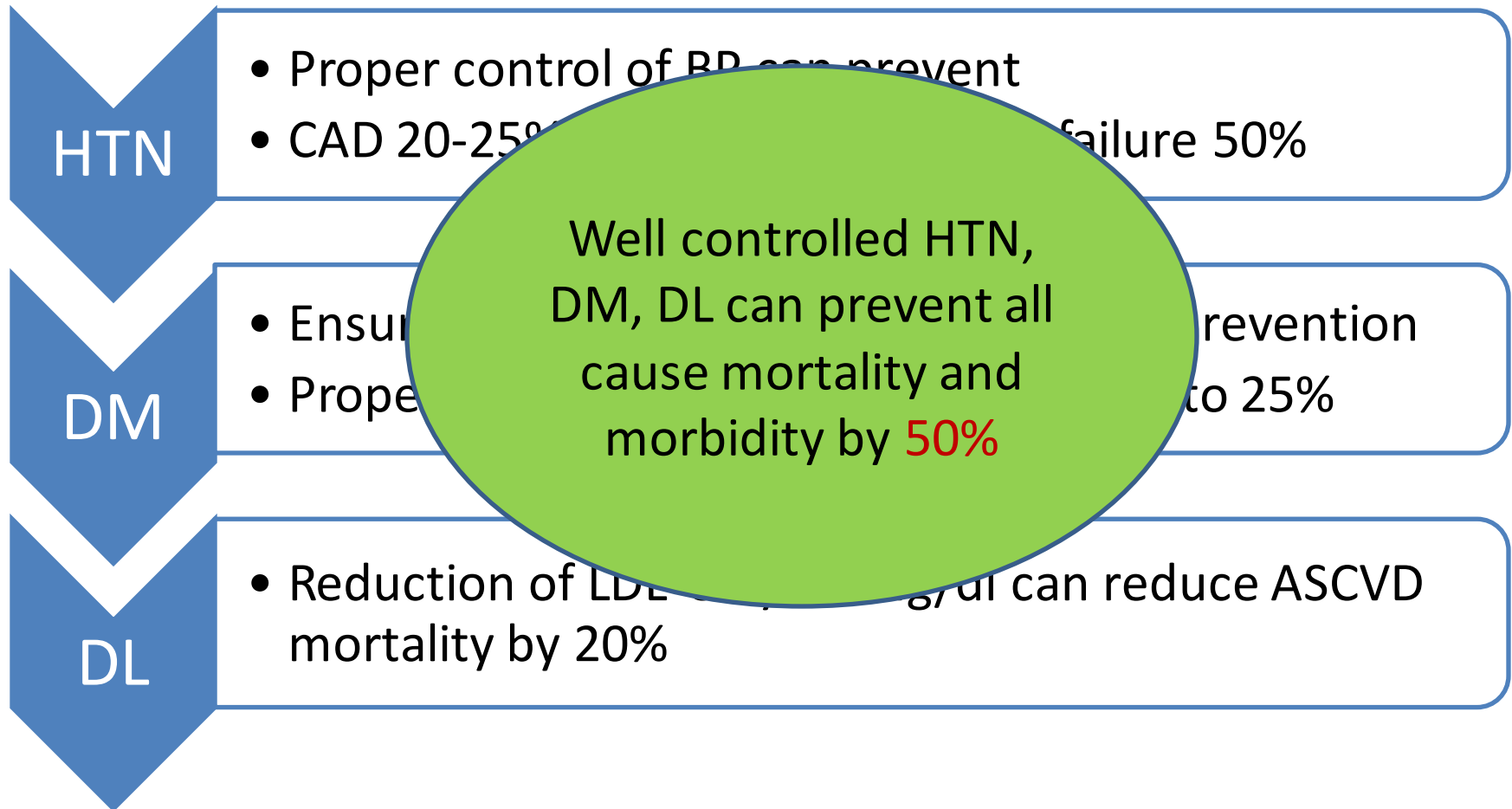
USE ♥ KNOW ♥

*What are your risk factors?
 Family history, cholesterol, blood sugar,
 blood pressure (BP) - you can take
 control of better manage your health.*

WORLD HEART DAY
 Facebook | @WorldHeartDay
 #WORLDHEARTDAY2016




Know your risk and control it



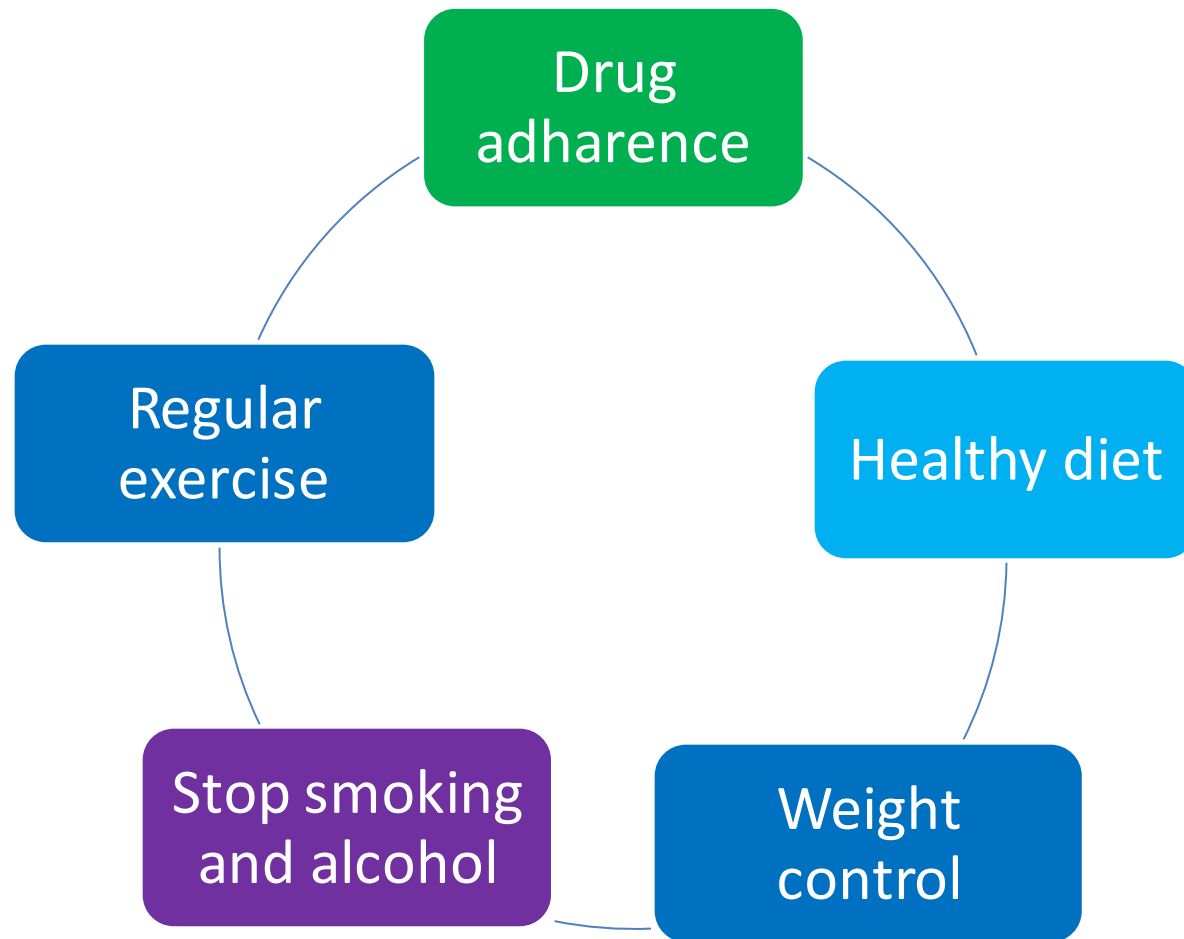
Take Home Message

- IHD is the leading cause of death worldwide
- Angiogram is the **Gold Standard** investigation
- Radial route is the class I indication
- Never stop medications after MI/PCI/CABG unless indicated
- Control all potential risk factors associated with IHD

Reference

- Manual of cardiovascular medicine 5th edition
- 2025 ESC guidelines and update



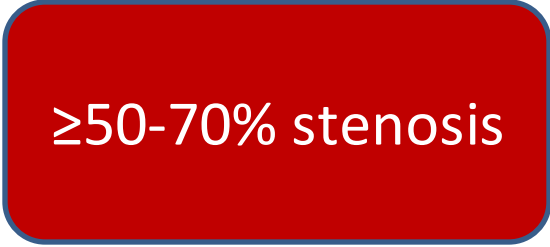


Lifestyle modification

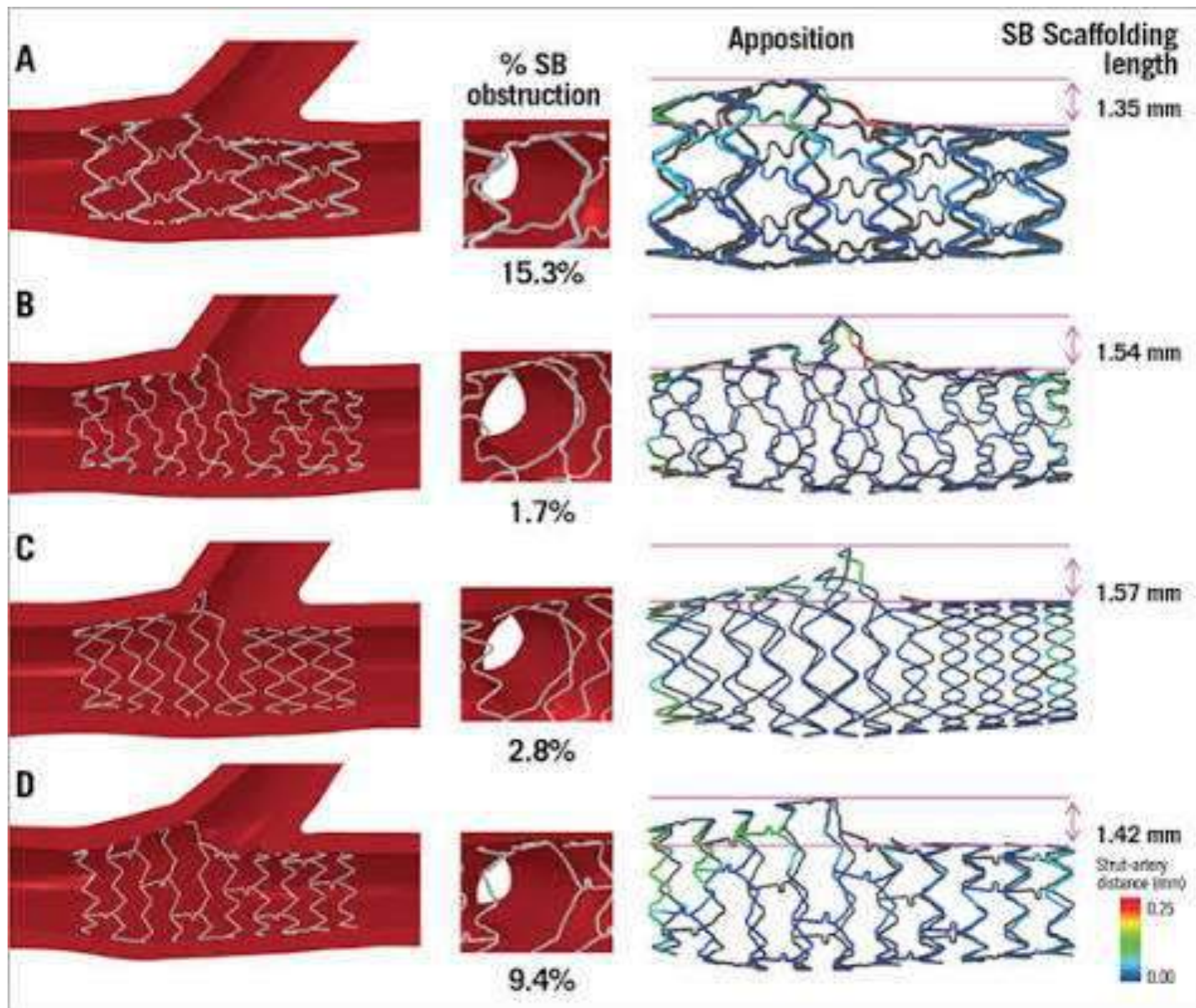
- Smoking cessation
- Regular exercise (Limited for first 4 week in acute MI)
- Weight control
- Diet (Mediterranean diet)
 - Restrict salt intake
 - Increase consumption of fresh fruits, vegetables
 - Decreased consumption of saturated fat
 - Avoid alcohol intake

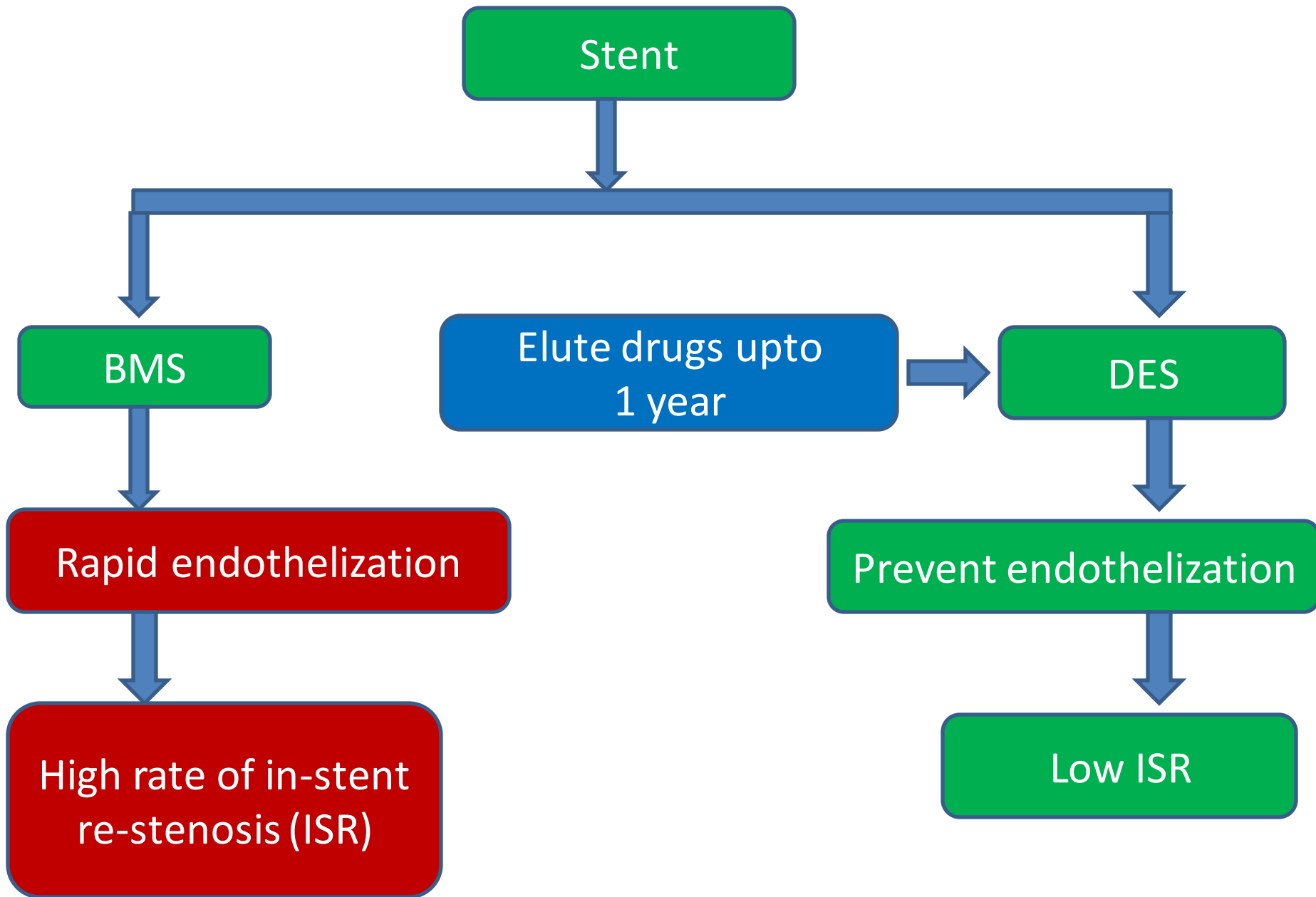
Indications

- Acute STEMI
- NSTEMI
- Unstable angina
- Stable angina with ischemic symptoms on medications



≥50-70% stenosis





MINOCA

Myocardial Ischemia with non Obstructive Coronary Artery

