



The Most Challenging and Frigthening Complications During LM Interventions: How to Tackle ?

I. Sheiban

**Director Interventional Cardiology
Pederzoli Hospital
Pescheria del Grada (Verona)/ Italy**

e-mail: isheiban@gmail.com

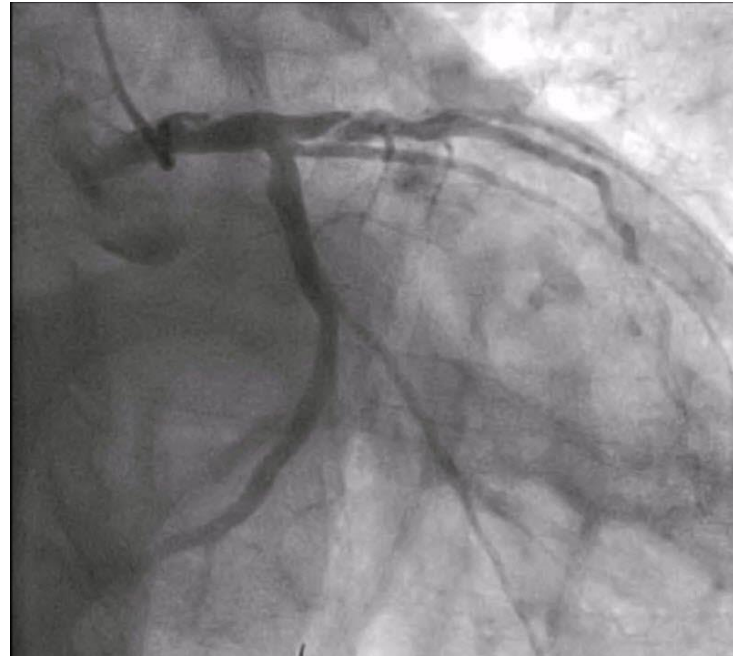
Possible Complications in Left Main PCI

- **LM dissection**
- **Aortic-Dissection**
- **Thrombosis**
- **Perforation**
- **Stent / balloon embilzation**
- **Stent deformation / Rupture**
- **Aneurysm/ pseudoamenurysm**
- **Cardiogenic shock**
- **Abrupt Vessel / branch Occlusion**
- **Stroke**

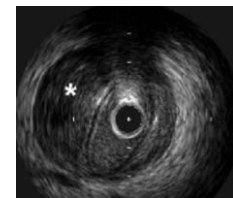
Iatrogenic Dissection

Dissection –antegrade , retrograde by guiding catheter

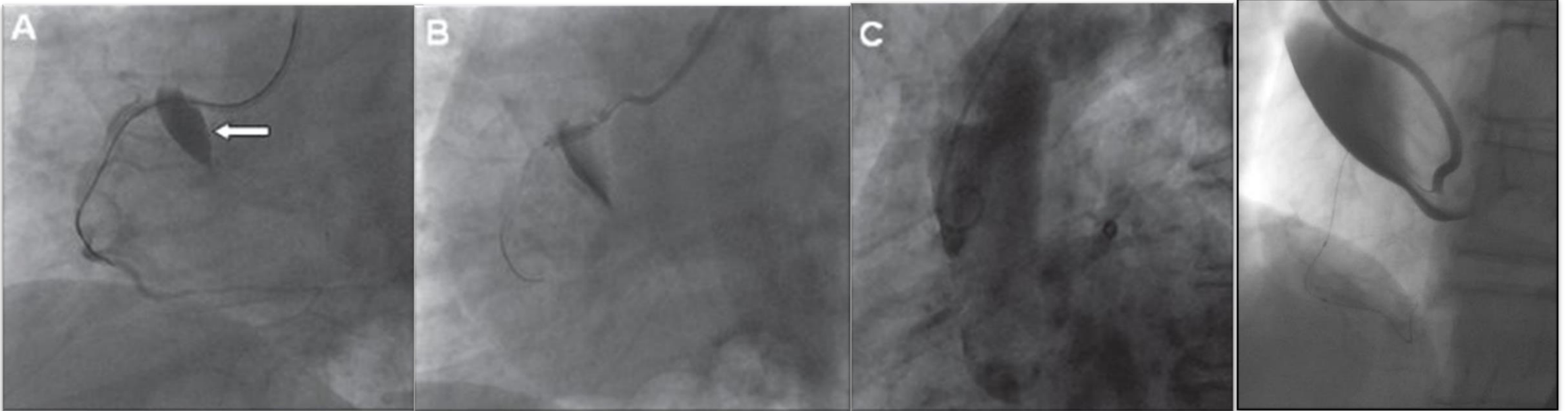
Guiding Catheter Orientation & Alignment



- Avoid further contrast injections.
- Place or retain coronary wire in the true lumen (consider IVUS guidance).
- Appropriate stent placement



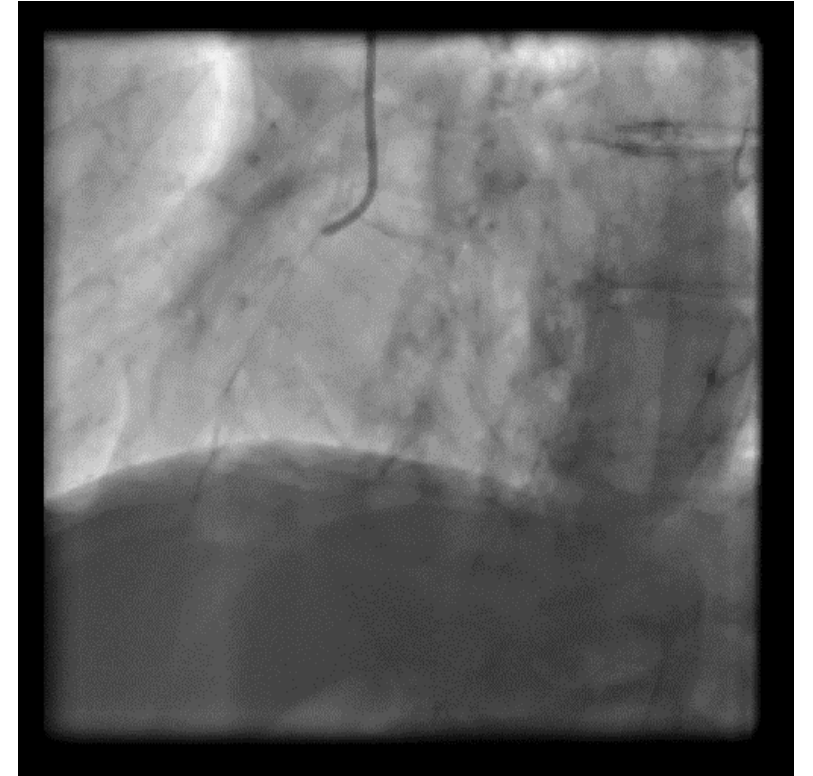
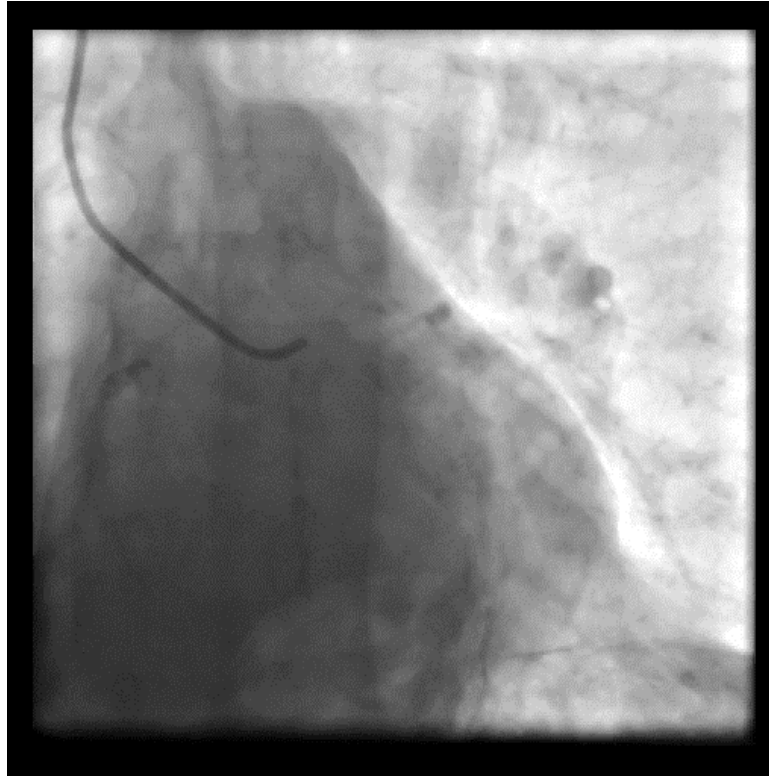
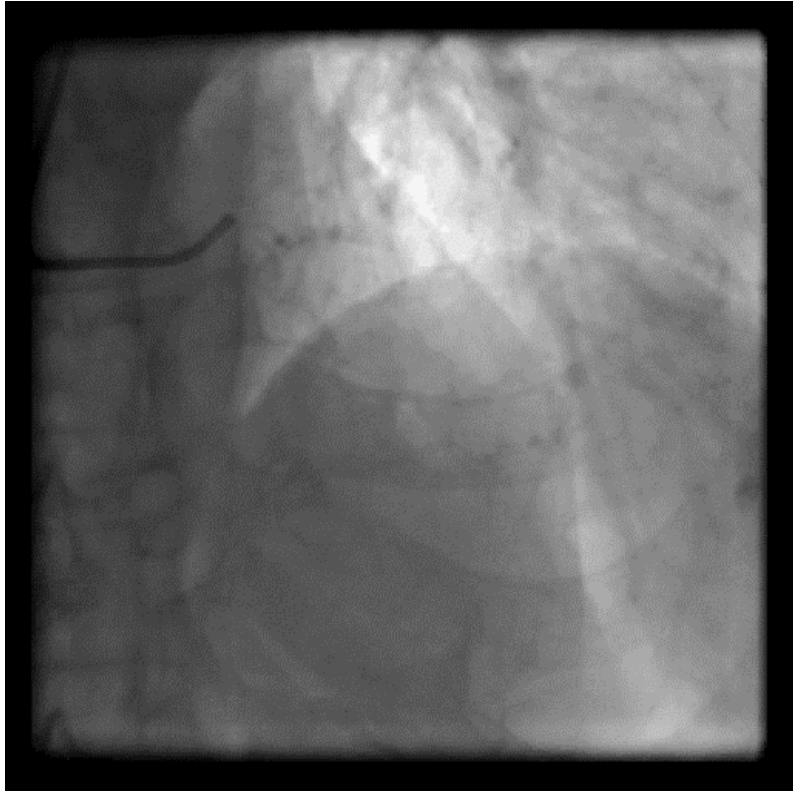
Aortic Dissection



Drammatic and extensive aortic dissection during PCI

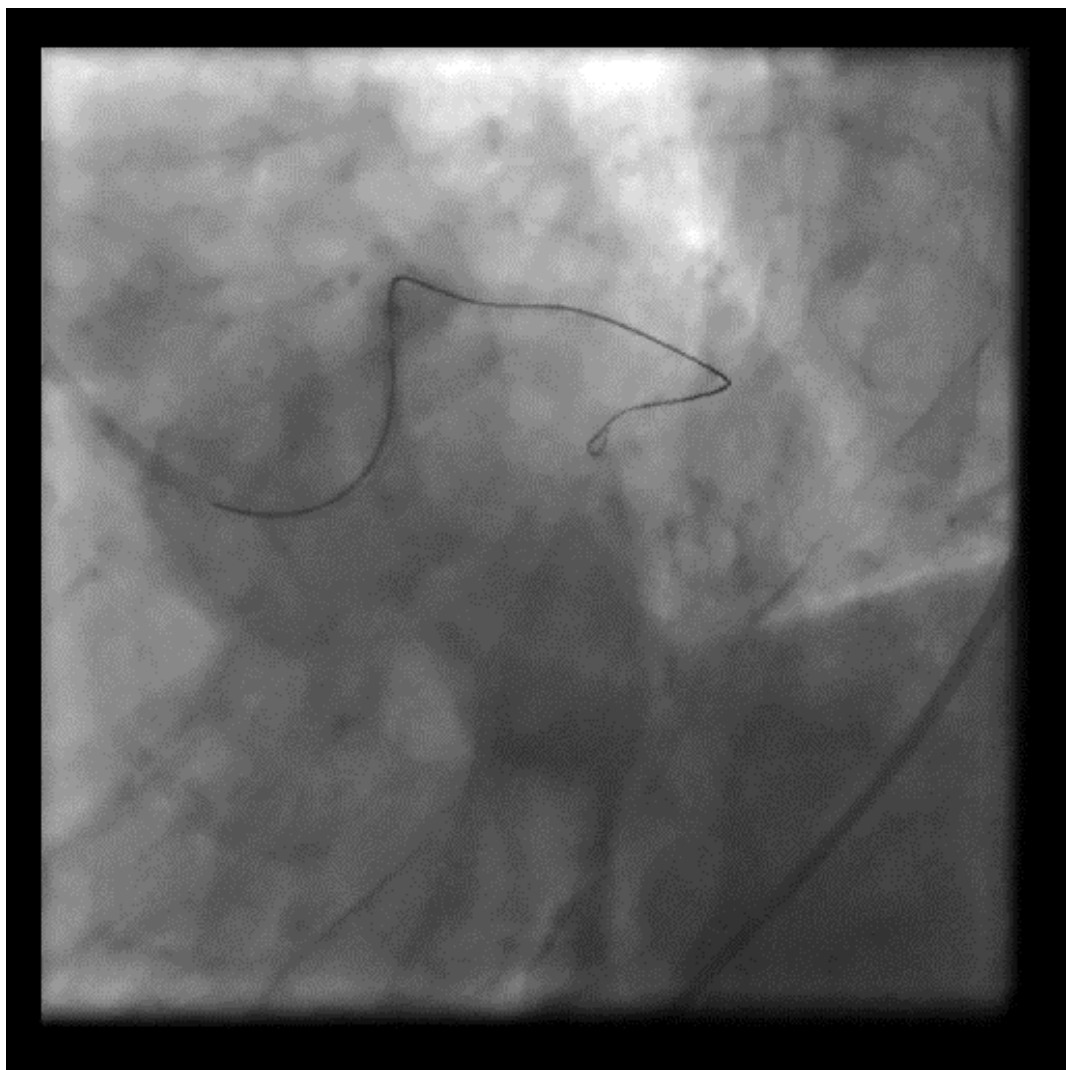
- **Stop injections , Place a stent to seal the entry point**
- **In Extensive dissection Consult Surgeon !**

R.T , Male , 84yrs

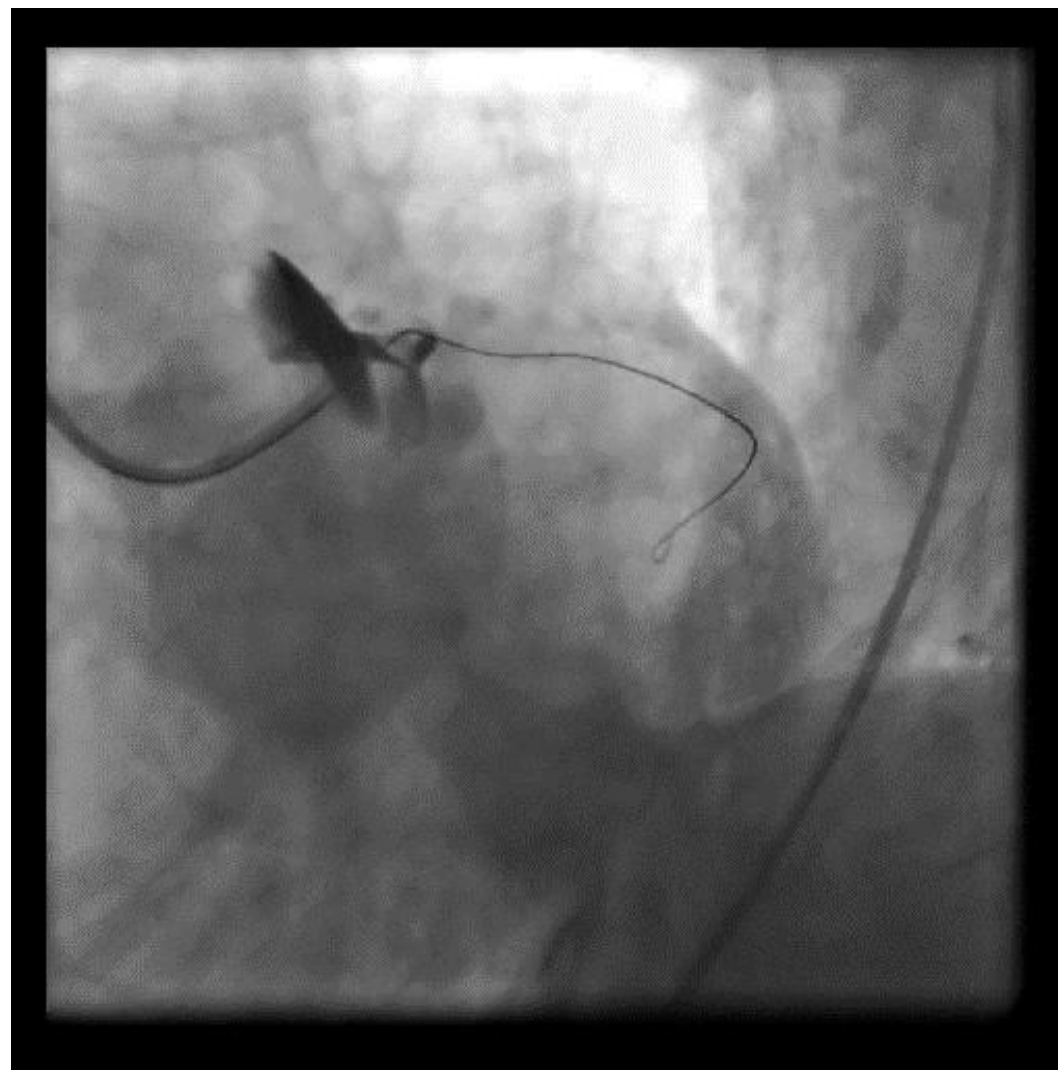


Distal LM + diffuse 3 vesele disease

R.T , Male , 84yrs

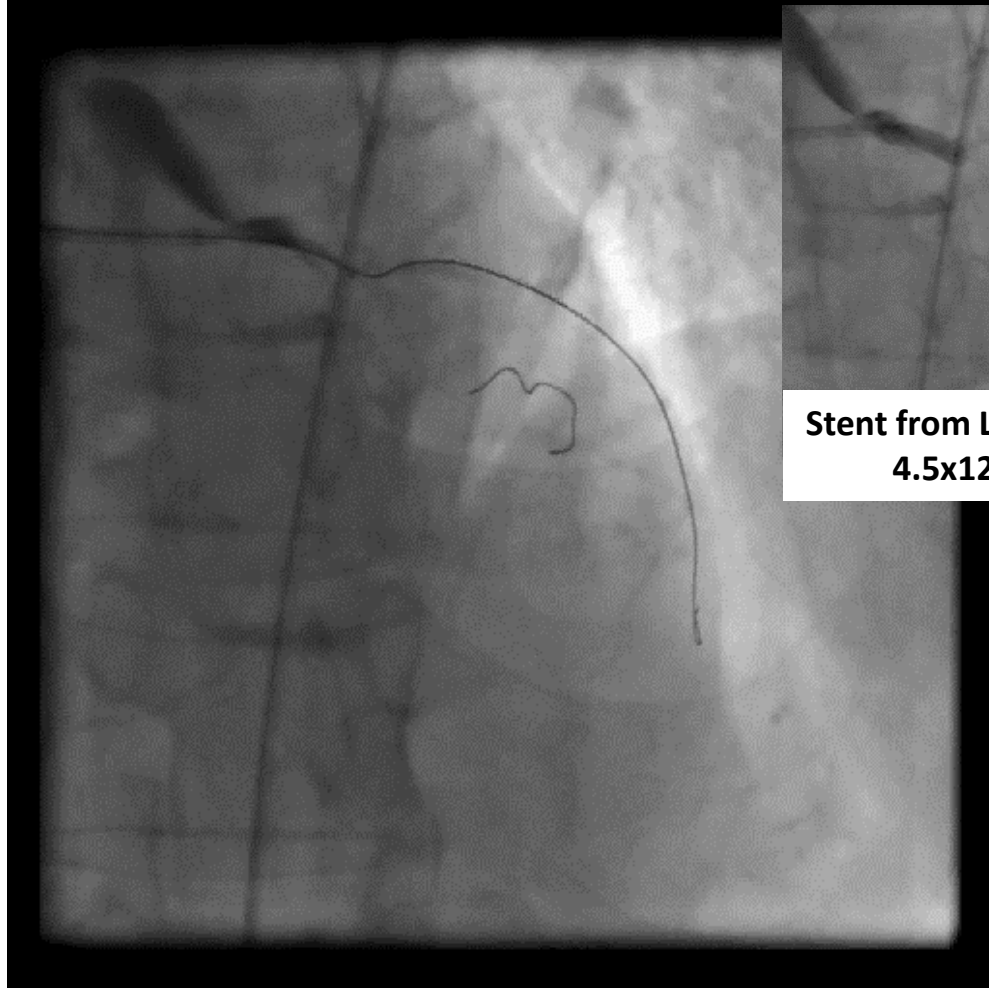


After changing GC and wiring LCX with Gaia I !!!!

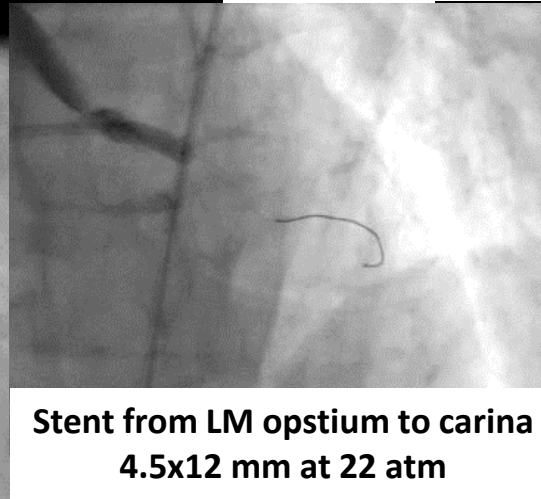


GC retrieved immediately back

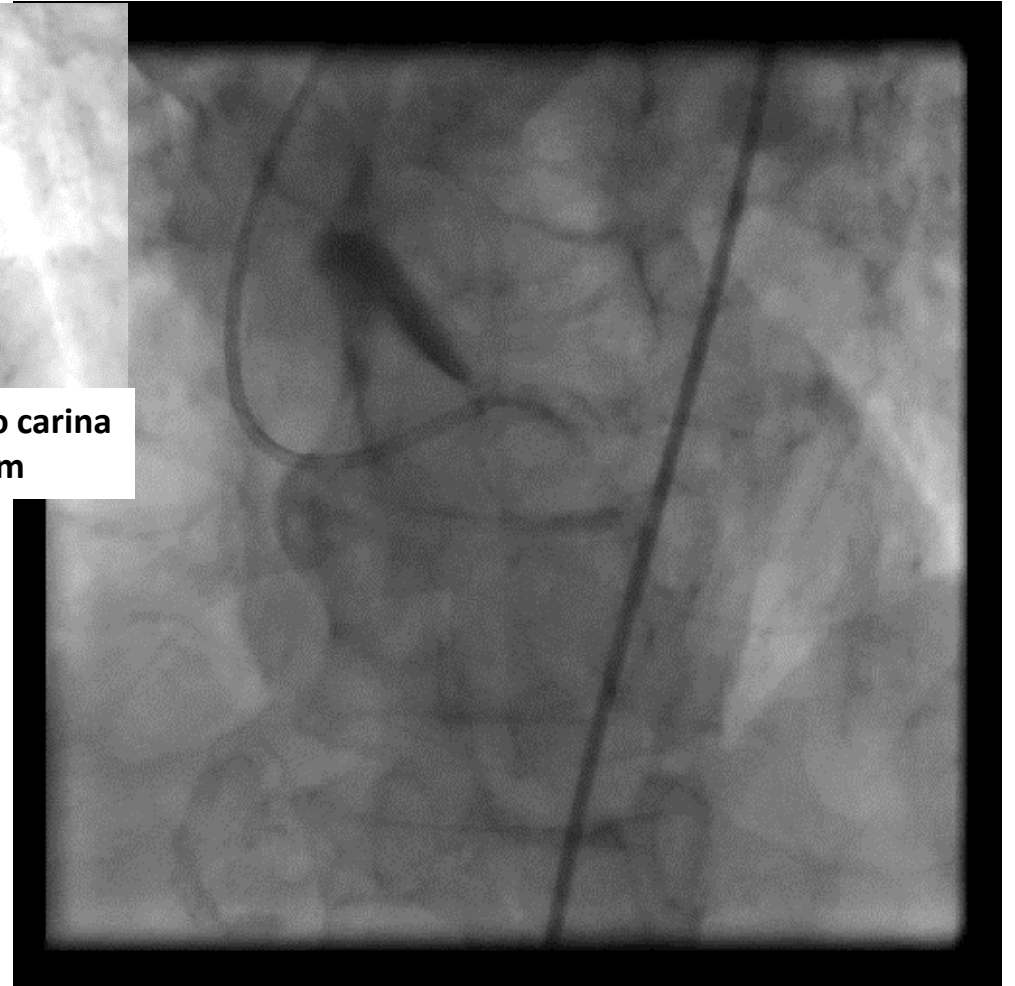
R.T , Male , 84yrs



IR and and LAD wired



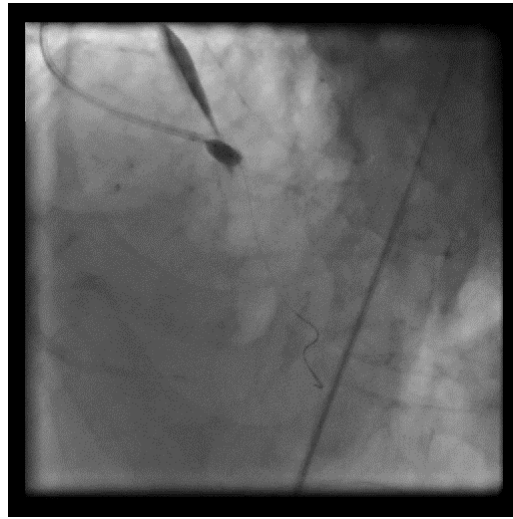
**Stent from LM opstium to carina
4.5x12 mm at 22 atm**



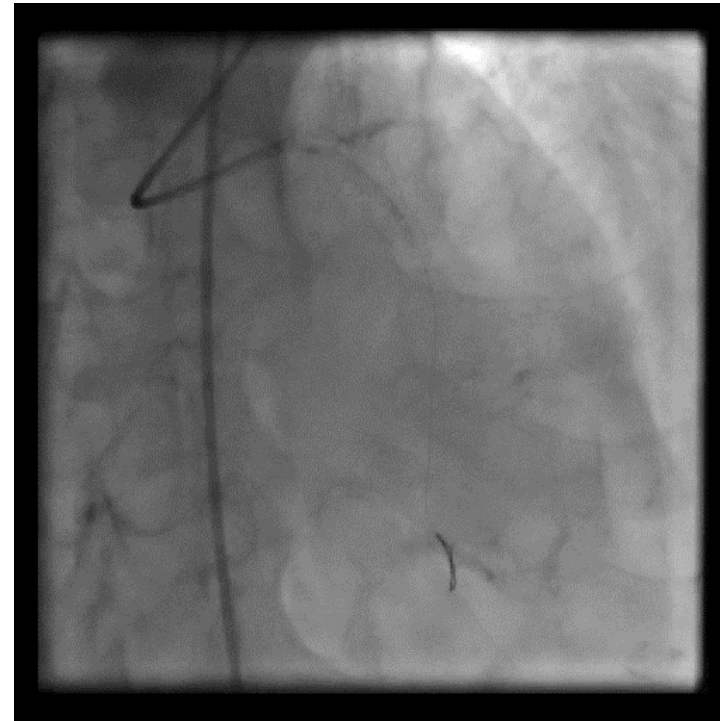
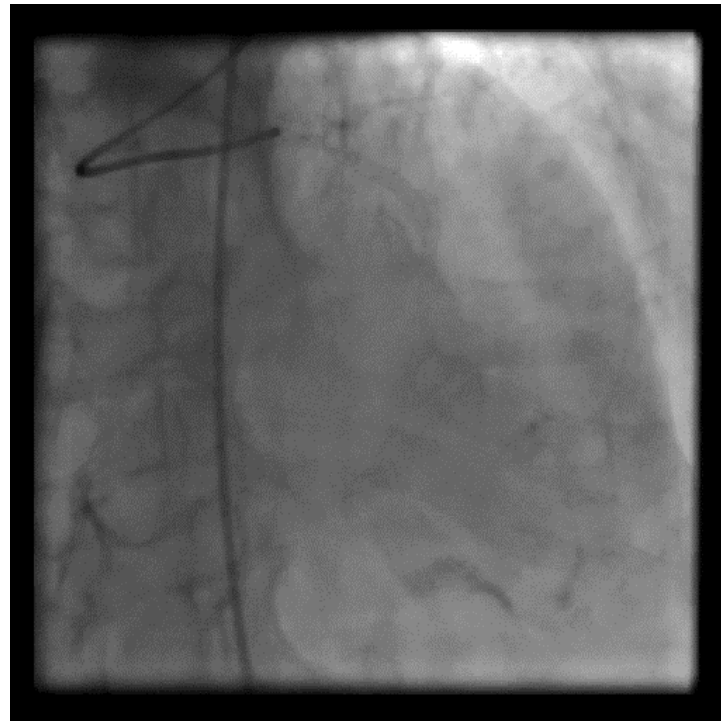
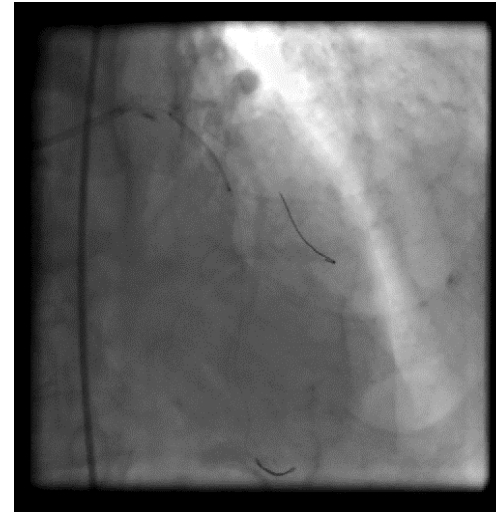
After stent deployment Gaia wire retrieved

R.T , Male , 84yrs

Stent post-dilatation with NC 5.0x8mm at 22 atm



Stent to prox LAD (3.0 x 23 mm) at 18 atm

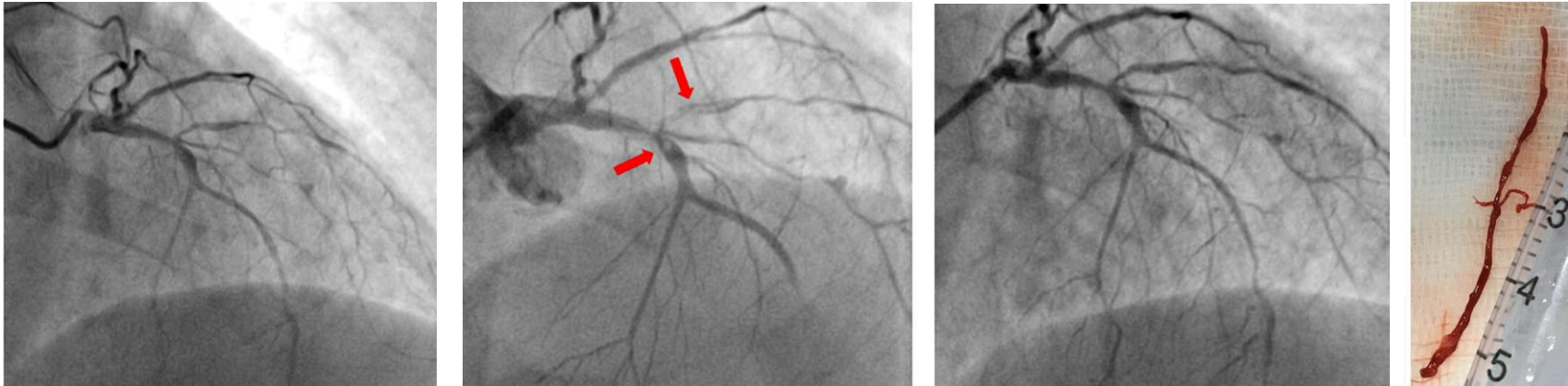


Final angio

Iatrogenic coronary thrombosis

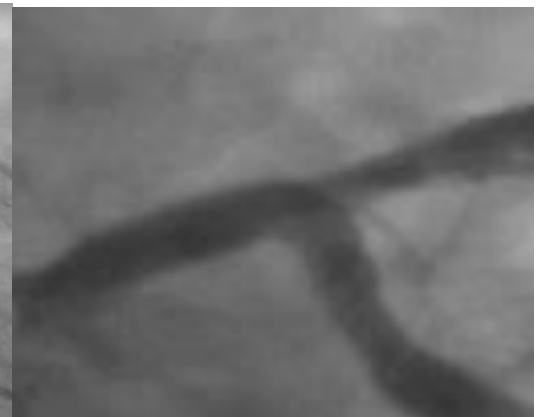
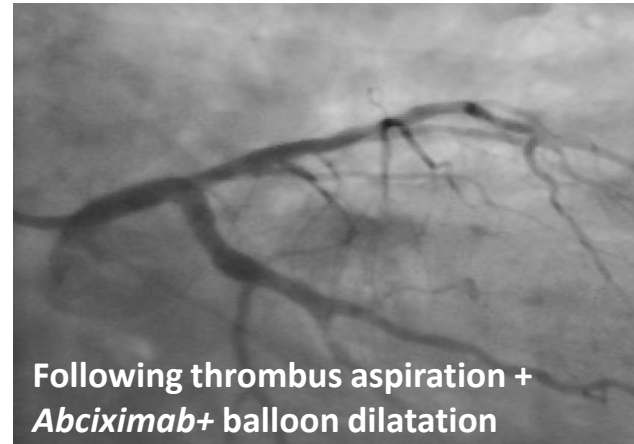
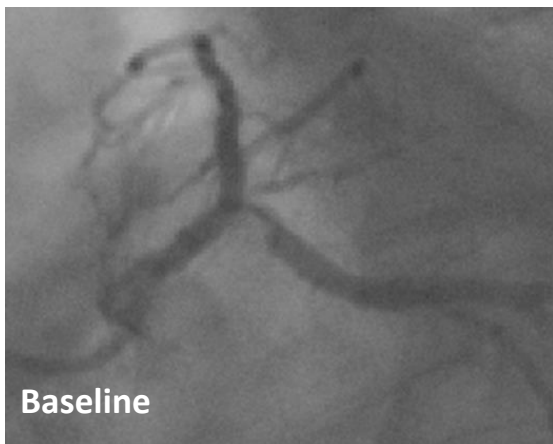
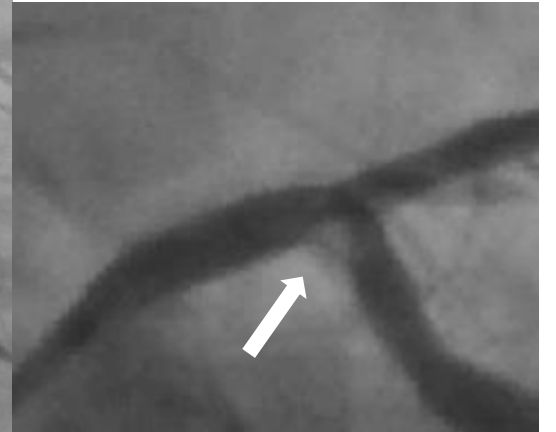
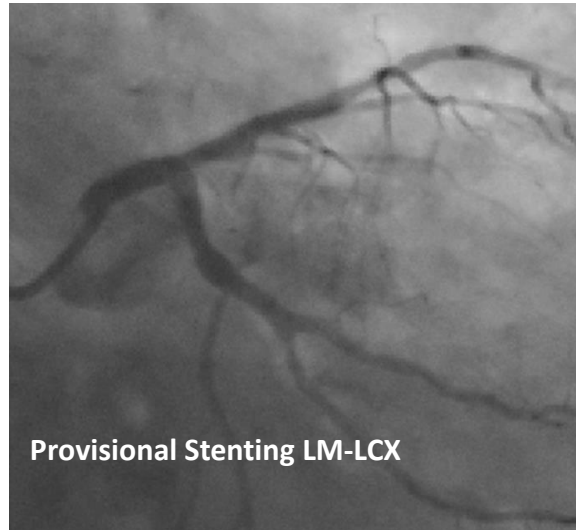
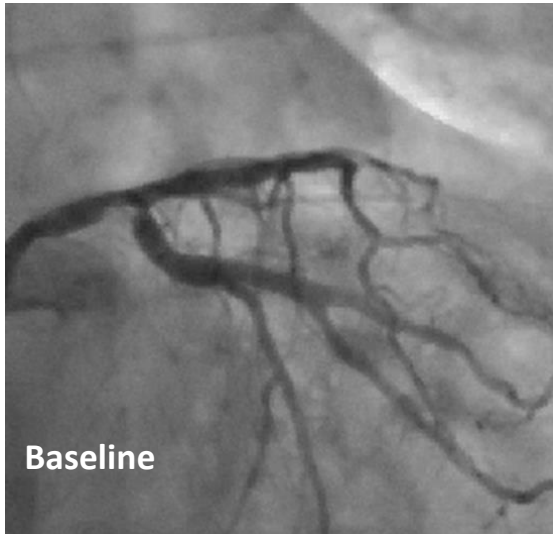
- Thrombus injected from the guiding catheter,
- Thrombus formation in situ because of suboptimal antithrombotic therapy
- Disturbed haemorrhheology from intracoronary instruments
- Accidental thrombus migration from one vessel to another (aspiration thrombectomy).

Predictors: Long *procedural time*, *complex procedures* *inadequate antithrombotic therapy*



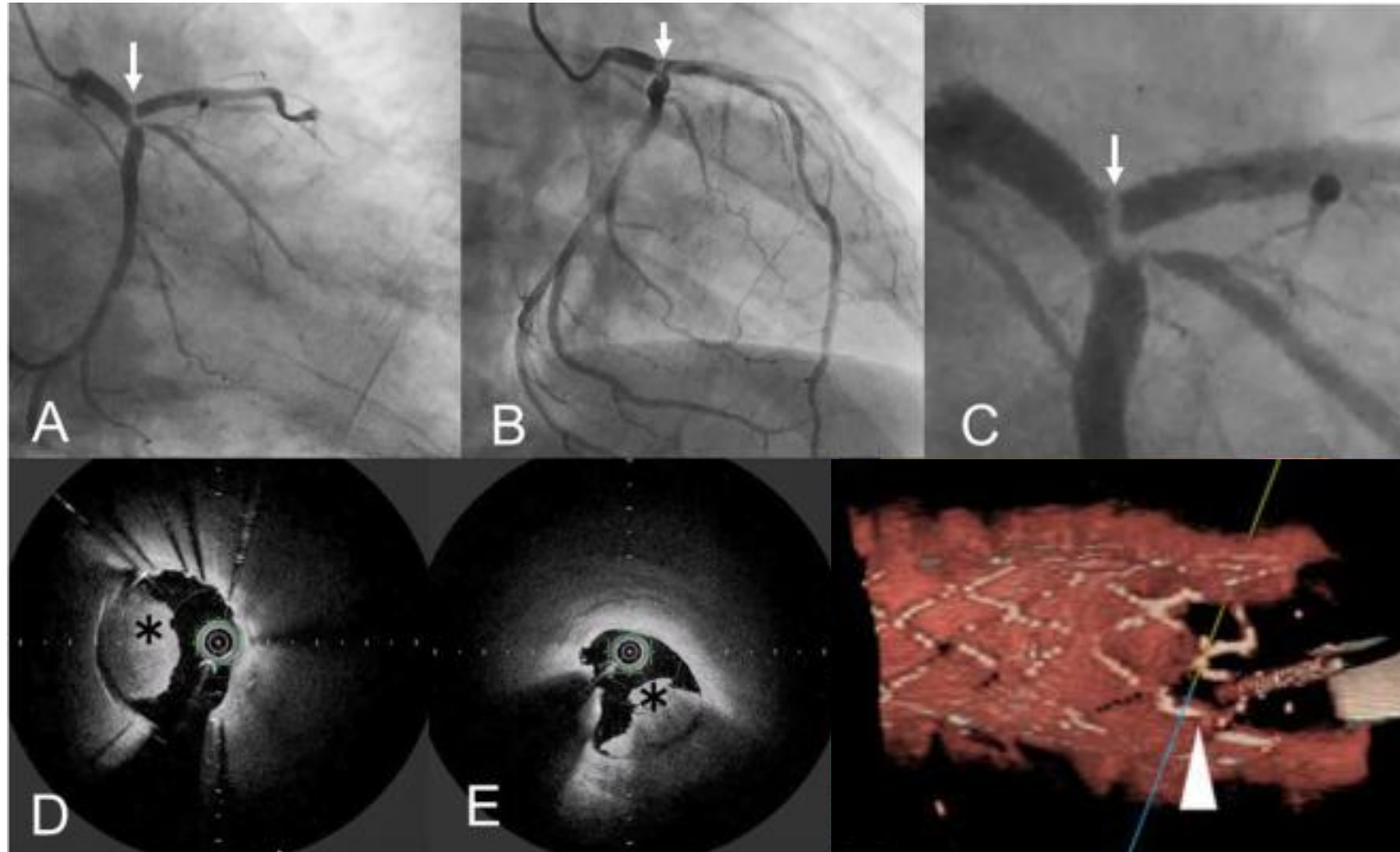
- **Thrombus Aspiration**
- **lib-IIIa inhibitors** Dose based on weight Intracoronary, intravenous
- **Alteplase 200–300 μ g** Intracoronary
- **Balloon Inflation** or agitation may disperse small thrombi causing distal vessel occlusion

LM Thrombosis During PCI

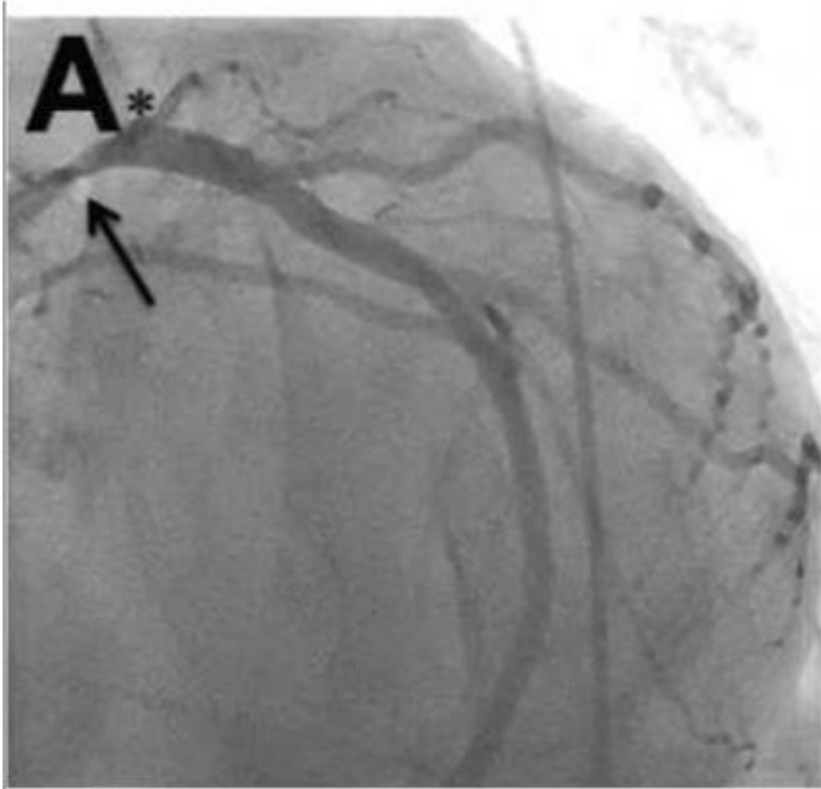


Anti-coagulant Rx : Check ACT

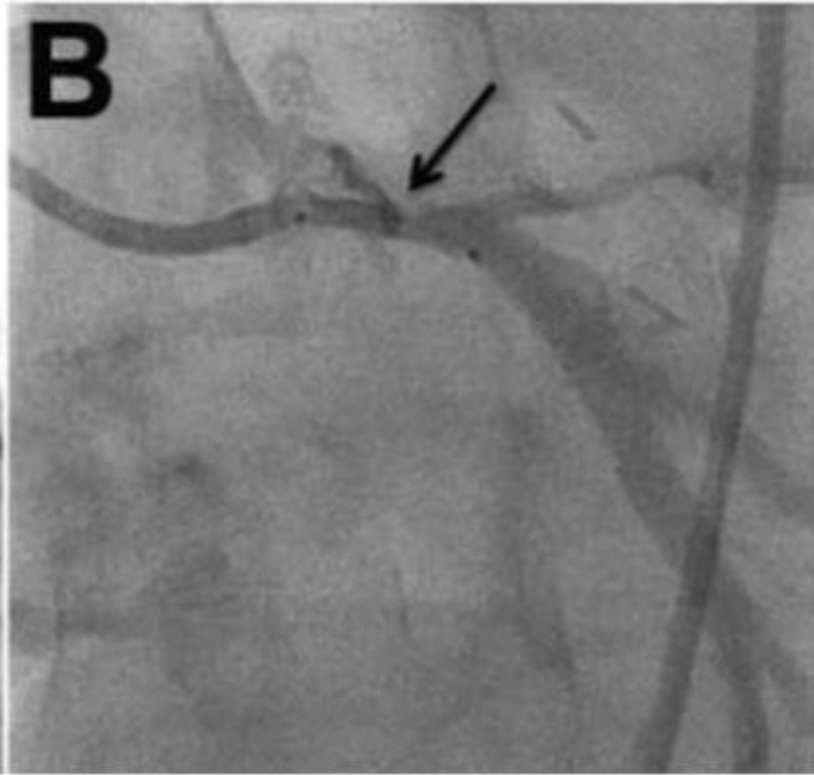
Stent Thrombosis in Distal LM on protruding struts (Metallic Carina) ..



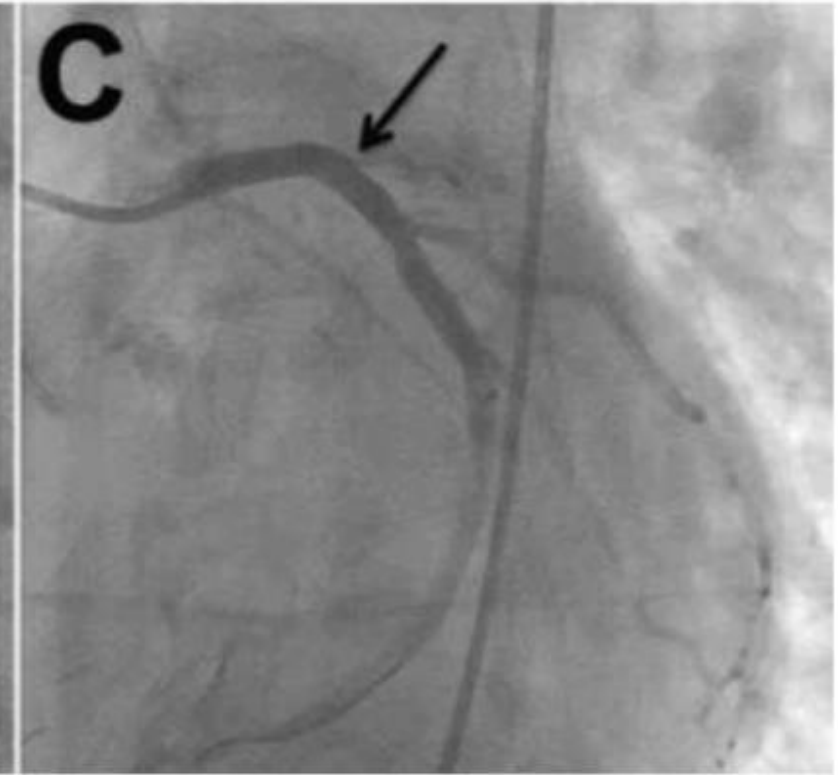
Perforation



Distal LM 90% stenosis
Ostial CTO of LAD



Following Predilatation :
Perforation at distal LM



Treated successfully with covered
stent

Coronary Perforation – Management

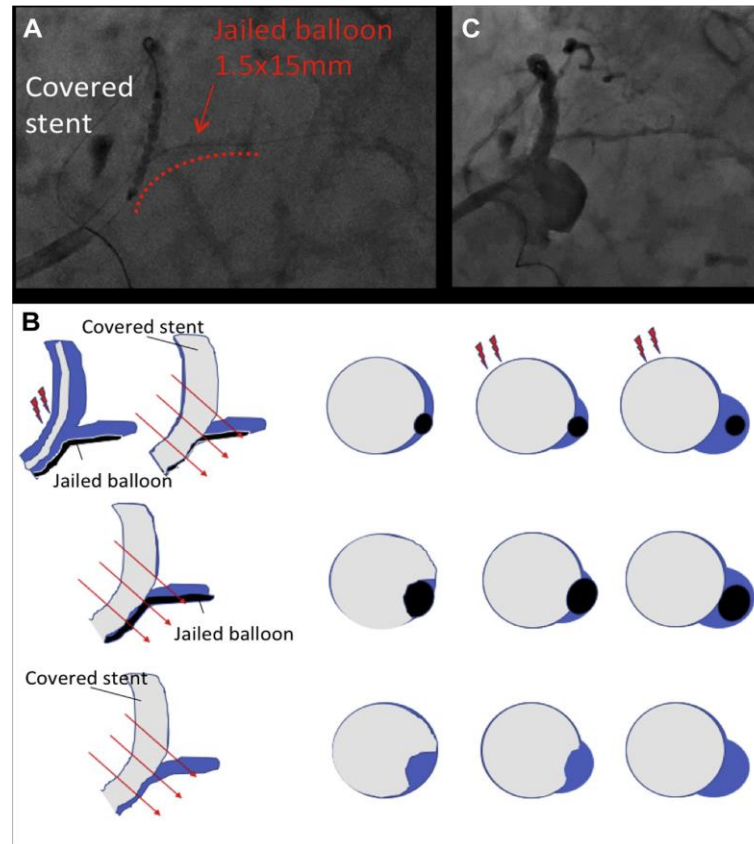
Early active management is the key!

- Prompt recognition
- Address haemodynamic instability
 - Pericardiocentesis
 - Fluid resuscitation
- Management of anticoagulation
 - Reversal of heparin generally not recommended
- Specific treatment
 - Balloon tamponade
 - Embolization / Coiling
 - Covered stents



Long Inflations and Covered stents is not always possible to use in LM perforations

Usefulness of the Jailed-Balloon Technique in Percutaneous Intervention for Severe Coronary Perforation Involving Left Main Bifurcation

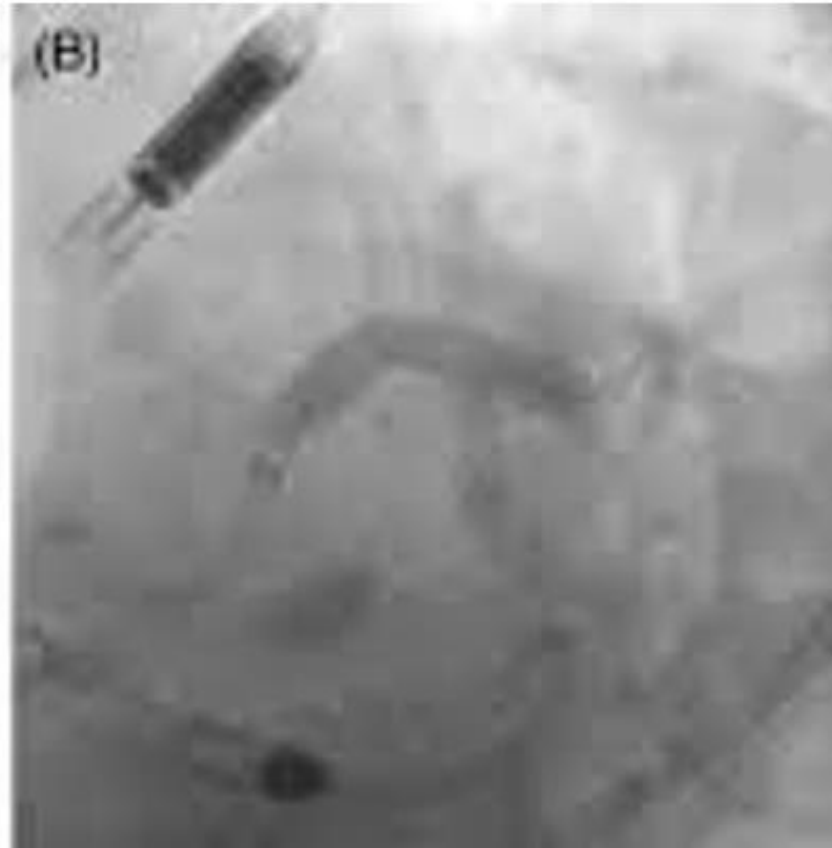


LM Perforation Location is important for the management : Distal

Treatment of rotablation-induced ostial left circumflex perforation treated by papyrus covered stent and its fenestration to recover the left anterior descending artery during CHIP



Ostial LCX perforation following Rota and DES implantation

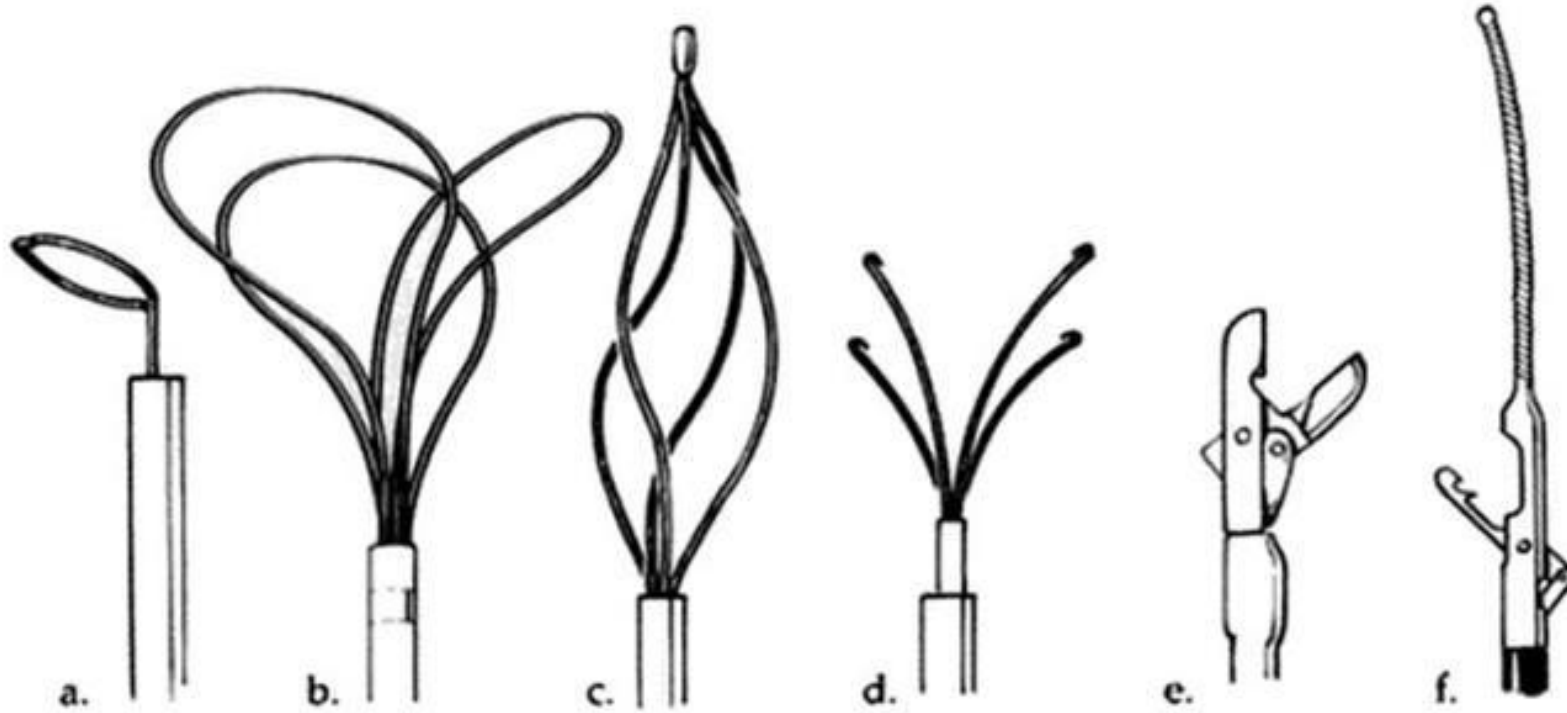


Covered Stent LM to LCX to seal the perforation

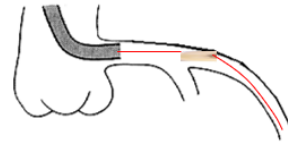
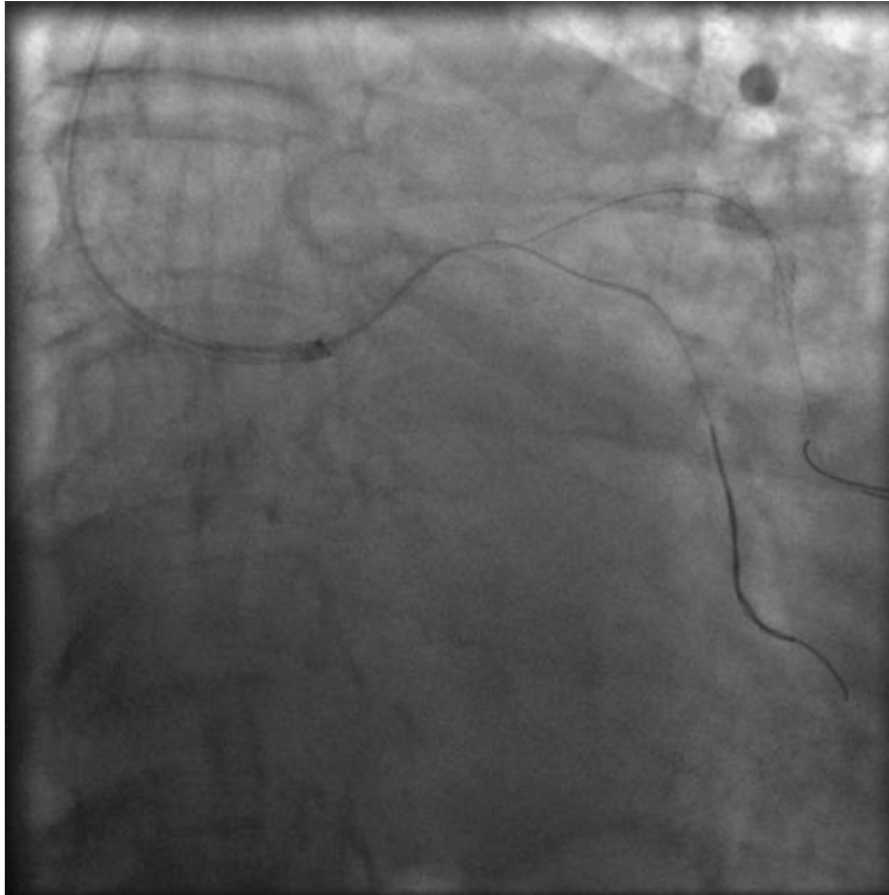


Fenestration of the covered stent to LAD with stiff wires and balloon dilatation

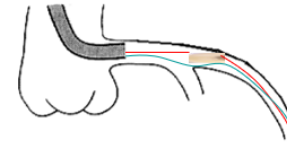
Dislodged stents Retrievements :



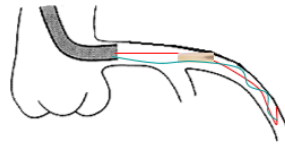
Twisted wire technique for retrieval of stent dislodgement in the LM



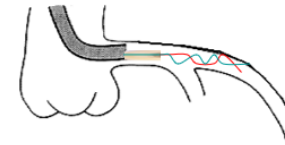
Dislodged stent on the wire



A second wire is advanced through the stent struts or beside the stent



Twisting the two wires together, the twisted end can trap the stent



Withdraw the two wires with the stent to guiding catheter then the whole system (catheter, wires & stent)



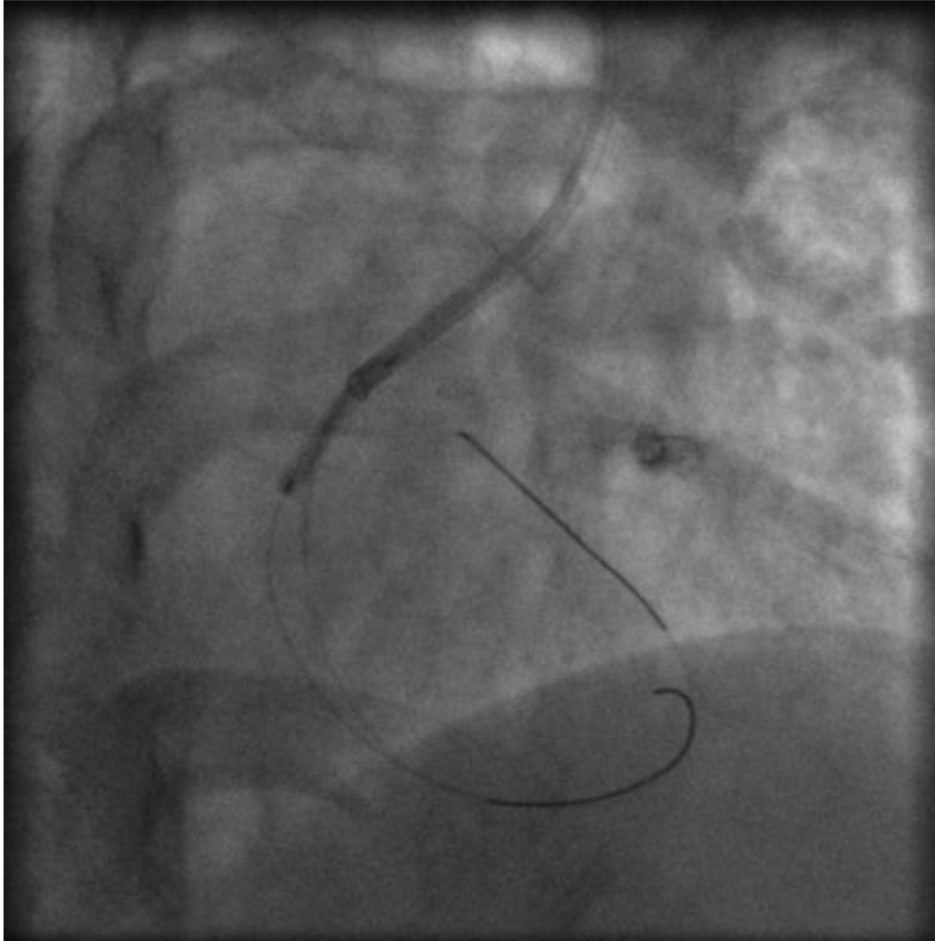
- One or 2 additional GWs are introduced pass the dislodged stent & the proximal ends of the 3 GWs are fixed with a rotator
- All (2-3) wires are rotated 30-40x until they are seen to respond.
- Gentle traction is applied to pull the entire C/GWs/stent as a unit.

Other removal techniques:

Use of :

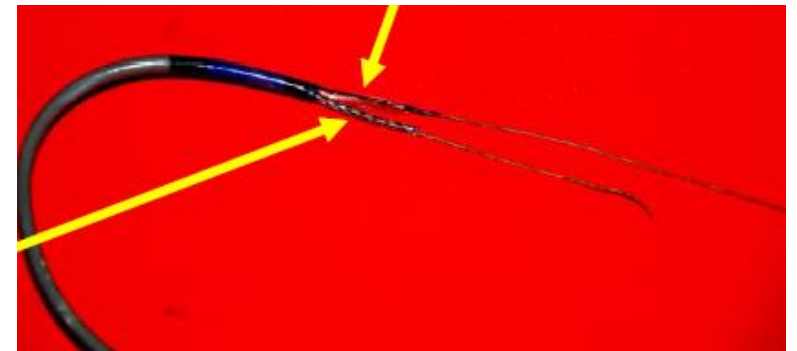
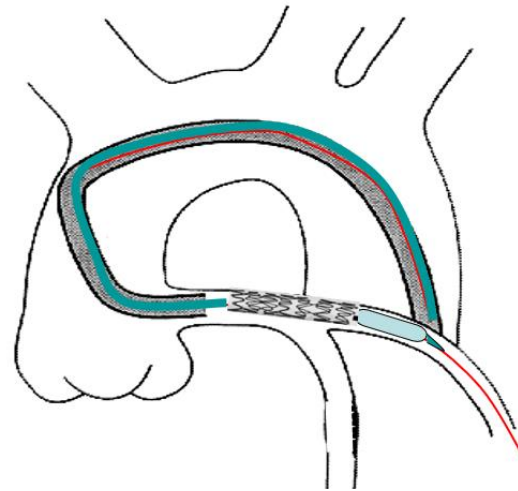
- small balloon distally
- snare

Balloon fixation technique for retrieval of stent dislodgement in the Aorta

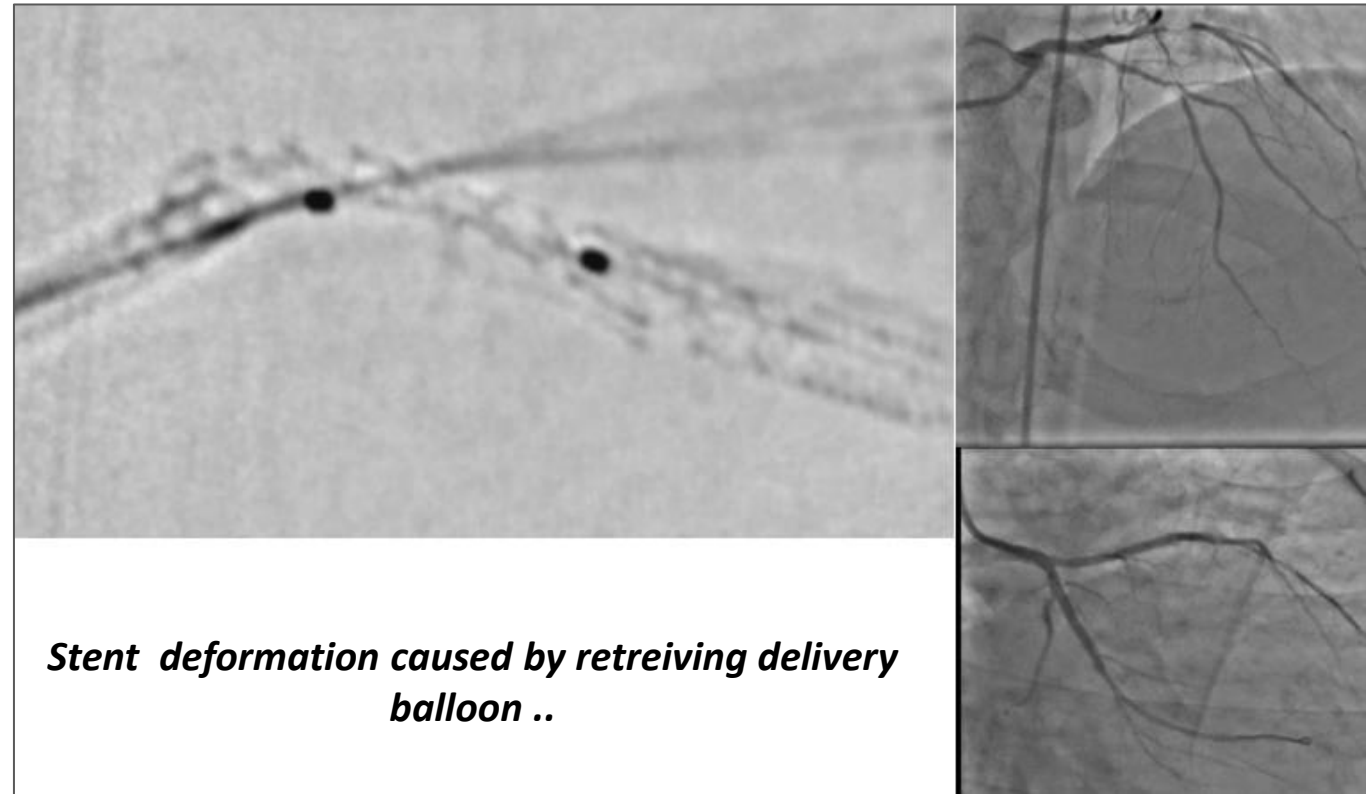
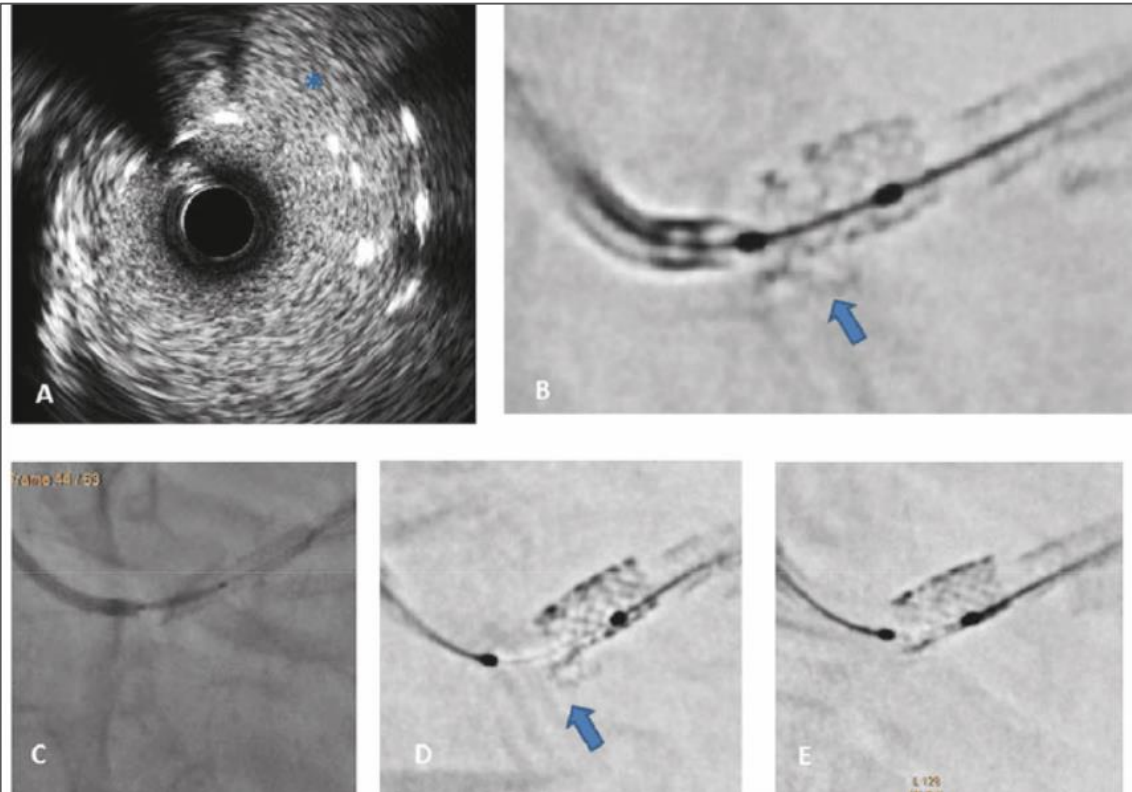


If the stent is free in the aorta, it will be embolized to the peripheral circulation & generally there is no serious consequences

If the stent is still hanging on the GW, use a balloon to fix it on the tip of the GC, then gently pulled the whole system (GC/GW/stent) as a unit



Stent Deformation



Cardiogenic Shock complicating LM PCI

BA, 46-yr , Male .

- ***Cigarette Smoker (30 /day)***
- ***Dyslipidemia***
- ***Hypertension***
- ***Familiarty for CAD***

January 2022 NSTEMI as first clinical manifestation

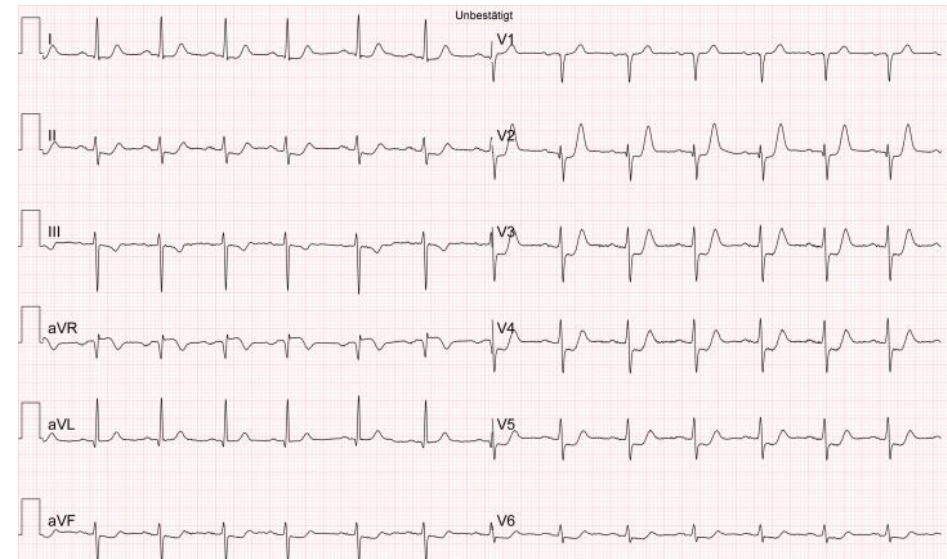
He was admitted to another hospital with:

- **Persisting Chest pain started 20 minutes before arrival to the hospital .**
- **SBP = 105mmHg , Pulse : 98 bpm , O2 sat= 94%**
- **ST dperession (2 mm) in infero-lateral leads**
- **T tropopnine = 470 ml/l**
- **Creatinine = 0.9 ml/dl**

Medical Rx: Hepain , ASA , Nitrates , Betablocker

Transferred to our hospital for coronary angiography

ECG at arrival



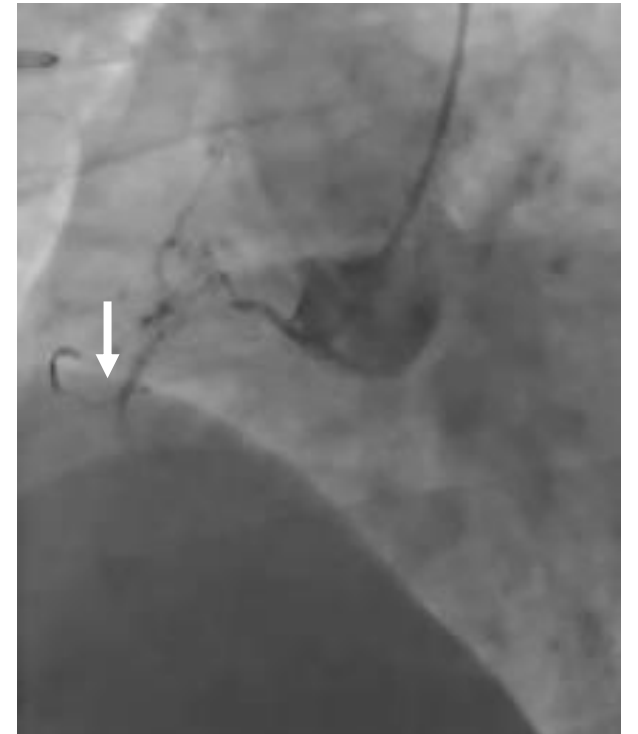
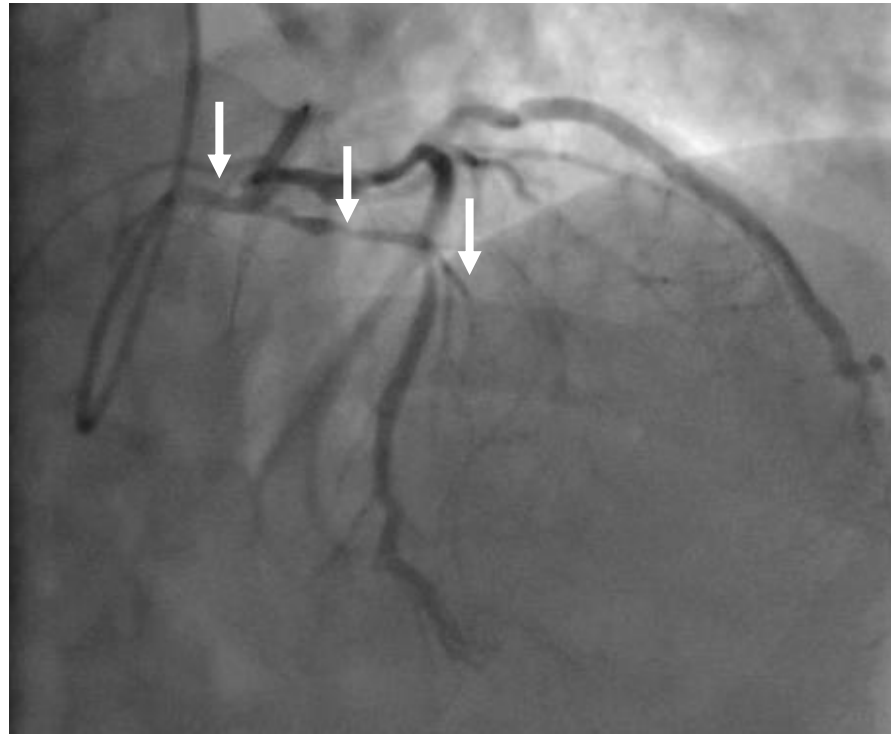
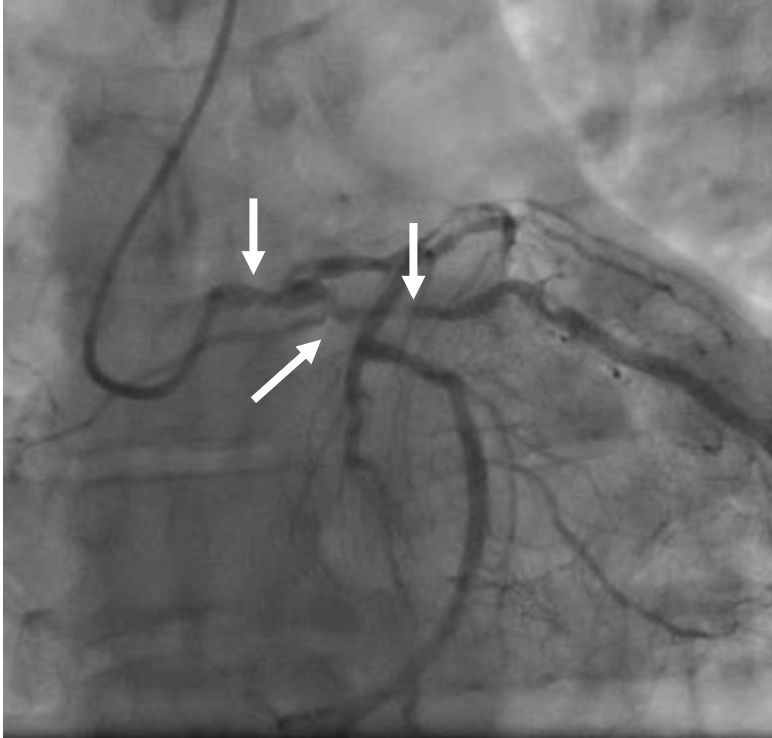
Chest pain reduced .

SBP = 110 mmHg

O2 Sat = 95%

Dropped to Cath Lab

Culprit Lesion LM- LCX- OM
High Syntax = 41



Complex anatomy with high Syntax Score

CABG is the most appropriate option

After wiring LAD , LCX and OM :

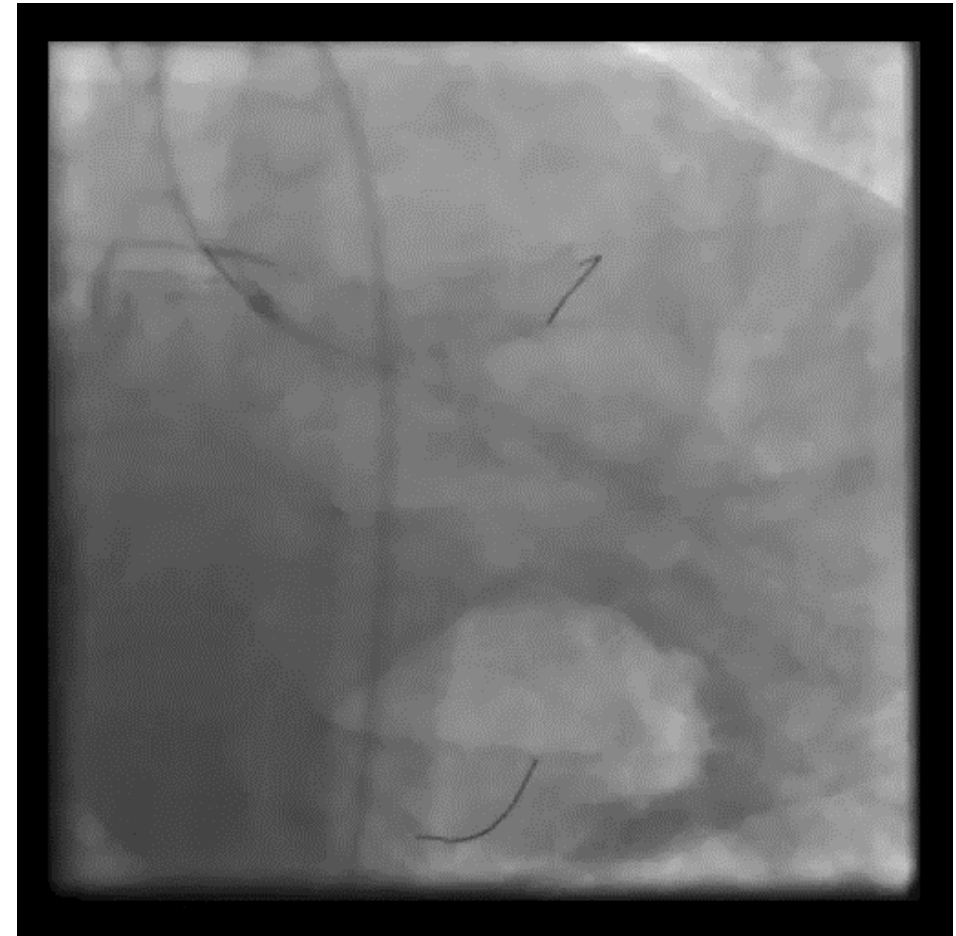
Soon After Angio (patient still in Cath Lab) :

Increasing Chest pain with ST elevation in Infero-lateral wall

We Decided to proceed for PPCI to culprit vessel LCX –OM + LM :

Given the High Risk Pocedure :

- **Femoral Access : 7F GC**
- **Controlateral Femoral Access -6F- ready if needed MCS**



• **SBP = 85 mmHg , Polse : 52 bpm , O2 sat= 91**

2 Essential Issues :

- MCS : soon (before starting the procedure)**
- PCI : only Culprit lesion LCX – OM**

MCS (IABP)

Intubation

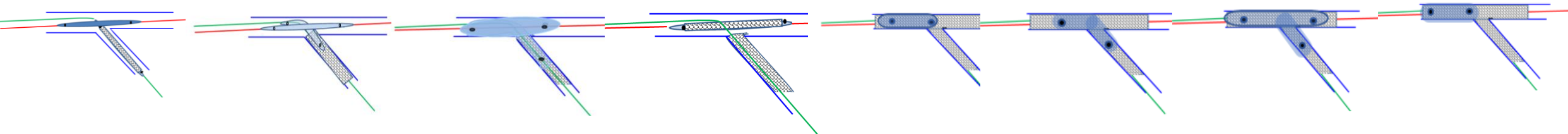
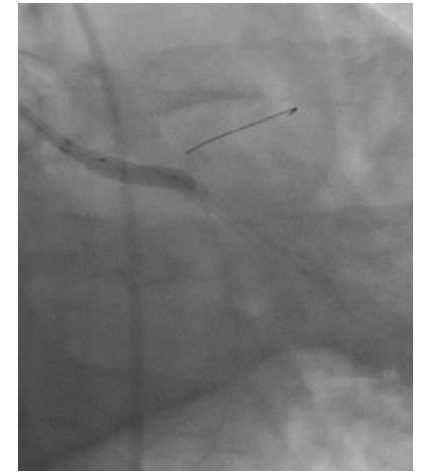
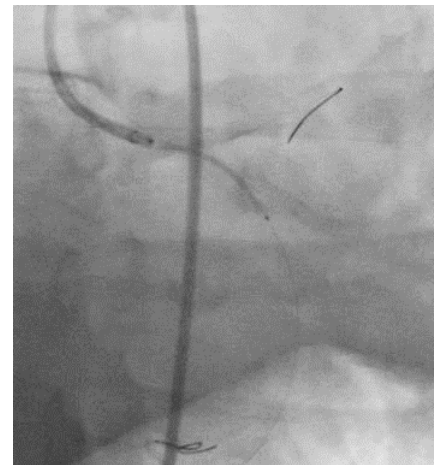
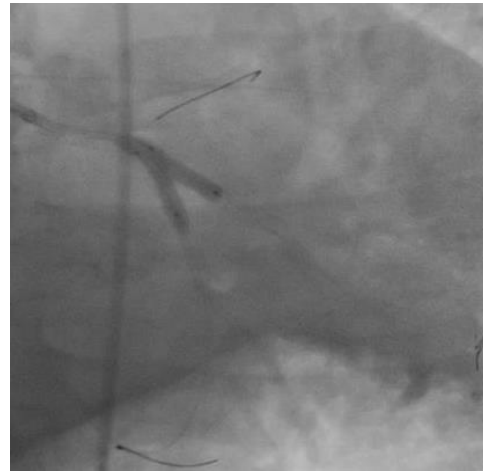
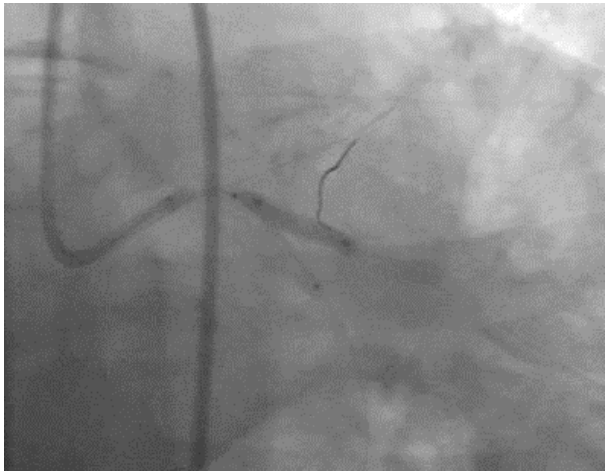
Anesthesiologist assistance

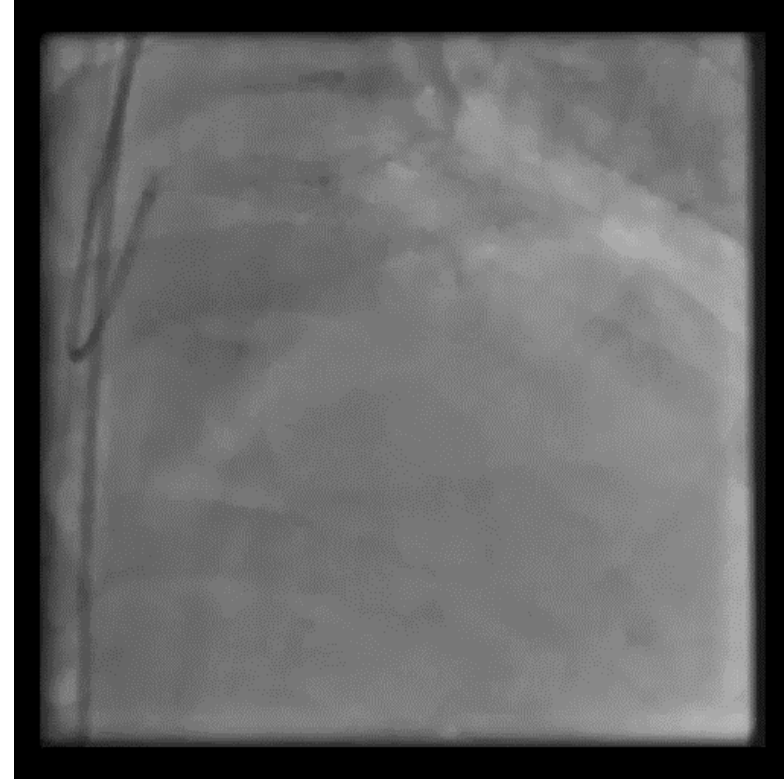
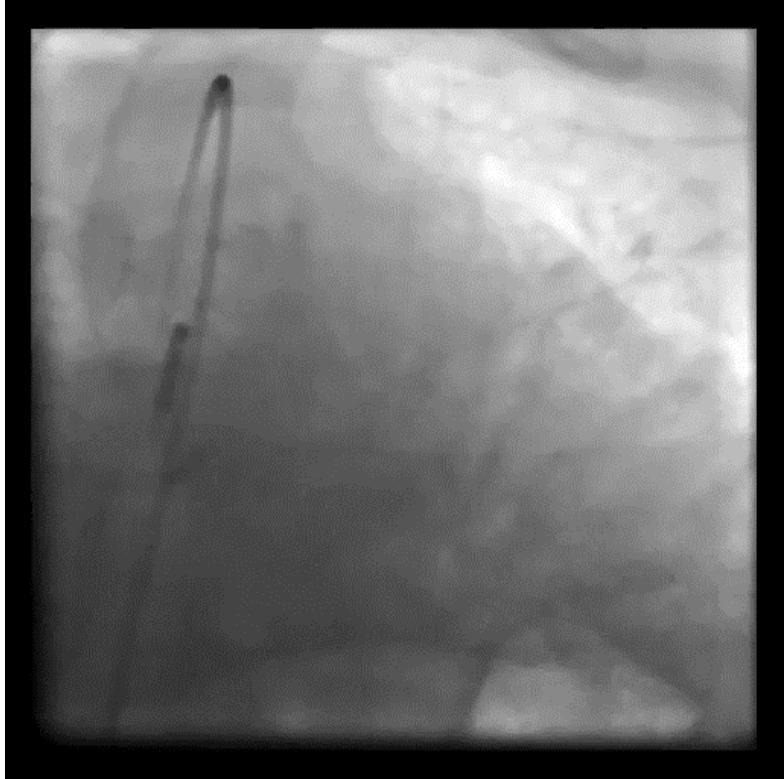
Procedure completed :

LCX /OM Bifurcation Dual stenting (Modified T Stenting / Reverse TAP) with a long stent from prox LCX to LM ostium (PS distale LM)

Onyx 3.0 x 22 mm to OM

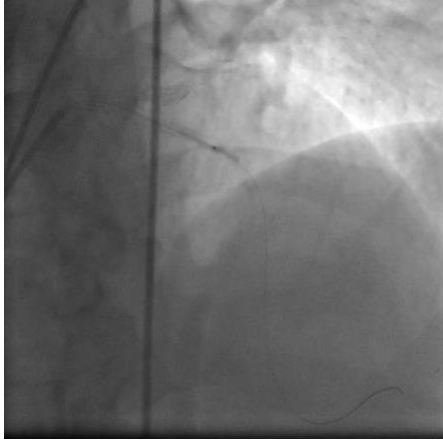
Onyx 3.5 x 38mm crossover LCX to LM



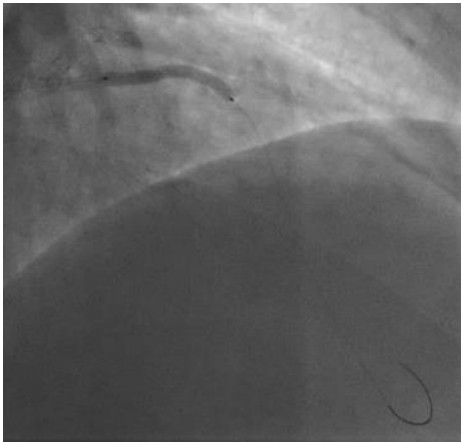


Angio Following LAD stenting and optimization

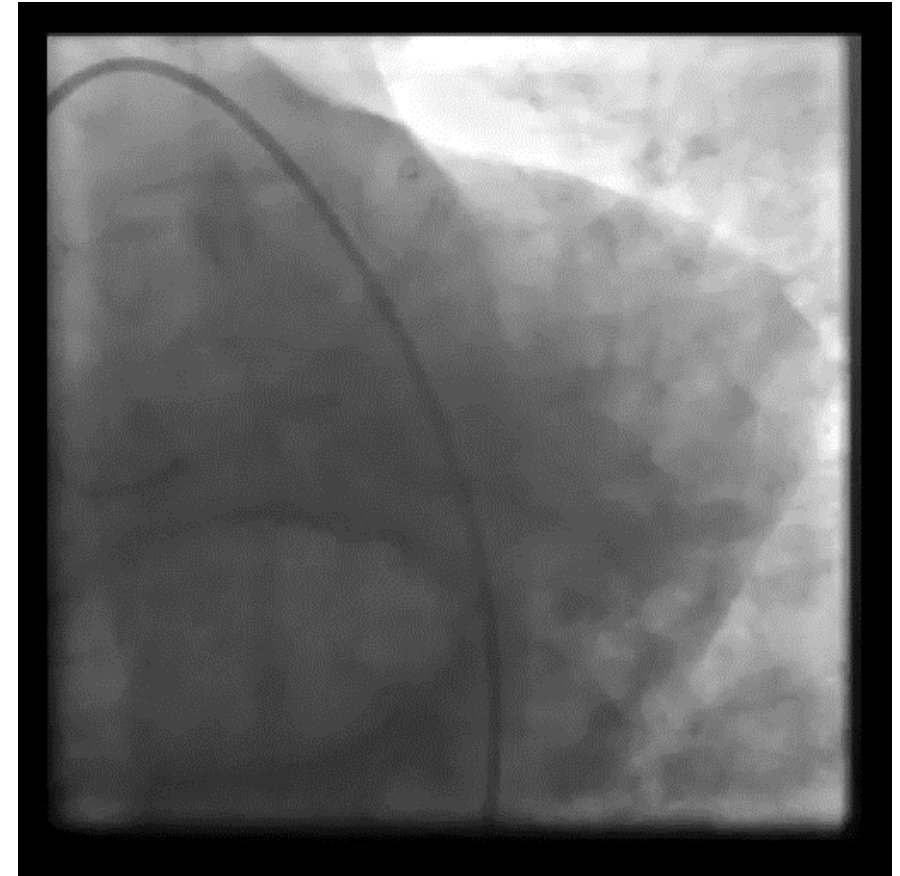
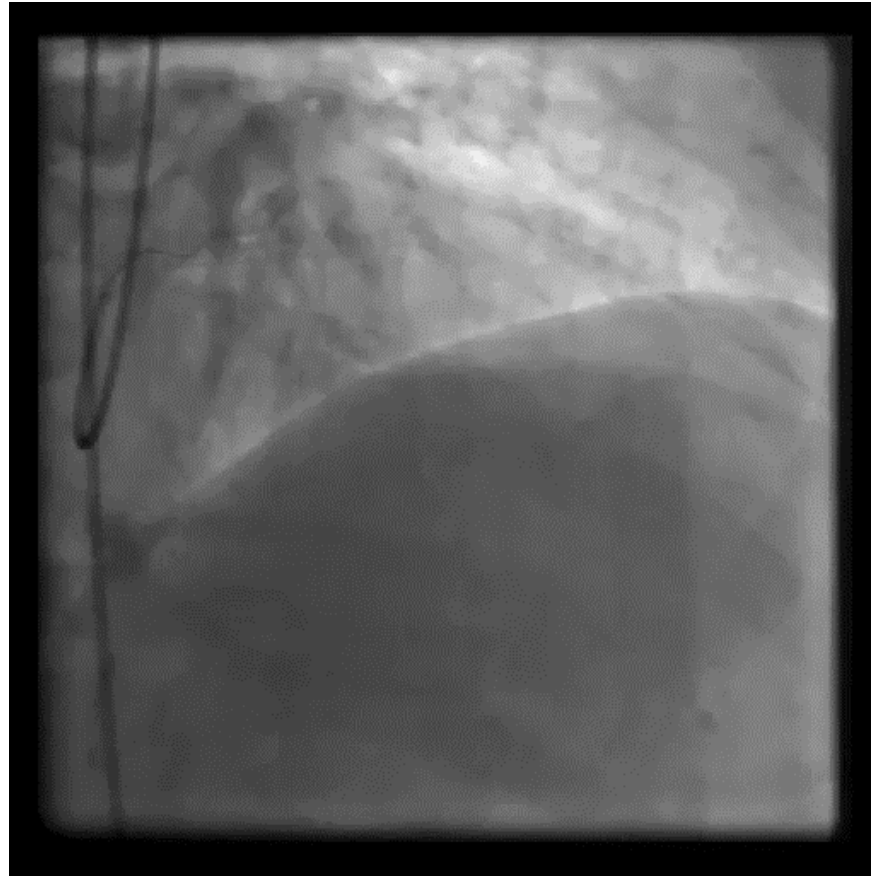
LAD recanalization completed 4 days later ..



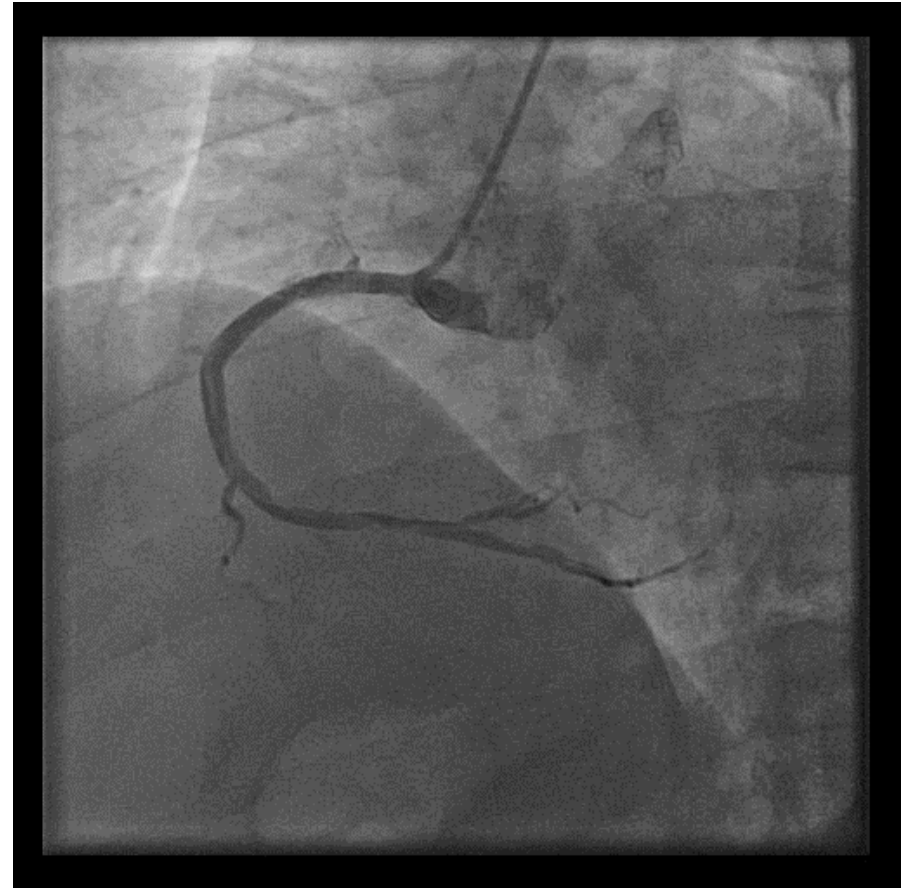
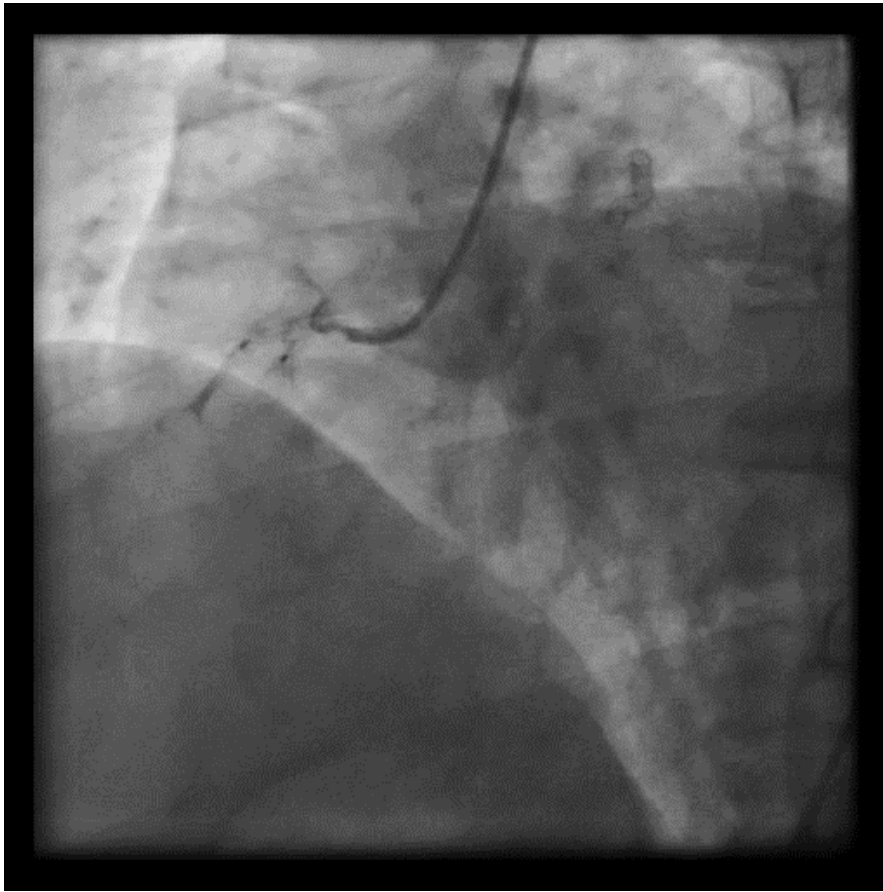
CTO crossing with Gaia II and wire exchange through microcatheter



Provisional stenting LAD/ I diagonal



Final result on LAD



Revascularization was completed with antegrade CTO-PCI also for RCA which was performed successfully during the same procedure

At 26 months follow up : patient is event free

BK, 56-yr , Male .

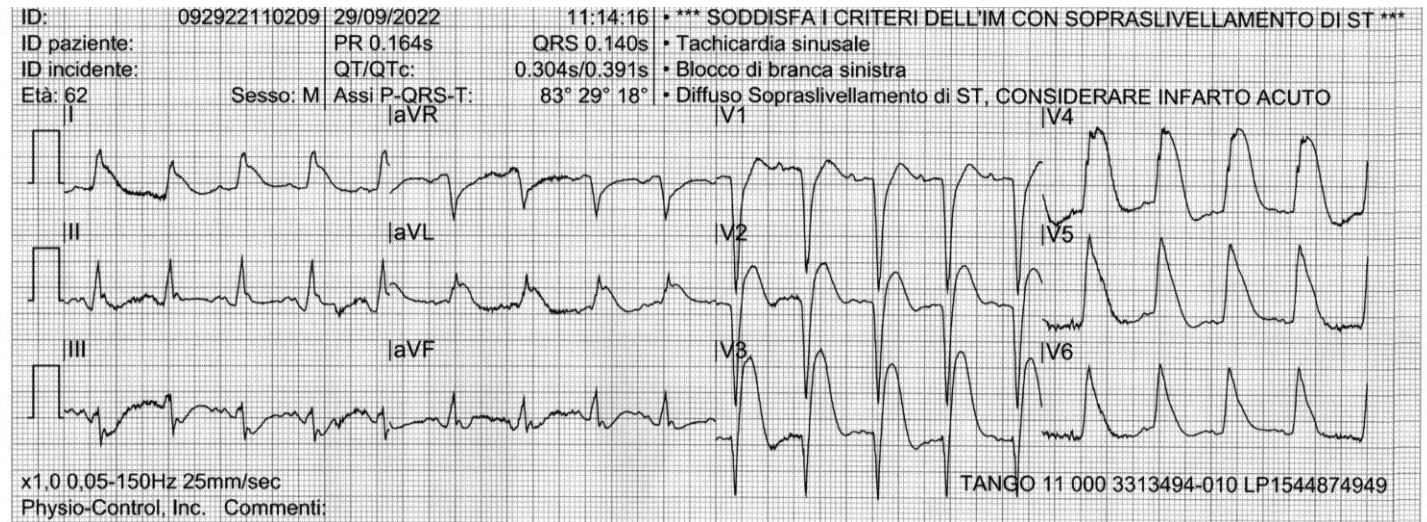
- **Cigarette Smoker (30 /day)**
- **Dyslipidemia**
- **Hypertension**
- **Familiarty for CAD**

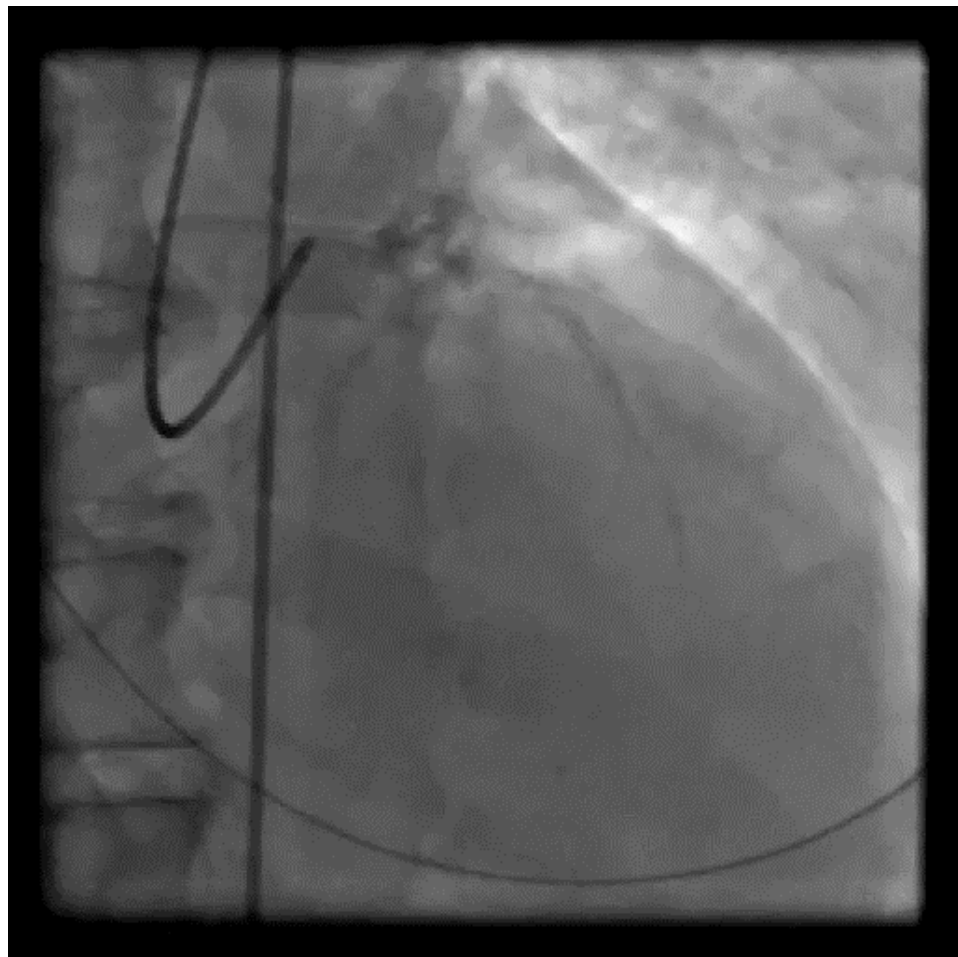
October 15, 2022

STEMI complicted by Cardiac Arrest.

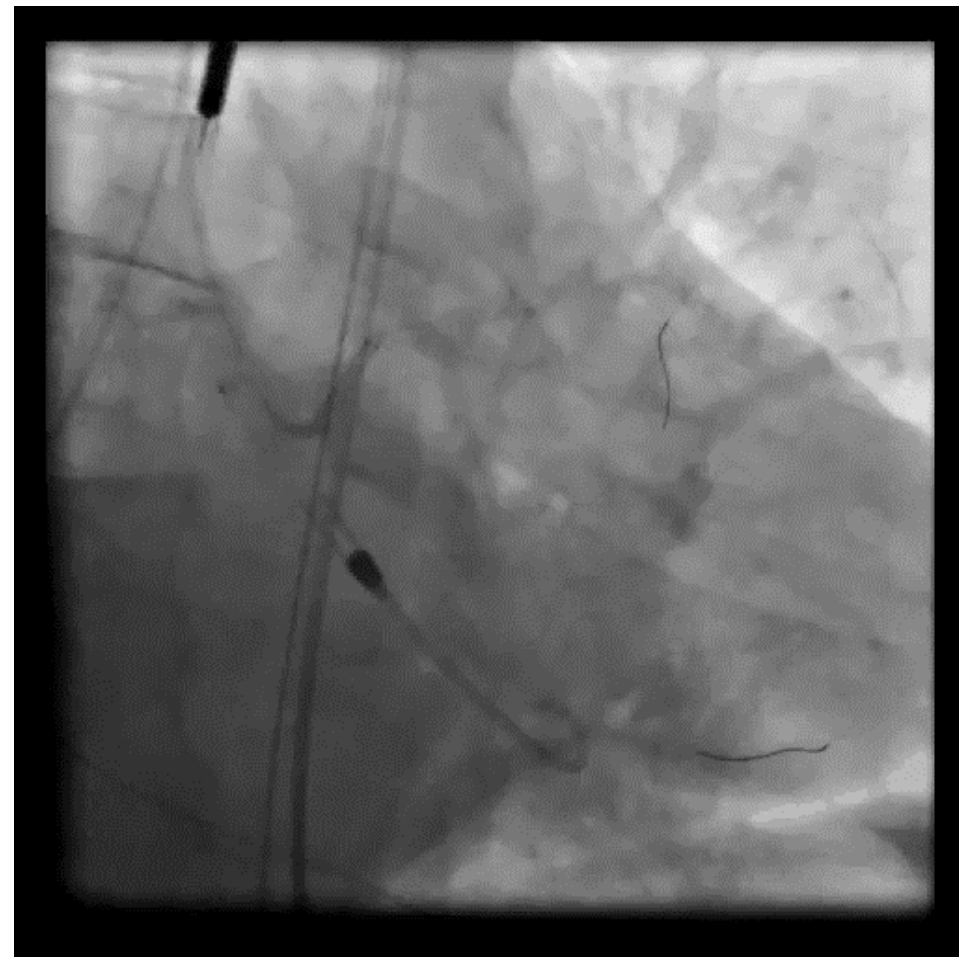
Resuscitated and intubated in emergency room and transfered to Cath Lab

- **SBP = 85 mmHg , Polse : 110 bpm , O2 sat= 91%**
- **T tropopnine = 1150 ml/l**
- **Creatinine = 0.9 ml/dl**



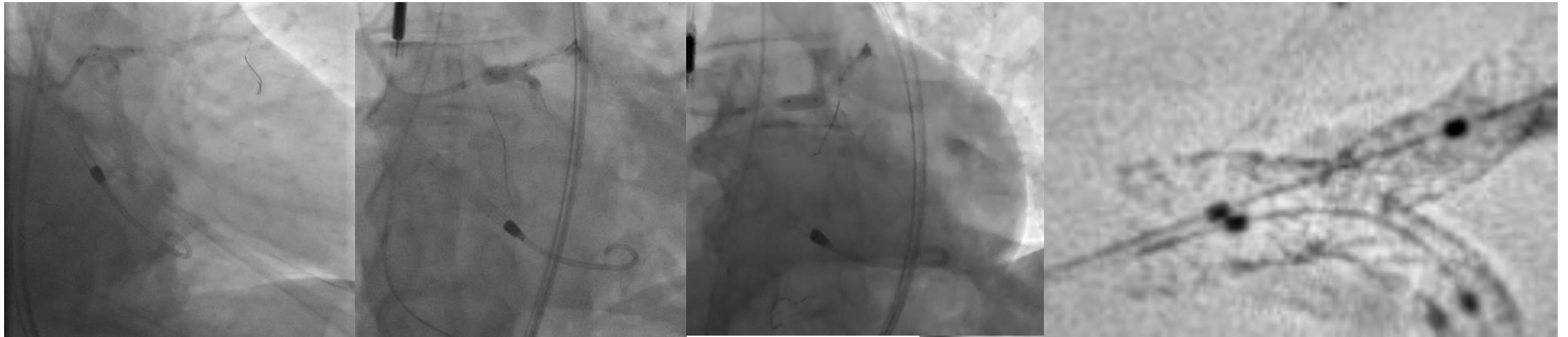


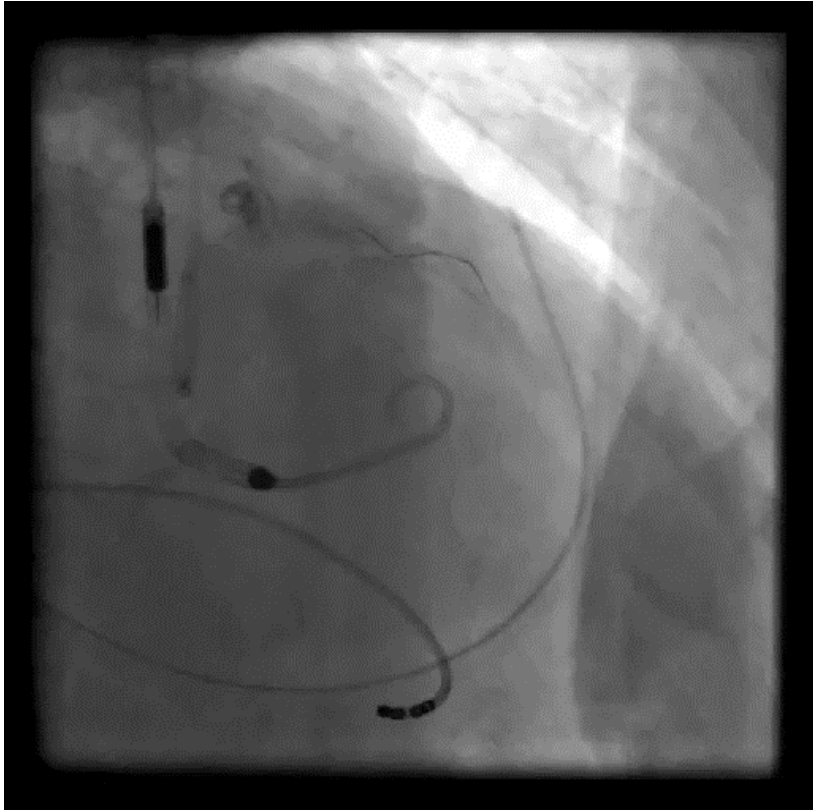
Baseline Angio



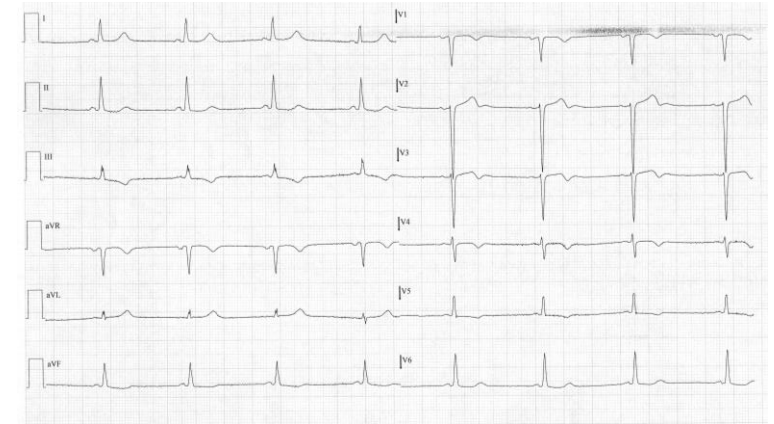
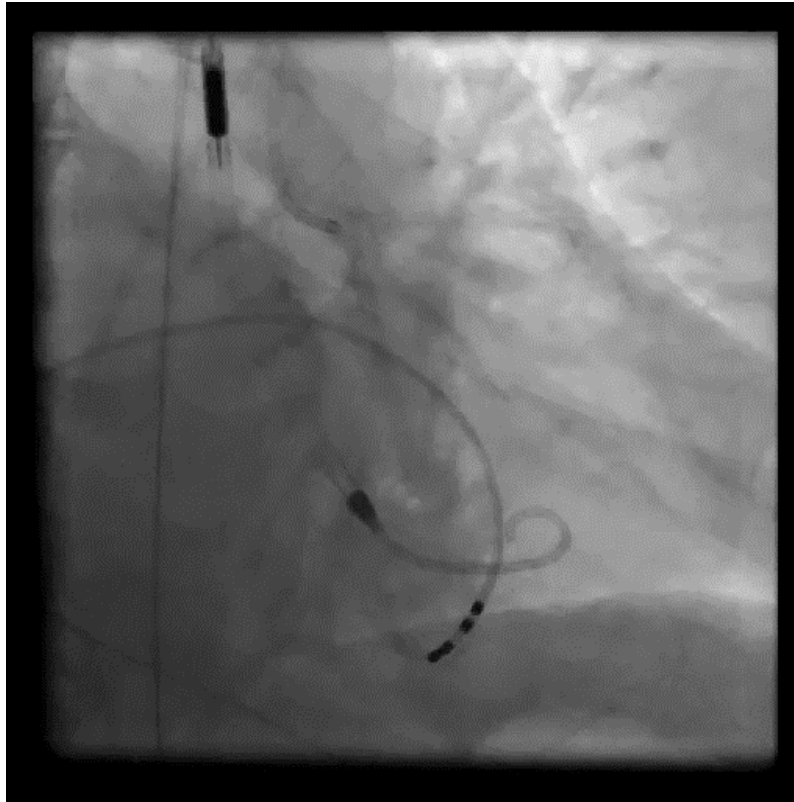
Impella positioned immediately

Distal LM Bifurction : DK MiniCulotte stenting

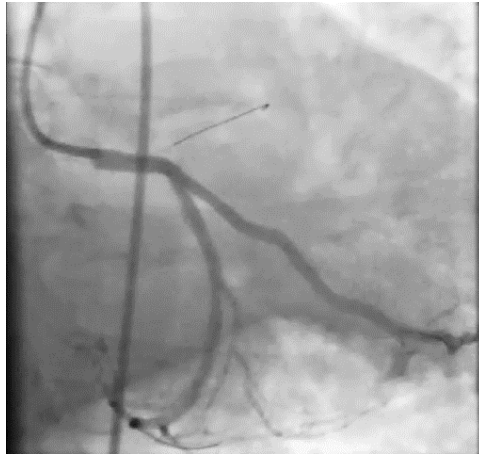




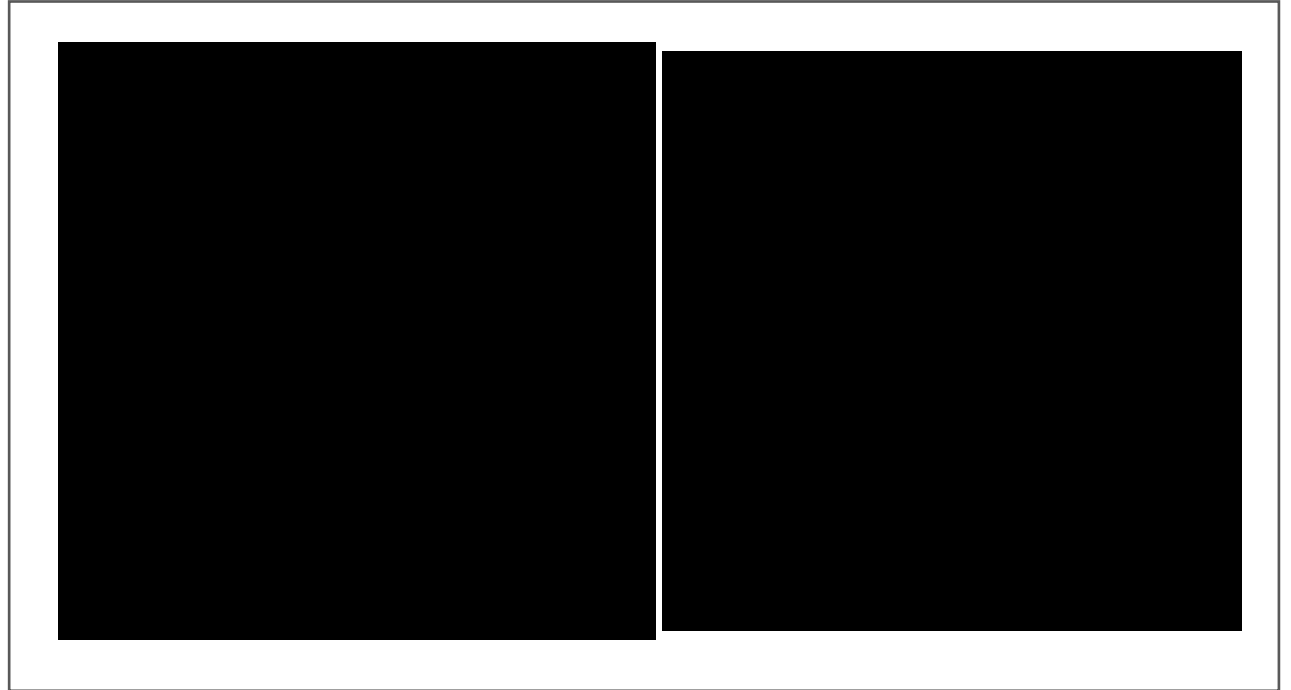
Final Angio



ECG after 24 hours ..



Abrupt Closure



**Stroke: LM rota
Thrombus Aspiration**

Complication	Possible cause	Management
LM dissection	Careful Guiding Cath handling EBU/AL cath, LM ostial Disease , short Lm	Stenting , CABG
Aorta-LM Dissection	Same as above	Stenting (sealing the entry point) w/wo cover stent , surgery
Thrombosis	Adequate anticoagulant Rx, avoidnace of too much , Trauma/ stenting / Dissection	Antiplatelet , lytics, thromboaspiration, stenting , CABG ?
Perforation	Avoidnace of excessive high pressure dilatation , oversizing (> 1,2) paicularly in calcified lesions	Stenting / covered stent with fenestration , reverse heparin , (CABG ?)
Stent / balloon embilzation	Use good back up and proper alignment of GC, adequate lesion preparation , buddy wire , ancor technique	Retreival of embolized stent , delivering in sito , crushing with another stent
Aneurysm/ pseudoamenurysm	Unknown, delayed perforation ?	Covered stent if necessary
Cardiogenic shock	Preventive MCS in poor LV function or any hemodynamic instability	Treat the cause

Final Remarks

- At some time or another, interventionalist will be confronted with procedural complication
- First Rule: Do your best to prevent complications during percutaneous procedures (Plan your procedure , check list with your team , discuss the case , be open to listen to other's suggestions)
- Until patient is stable , do not panic ; watch carefully and evaluate the most convenient , easy and safe strategy
- LM PCI complication management requires preparation, early recognition and broad differential diagnosis, knowledge of effective techniques and team-based work and strategies.
- LM complications are always high risk and complex procedures : keys to successful management : optimally equipped Cath Lab , good experience of both operators and Cath lab Team in complex interventions and emergencies (*a synchronous team work*)