

The Variable Cases of Stent Thrombosis

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Multi-Factorial Nature of DES ST

Patients factors

- Drug response/interactions
- Gene polymorphism
- LV function
- Acute coronary syndrome
- Renal failure
- Diabetes

Device factors

- Surface
- Drugs
- Polymers
- Stent overlapping

Procedural factors

- Dissection
- Incomplete stent apposition
- Stent expansion

**STENT
THROMBOSIS**

Lesion factors

- Vessel size/length
- Thrombus
- Plaque characteristics
- Bifurcation
- Calcificatoin
- Total occlusion

Platelet and Coagulation factors

- Coagulation activity
- Inhibition of platelet aggregation
- Inadequate response to anti-platelet therapy
- Premature anti-platelet therapy discontinuation

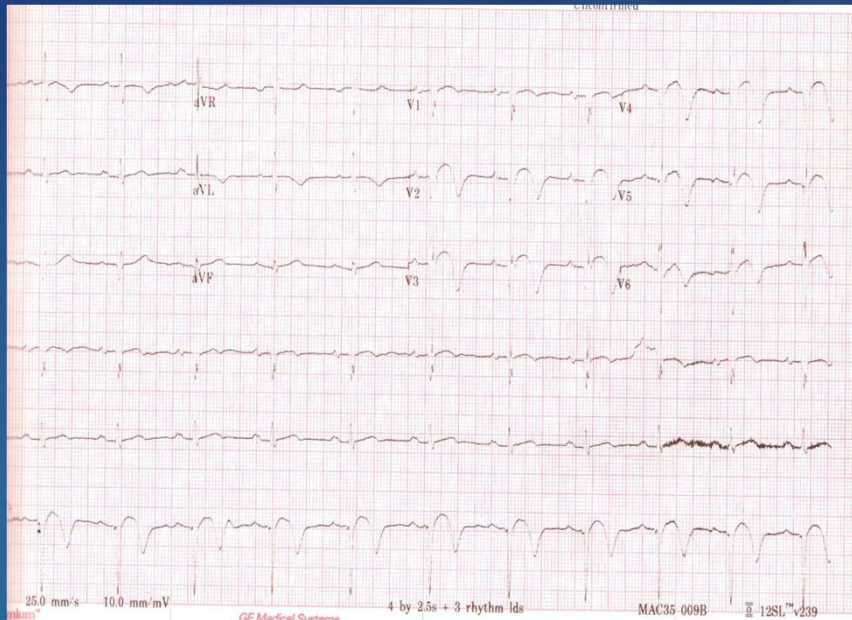
Windecker S et al. Circulation 2007;116:1952-65



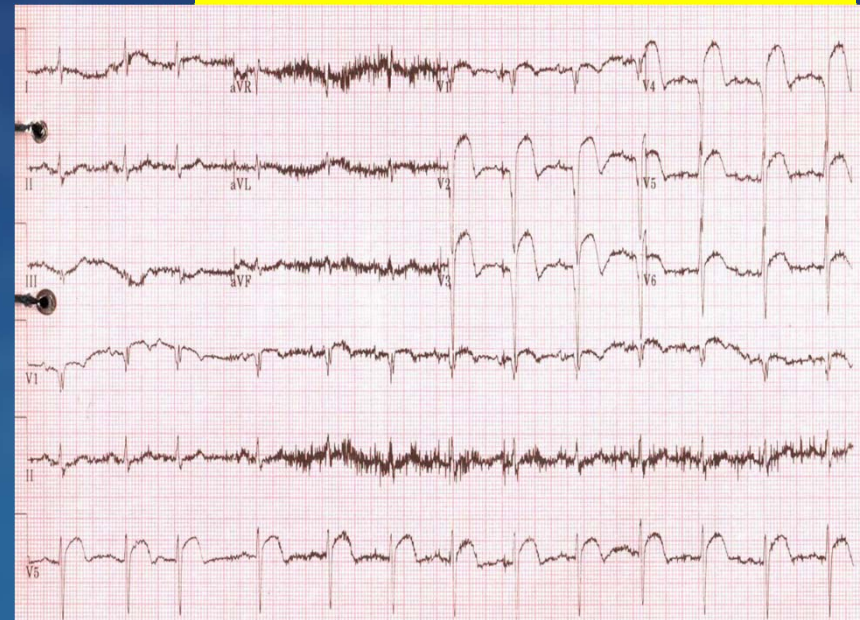
Case 1 (Subacute ST)

- 78 Male
- C.C: Ongoing chest pain for 2 hours (2007.12.13)
- Risk factors
 - Hypertension
 - P.O. medication

CK-MB: 2.41 ng/mL (<5.0)
Troponin I: 0.103 ng/mL (<0.78)
BNP : 171.75 pg/mL (<100)



2007.12.12

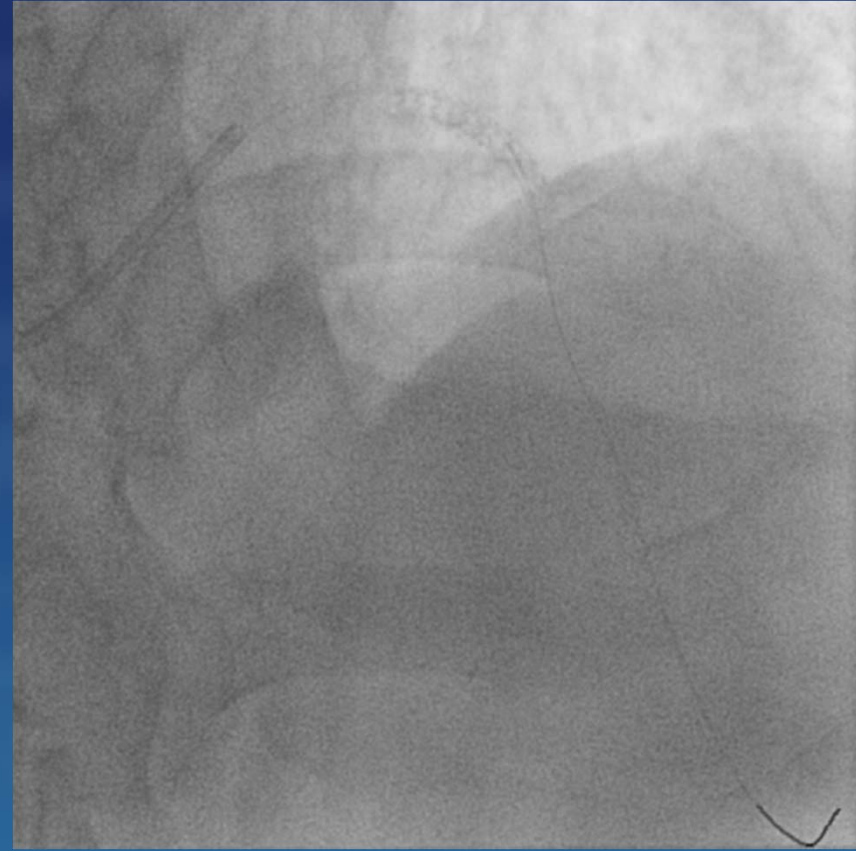
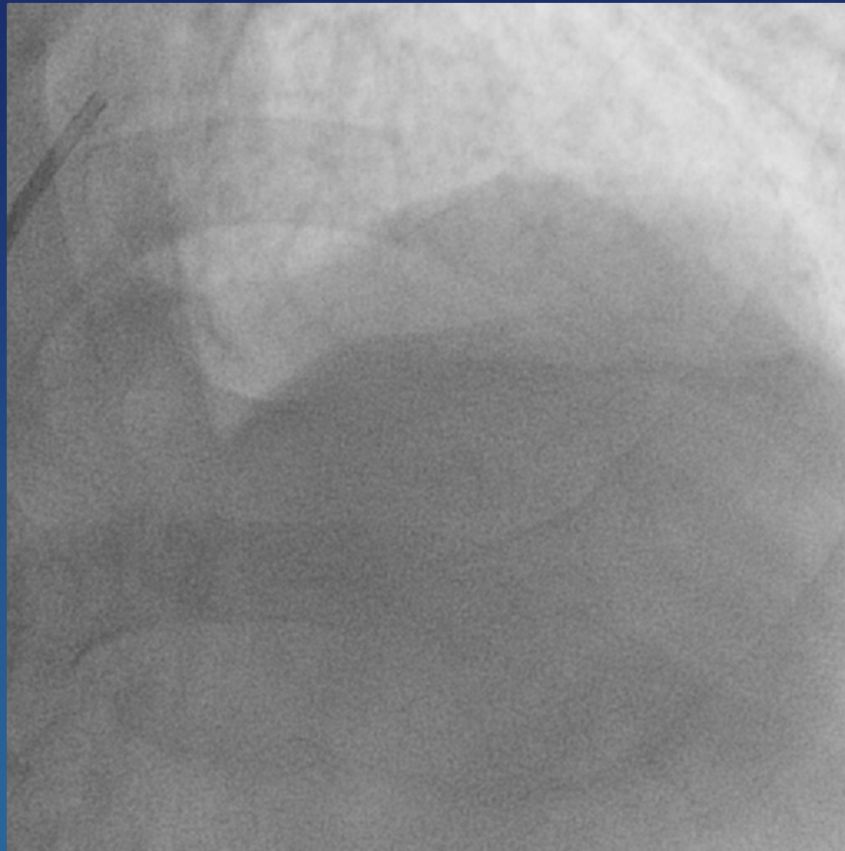


2007.12.13



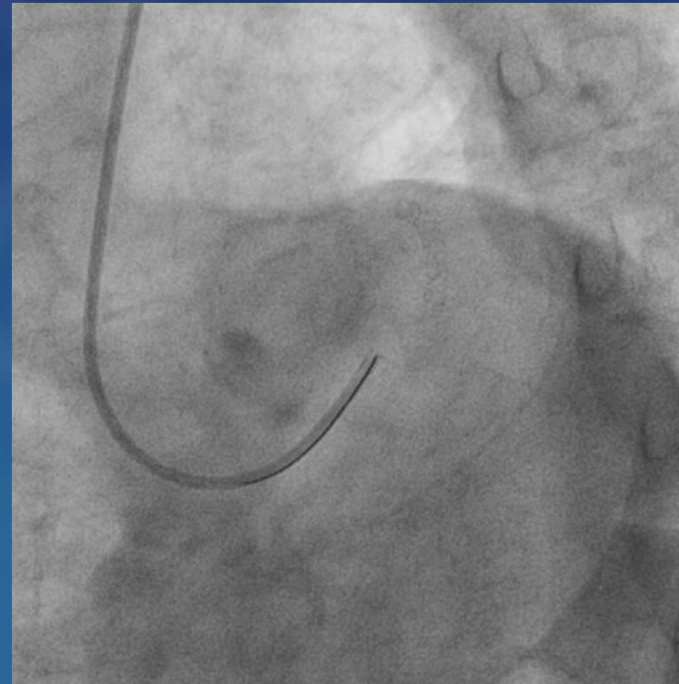
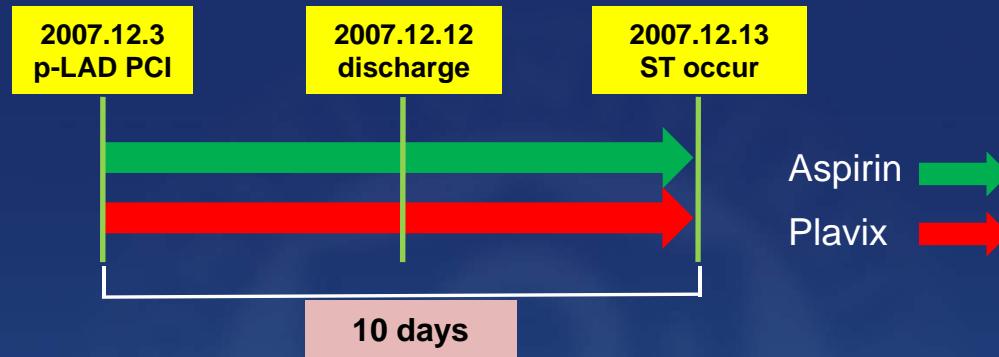
Index Procedure

s/p PCI on p-LAD (CYPHER 2.75 x 28mm) d/t recent MI (2007.12.3)
and discharged at 2007.12.12



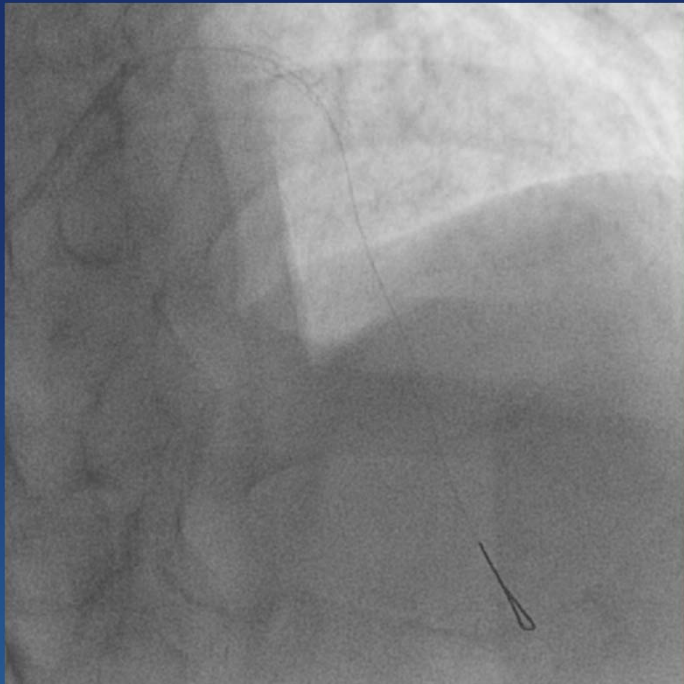
PRU value : 342
Percent inhibition of clopidogrel : 11%

Angiography (2007.12.13)



6 Fr UB 3.5

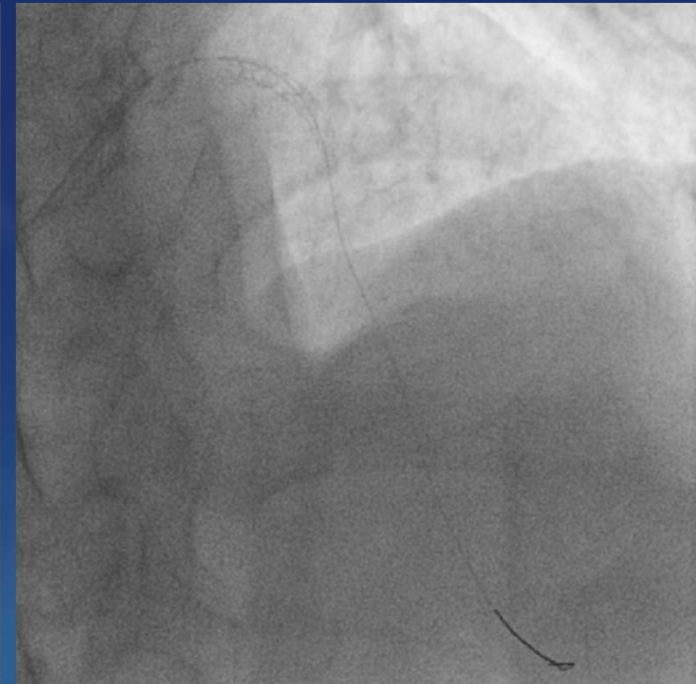
Thrombosuction



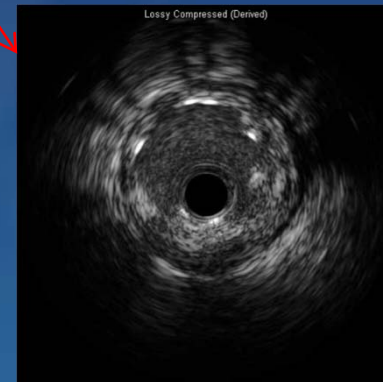
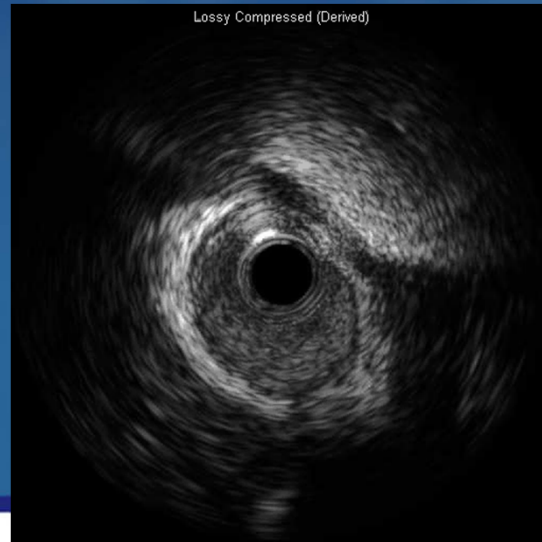
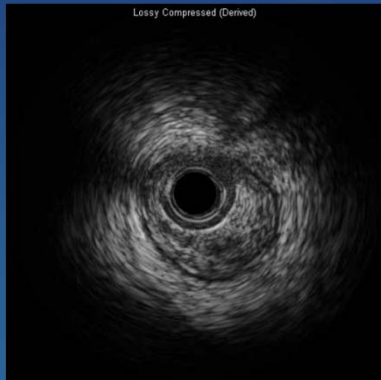
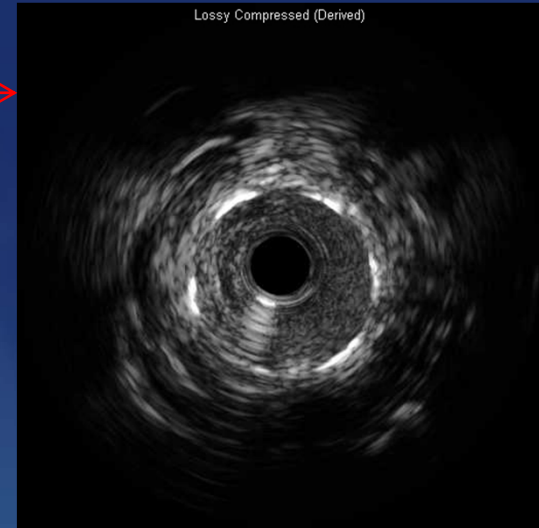
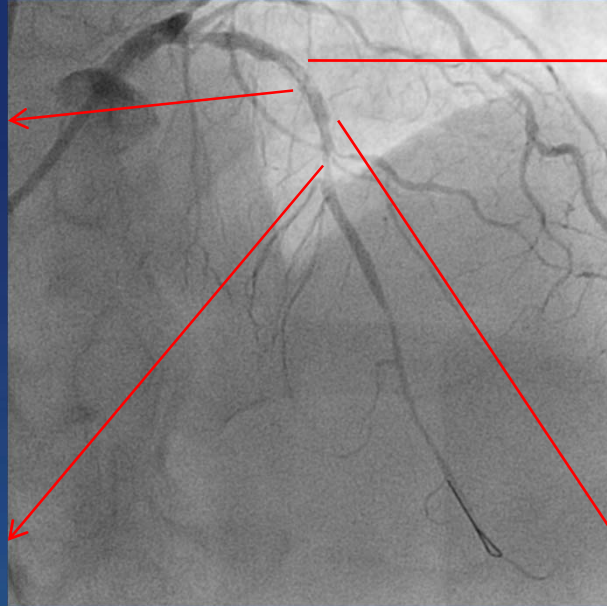
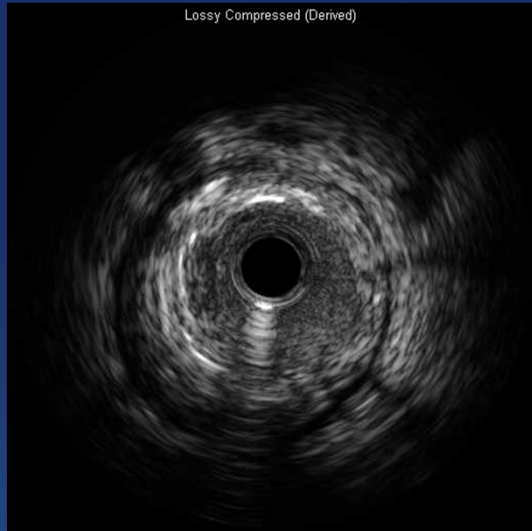
RUNTHROUGH G/W



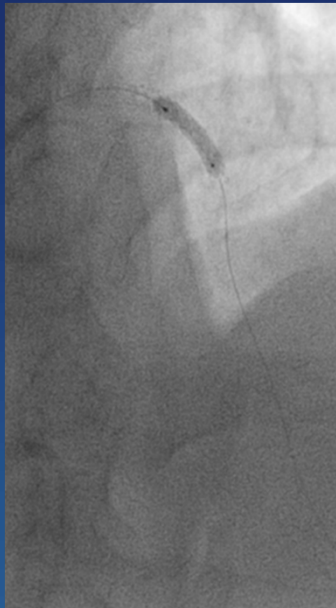
Thrombosuction with
Thrombuster II (2 times)



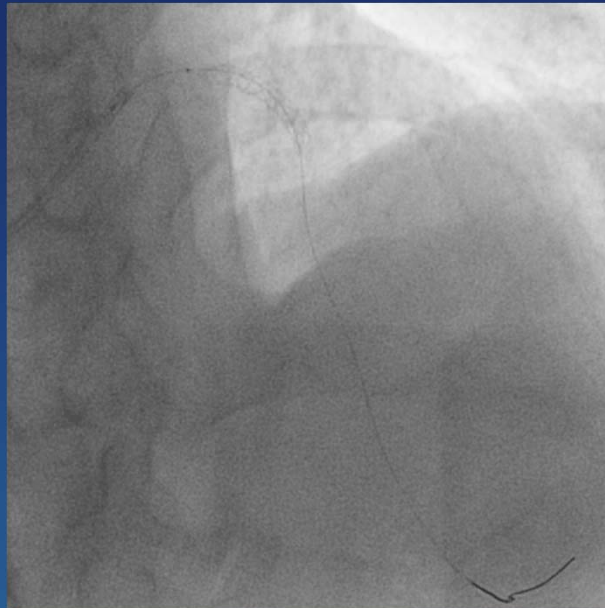
IVUS



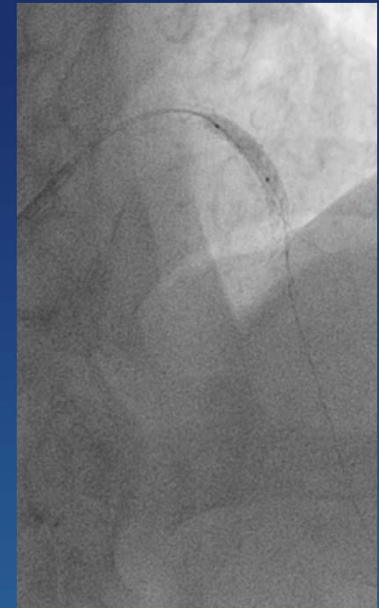
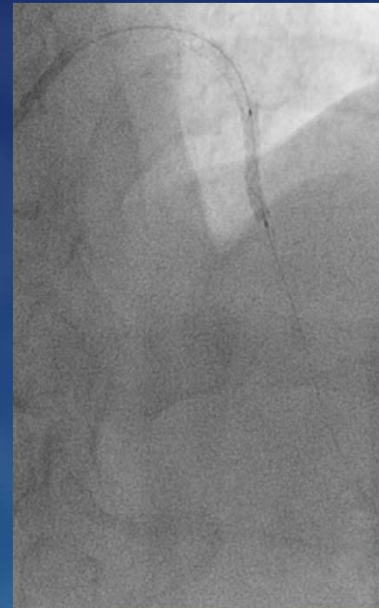
Balloon and Stent



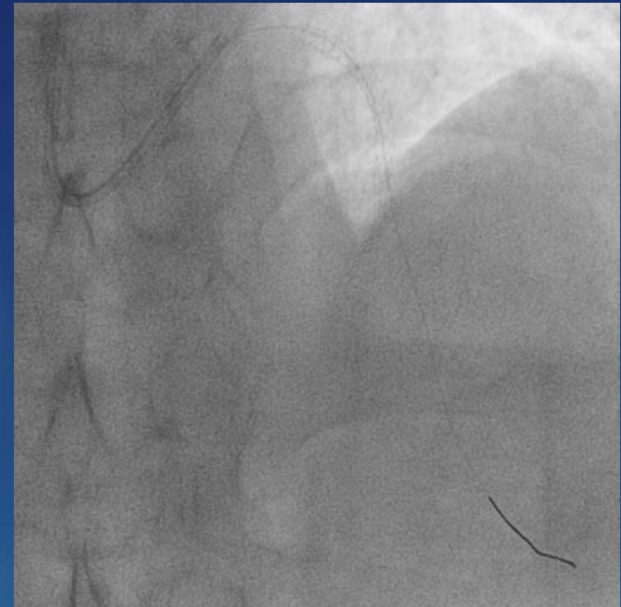
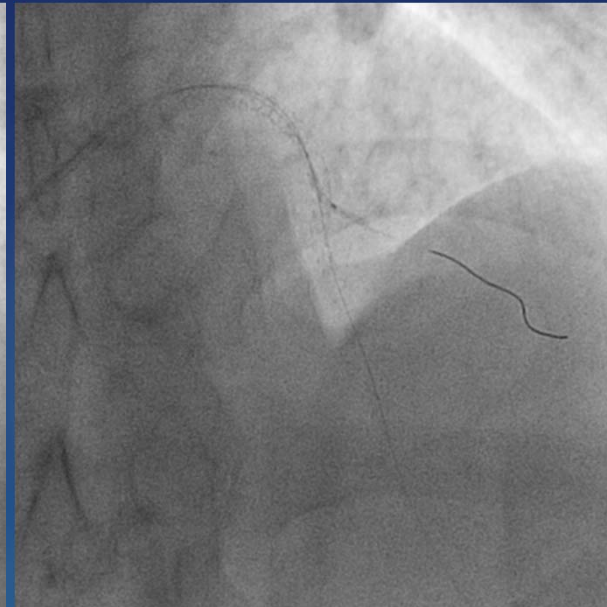
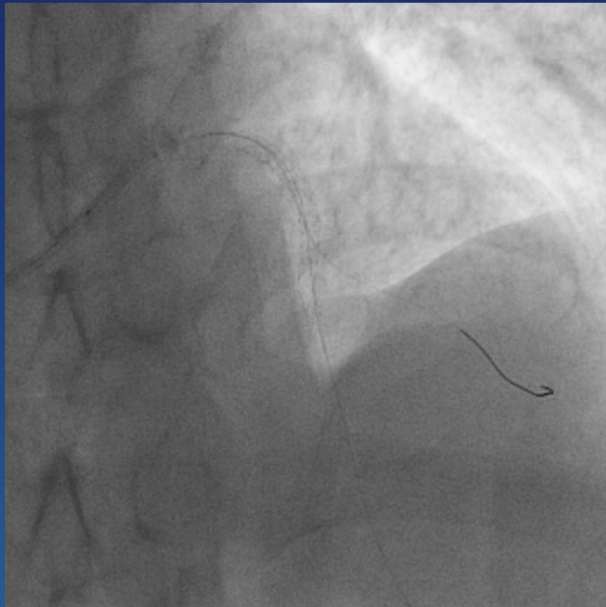
NERO 2.75 x 15mm, 13 atm



Cyper 2.5 x 18mm, 20 atm



Percutaneous Coronary Intervention



RUNTHROUGH G/W and
RYUJIN 1.5 x 15mm, 12 atm

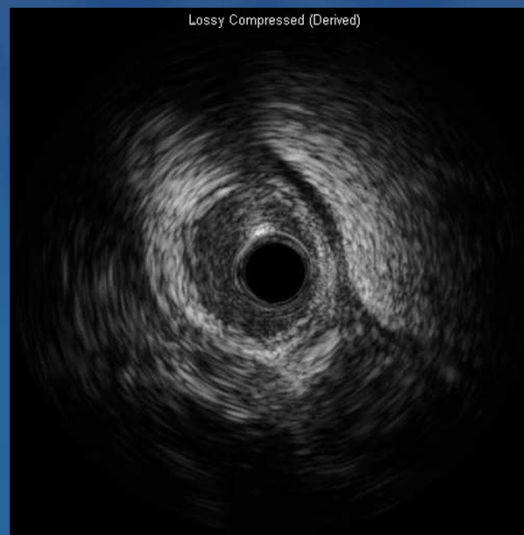
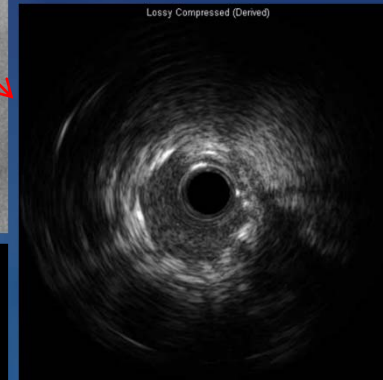
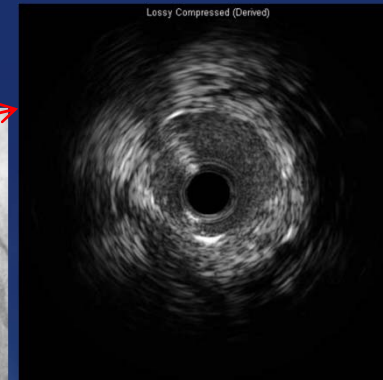
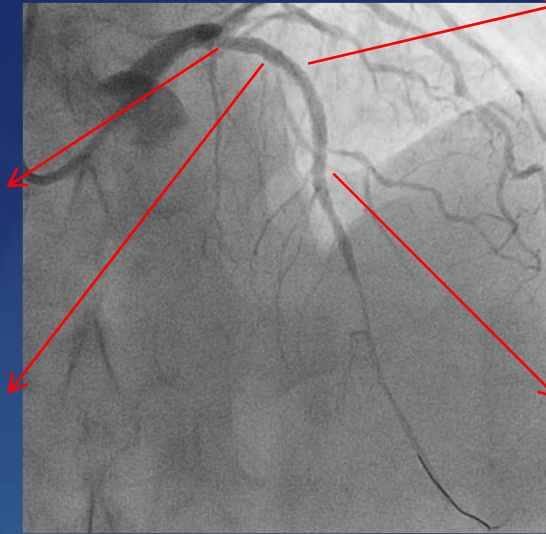
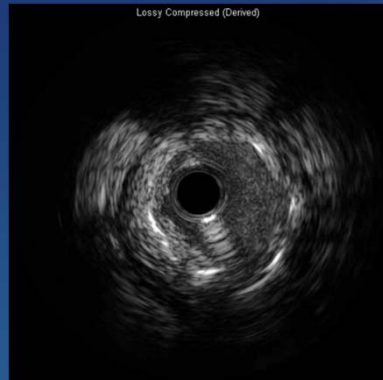
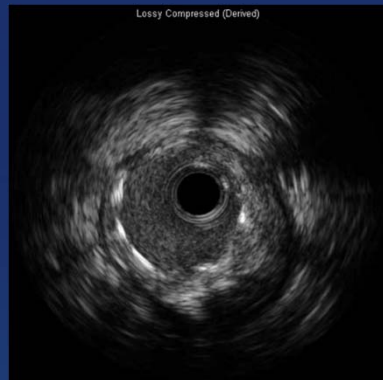
Final angiography



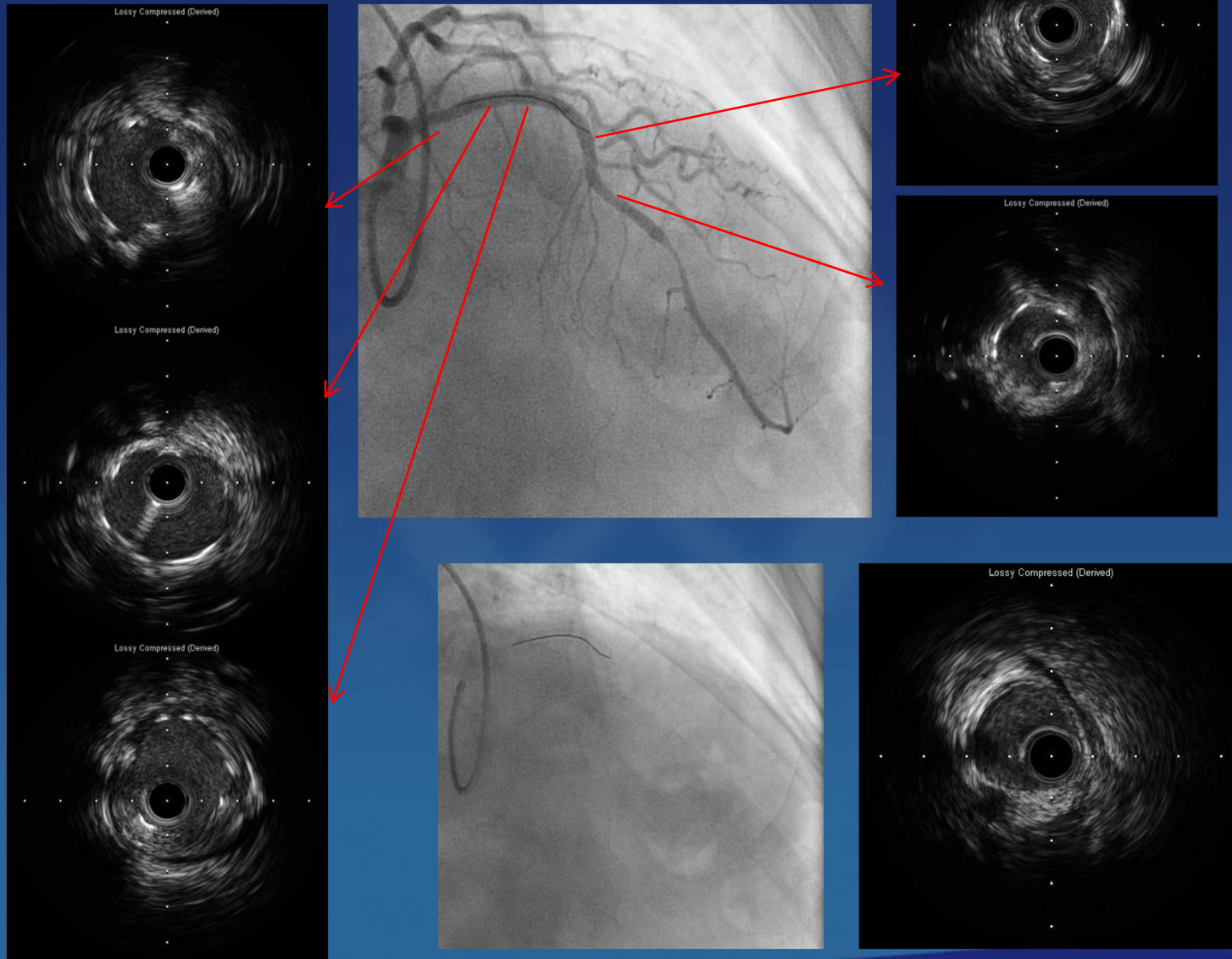
Pletaal Add



Final IVUS



Follow Up Angiography and IVUS (11 months)



Discussion Points

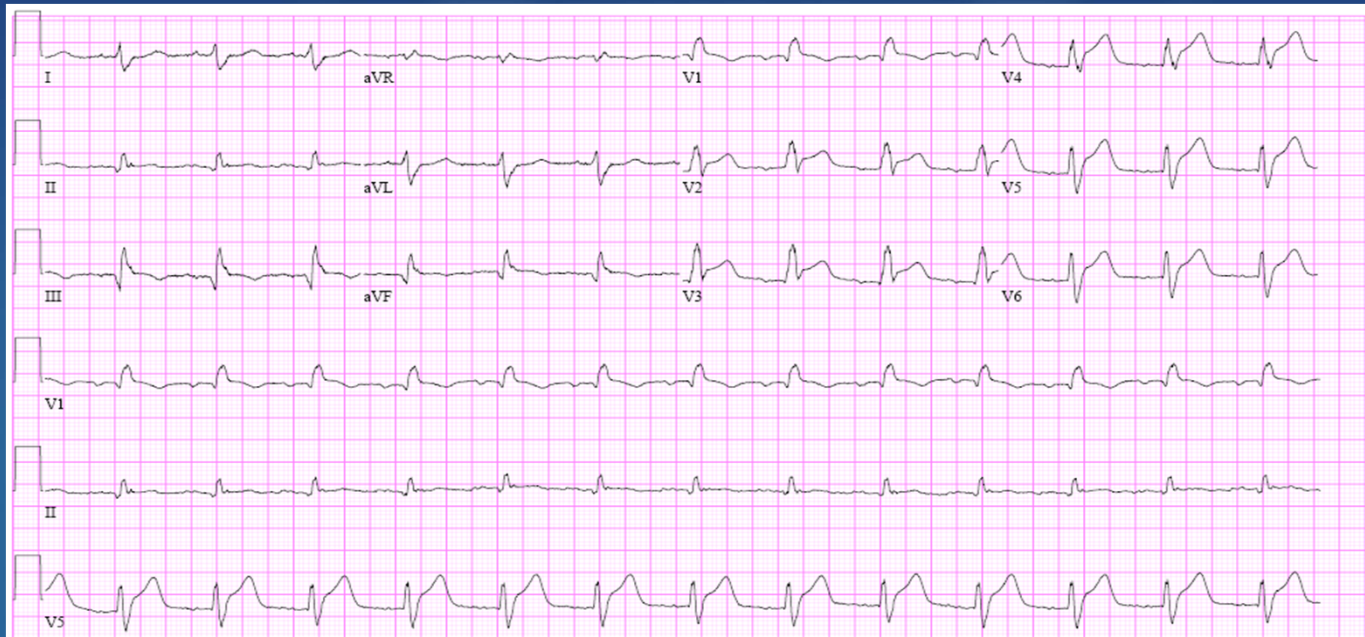
- Low response or resistance to clopidogrel is associated with recurrent thrombotic events after drug eluting stent (DES) implantations
- Residual lesion at mid-LAD (flow limitation) may affect thrombus formation



Case 2 (Late ST)

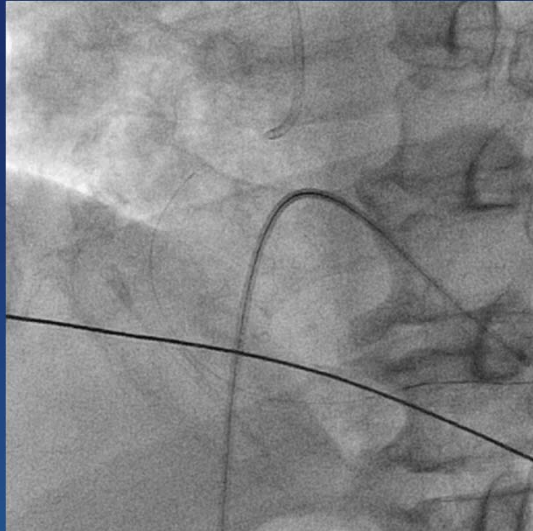
- 73 Male
- C.C: Ongoing chest pain for 20 minutes
- Risk factors
 - Hypertension, Diabetes
 - P.O. medication
 - Discontinuation of aspirin and clopidogrel due to coccyx sore OP for 11 days

CK-MB: 8.30 ng/mL (<5.0)
Troponin I: 6.8 ng/mL (<0.78)

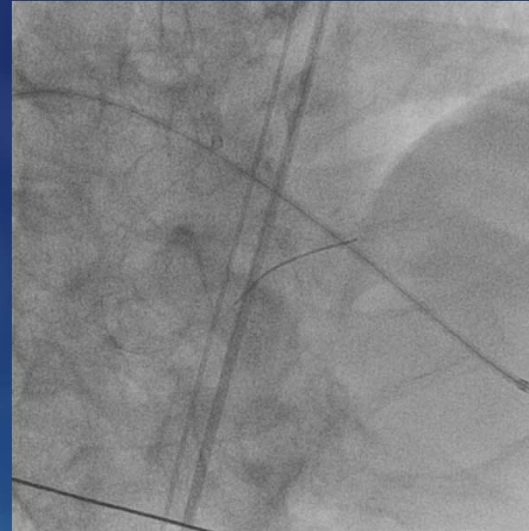


Index Procedure

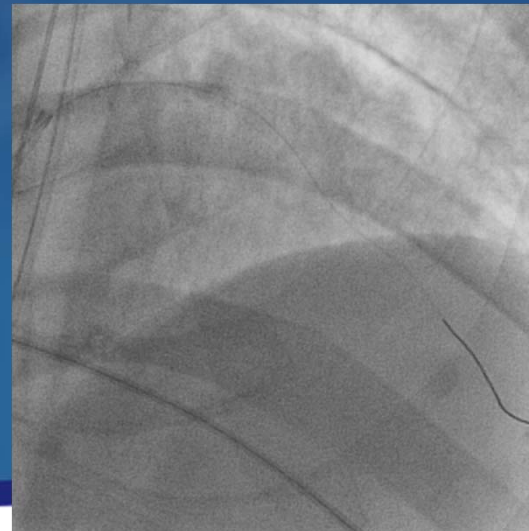
s/p PCI on proximal RCA and mid-LAD d/t STEMI (killip 4) (2008.2.29)



Pico Elite 3.0 x 38mm

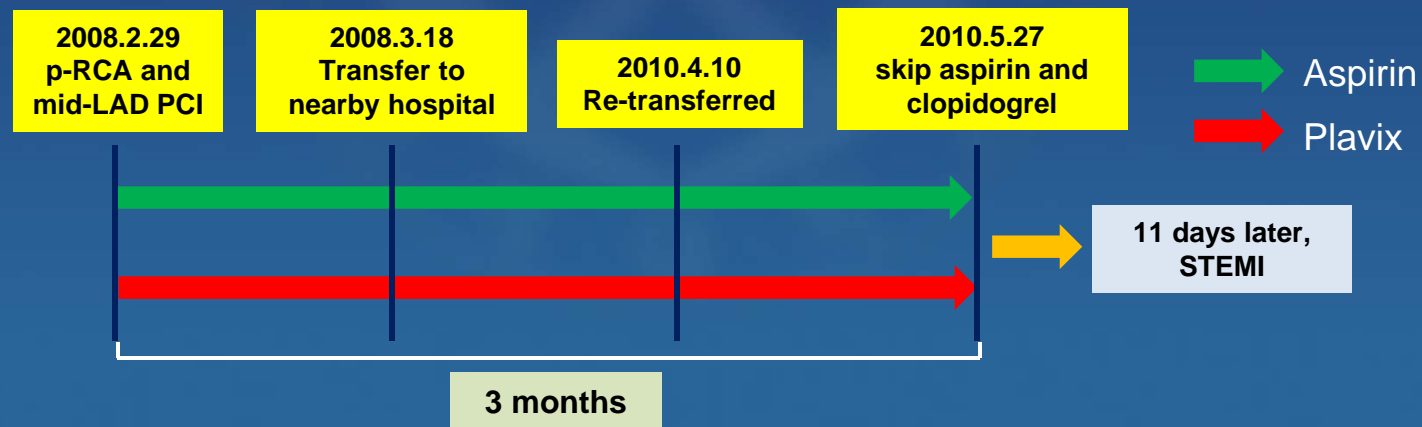


Pico Elite 3.0 x 18mm

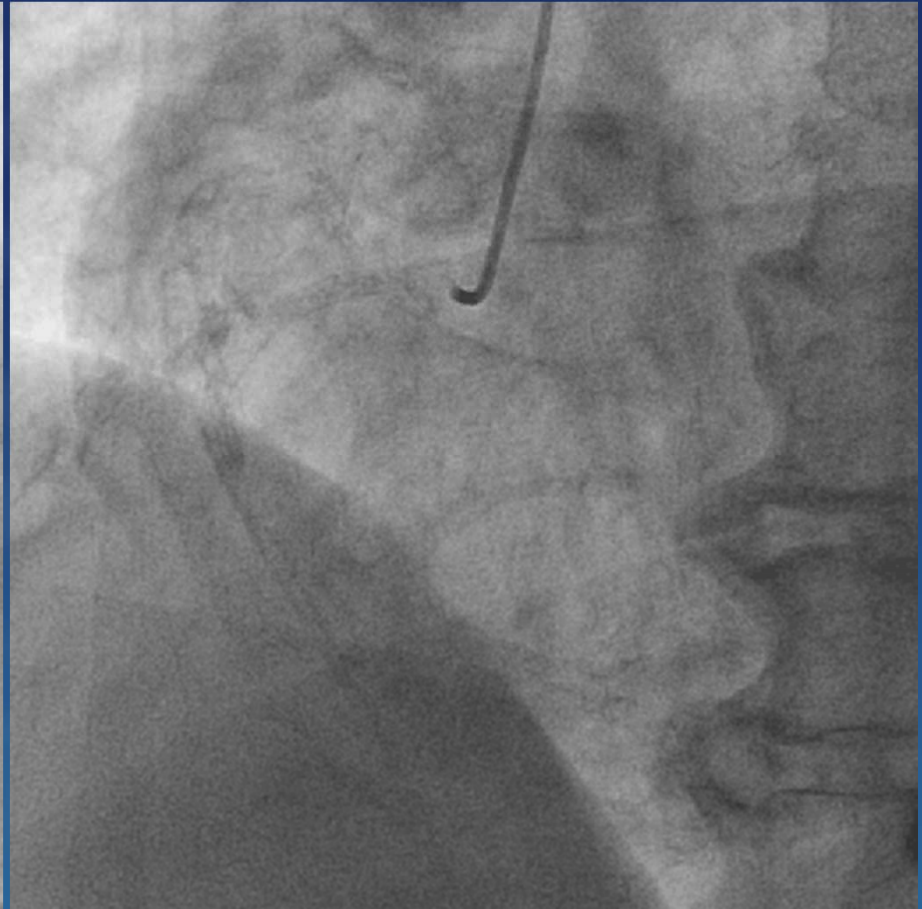


Past History

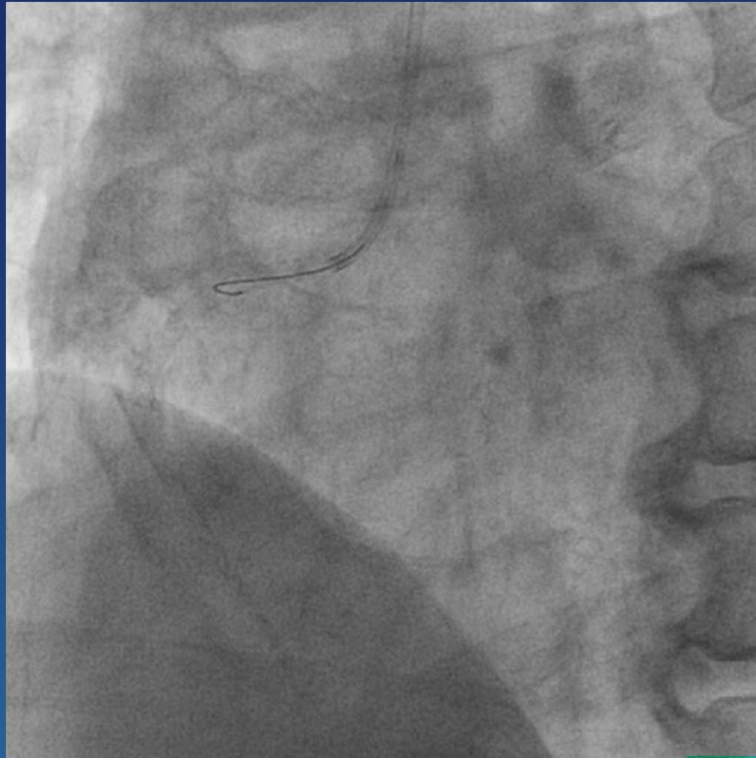
- He was transferred to nearby hospital for further treatment. However he was re-transferred to our hospital after 20 days because of worsening of condition.
- The condition of patient was became better, he was planed to conduct operation of coccyx sore and discontinued aspirin and clopidogrel.



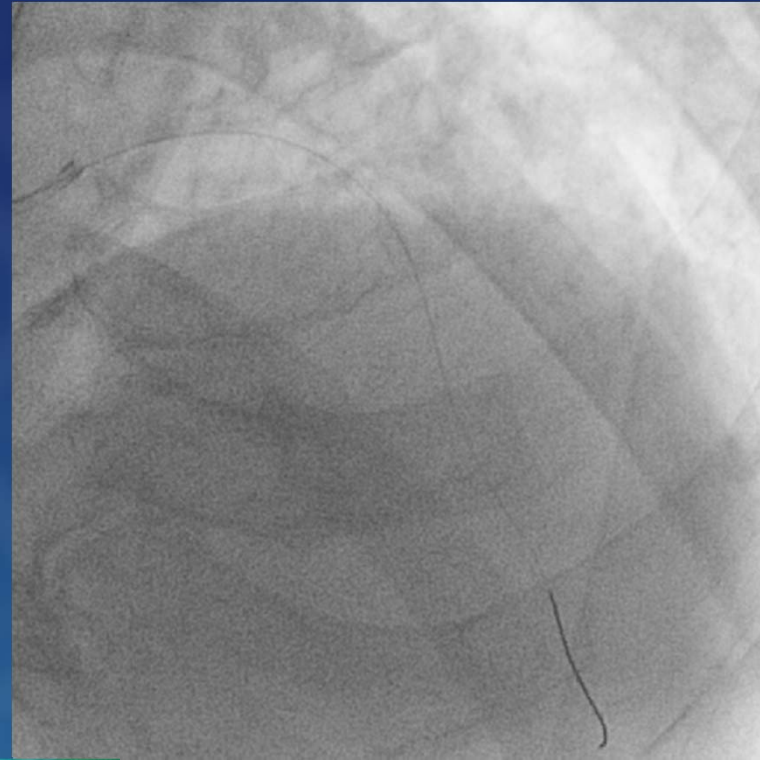
Angiography



Percutaneous Coronary Intervention



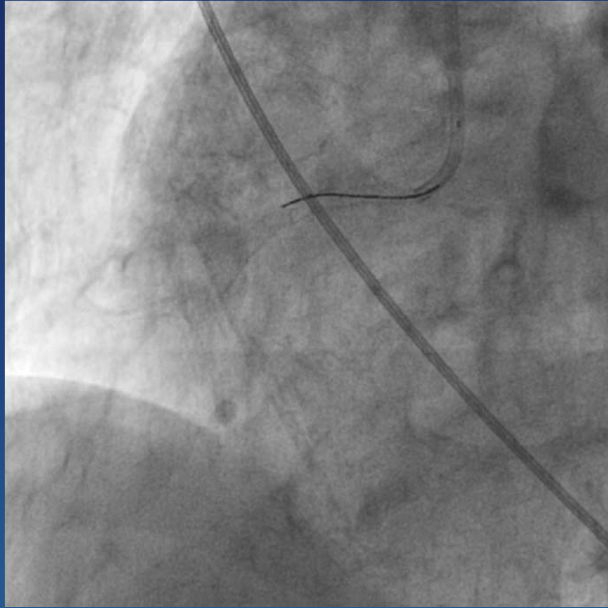
6 Fr JR 3.5
RUNTHROUGH G/W passing failure



6 Fr JL 4.0
RUNTHROUGH G/W passing and post-
thrombosuction angiography



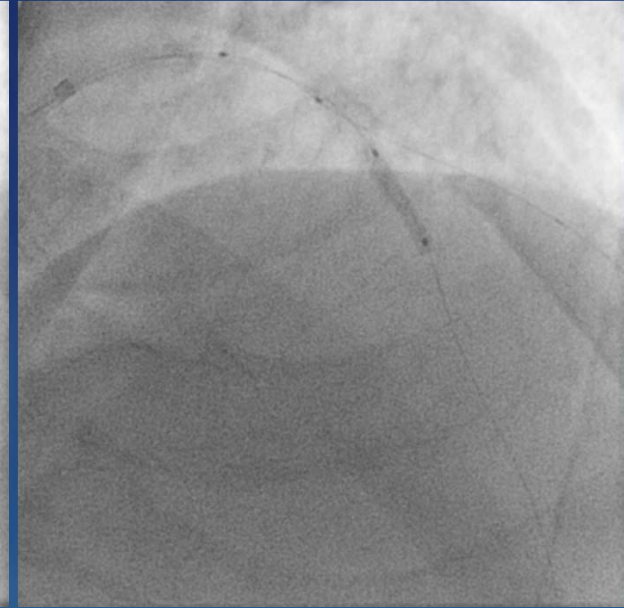
Percutaneous Coronary Intervention



6 Fr JR 3.5
Pilot 50 G/W passing failure



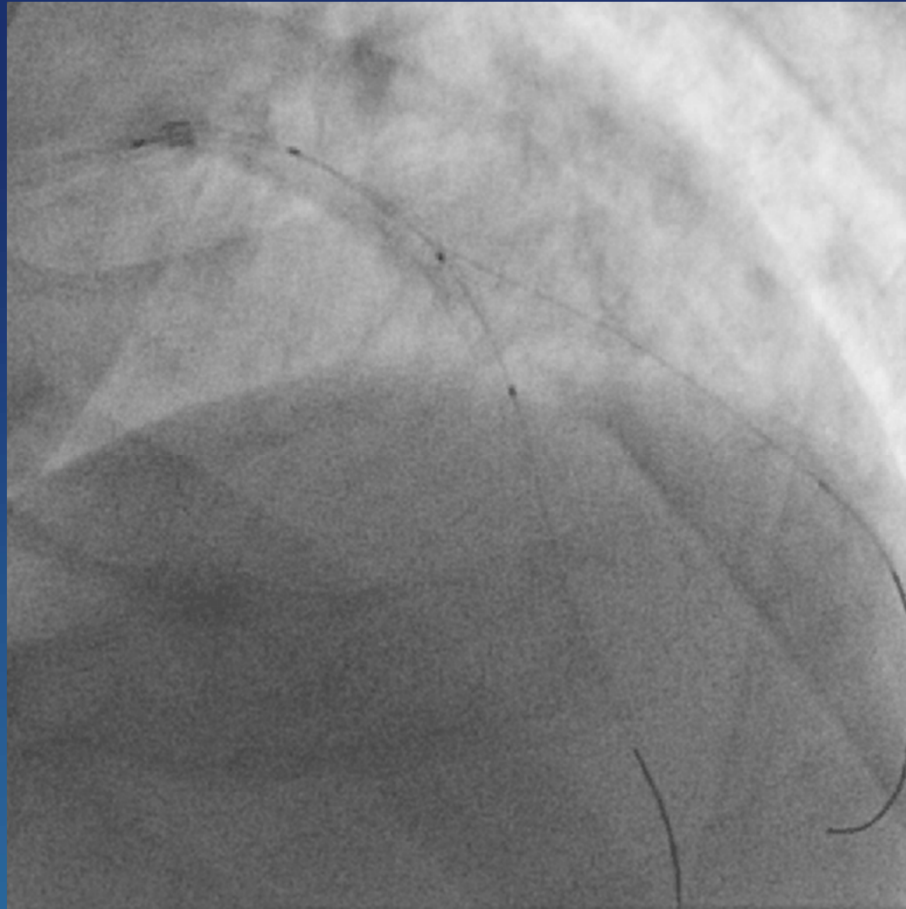
6 Fr JL 4.0
Pilot 50 G/W passing and thrombus



Sprinter 2.75 x 15mm, 6 atm



Balloon



After balloon, cardiac arrest occurred and no ROSC



Discussion Points

- There are many factors affecting late stent thrombosis in DES era
- Among these many factors, discontinuation of thienopyridine within 6-month may be the most strong factor (above 13 times compared with continuation group)

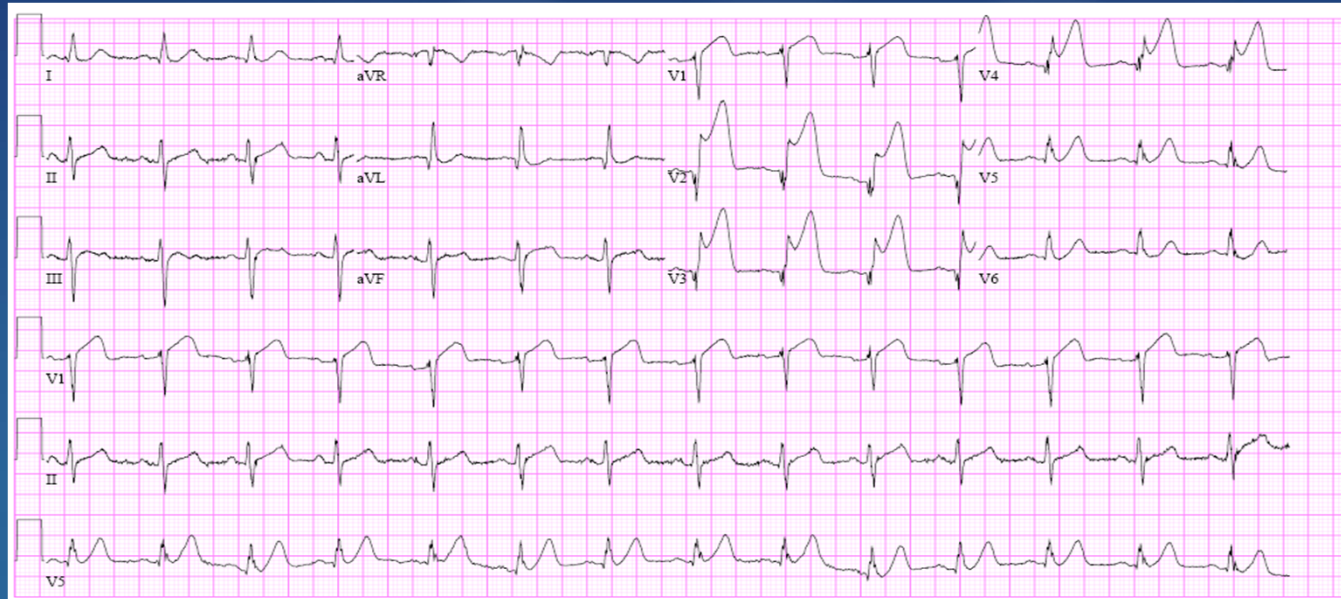
Airoldi et al. Circulation 2007;116:745-54



Case 4 (Delayed aneurysmal change)

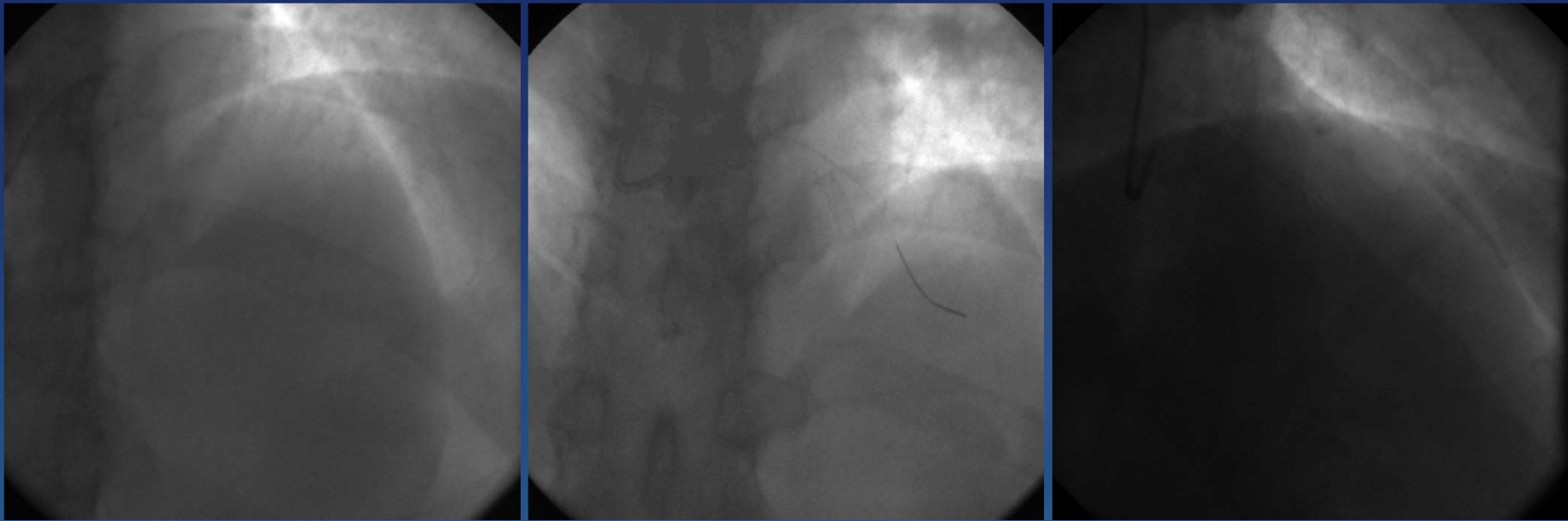
- 55 Male
- C.C: Ongoing chest pain for 1 hours
- Risk factors
 - Hypertension, Hyperlipidemia
 - ➔ P.O. medication
 - Discontinuation of medication for 2 weeks(aspirin d/t gastric ulcer and melena)
 - s/p PCI on p-LAD d/t unstable angina (2006.4.3)
 - Clopidogrel was discontinued from (2007. 4)

CK-MB: 1.87 ng/mL (<5.0)
Troponin I: 0.076 ng/mL (<0.78)
BNP: 24.49 pg/mL



Index Procedure

- s/p PCI on p-LAD d/t unstable angina (2006.4.3)

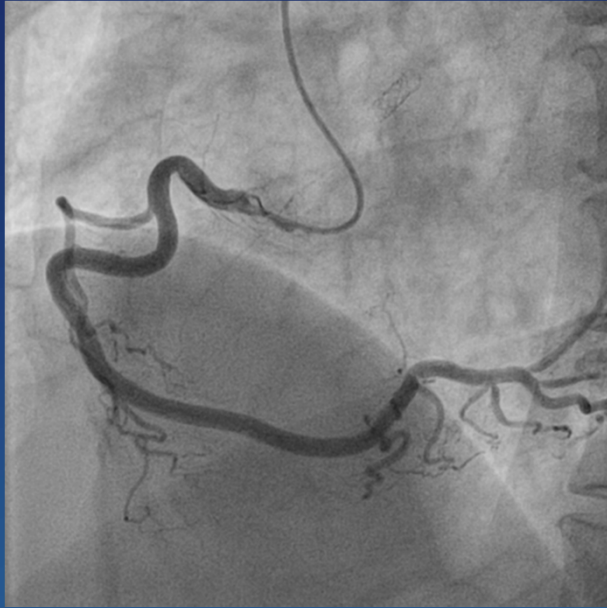


Cypher 3.0 x 18mm with kissing balloon

8-month follow up angiography



Angiography(2011.2.3)



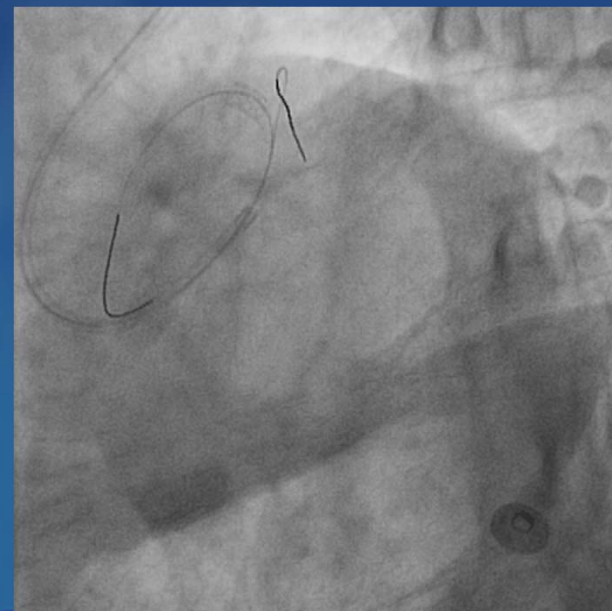
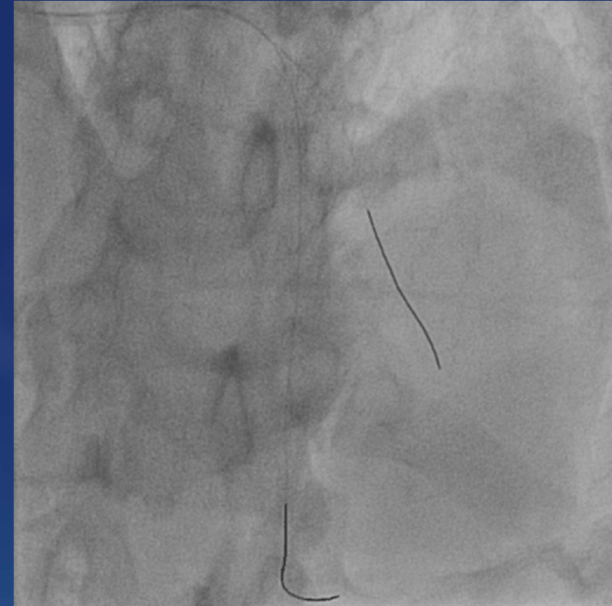
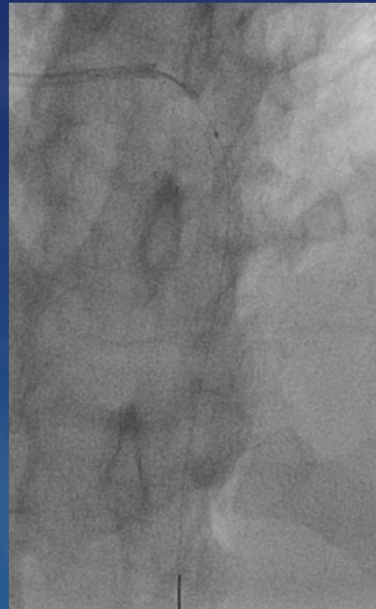
4 AL1SH



6 Fr XB 3.0



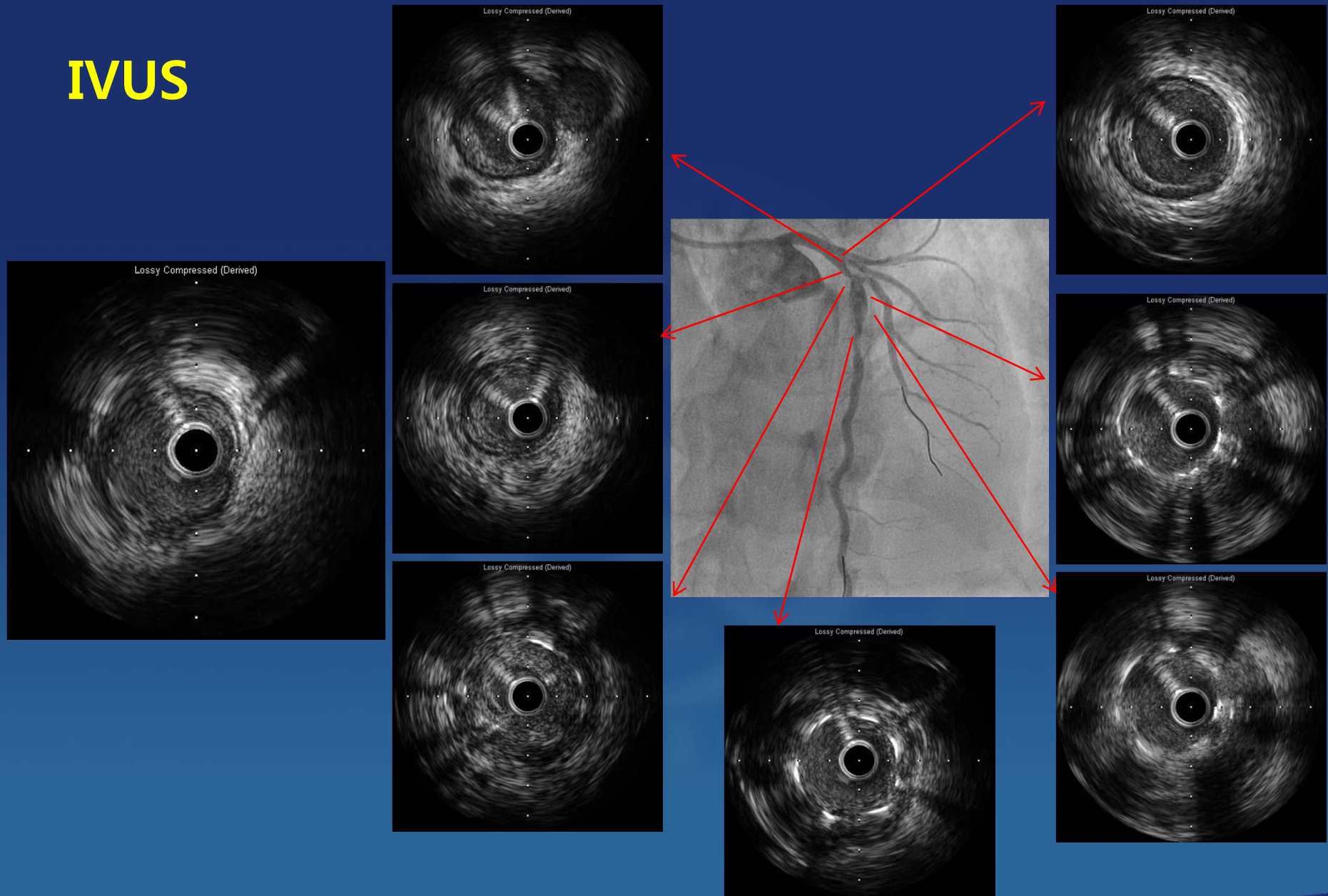
Thrombosuction



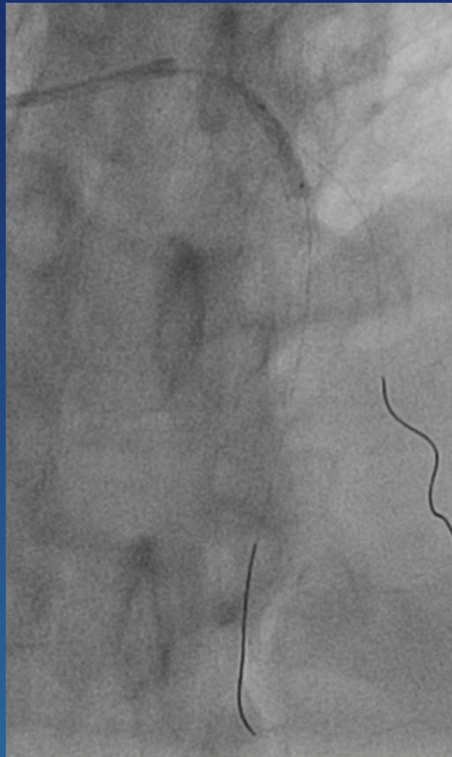
RUNTHOUGH G/W



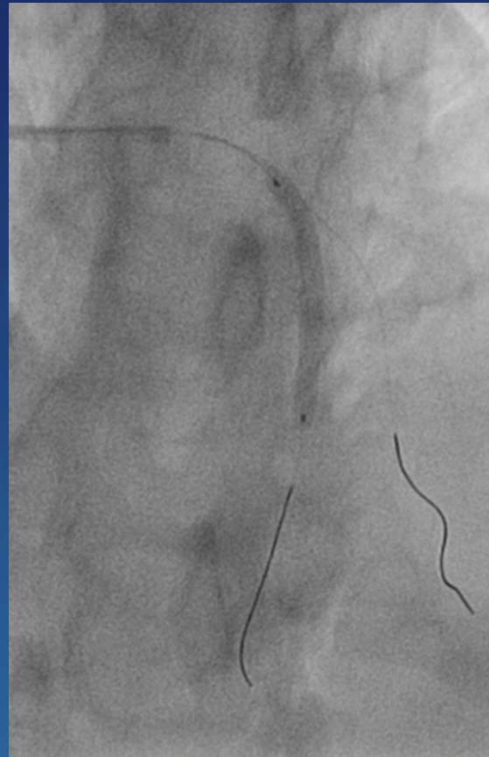
IVUS



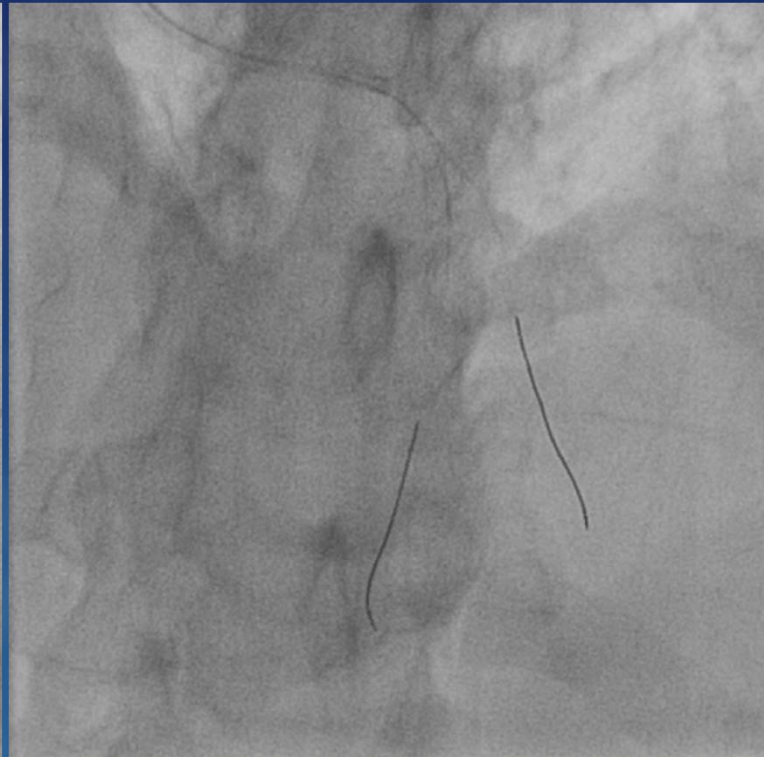
Balloon and Stent



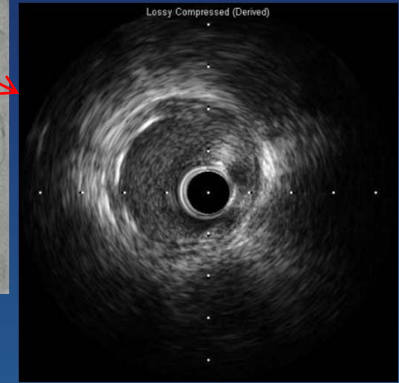
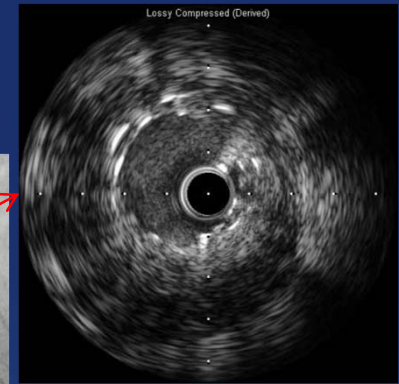
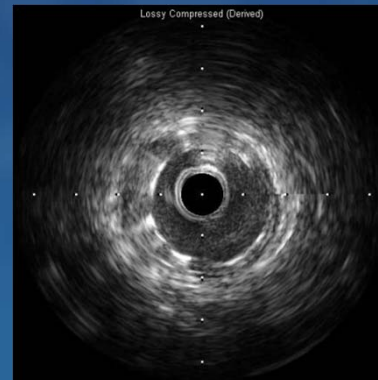
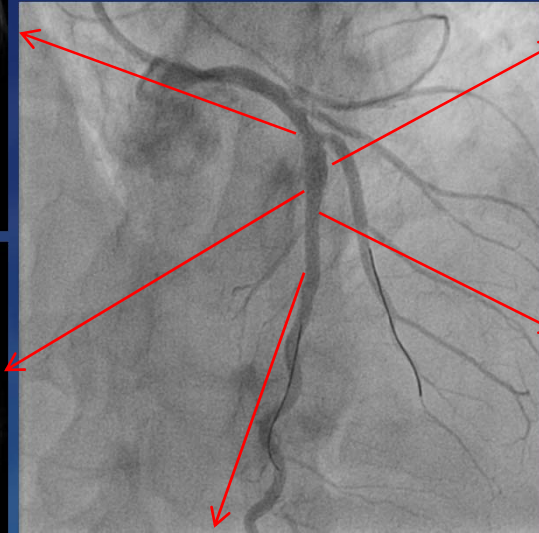
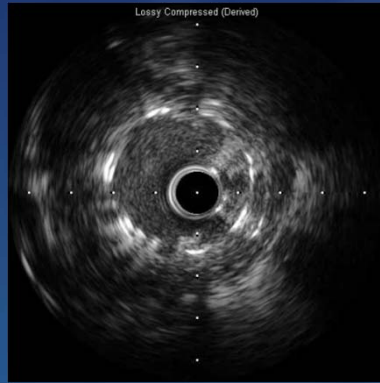
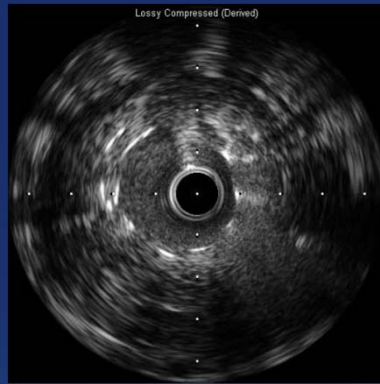
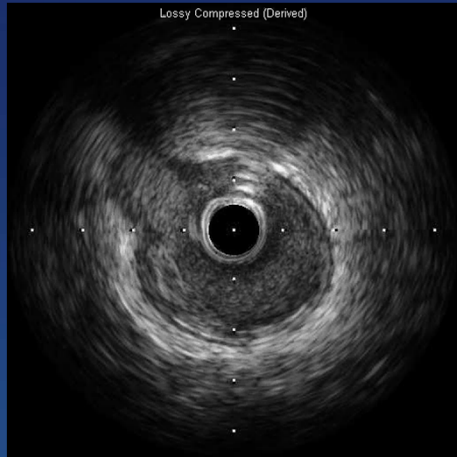
Sprinter 3.0 x 15mm



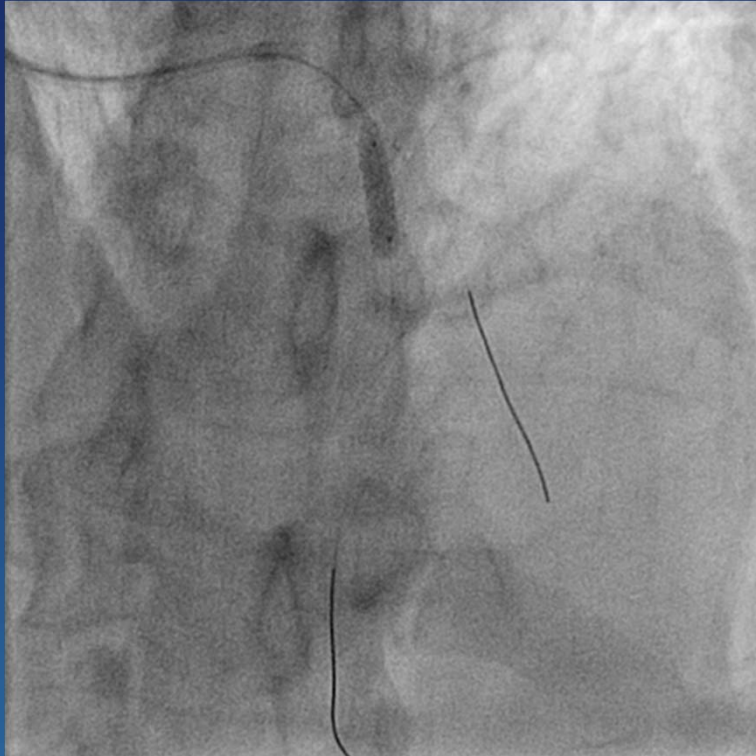
Genous 3.0 x 33mm



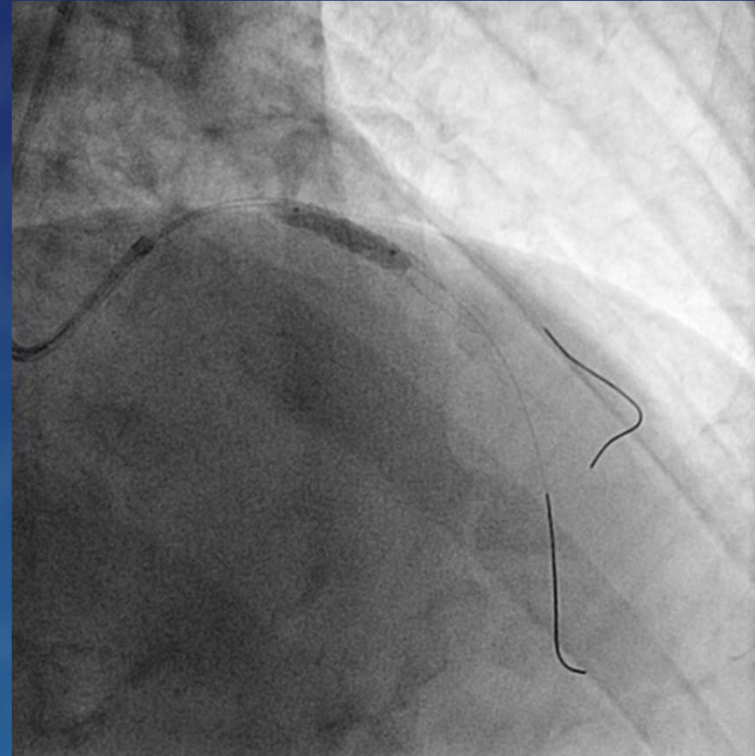
IVUS



Adjuvant Balloon



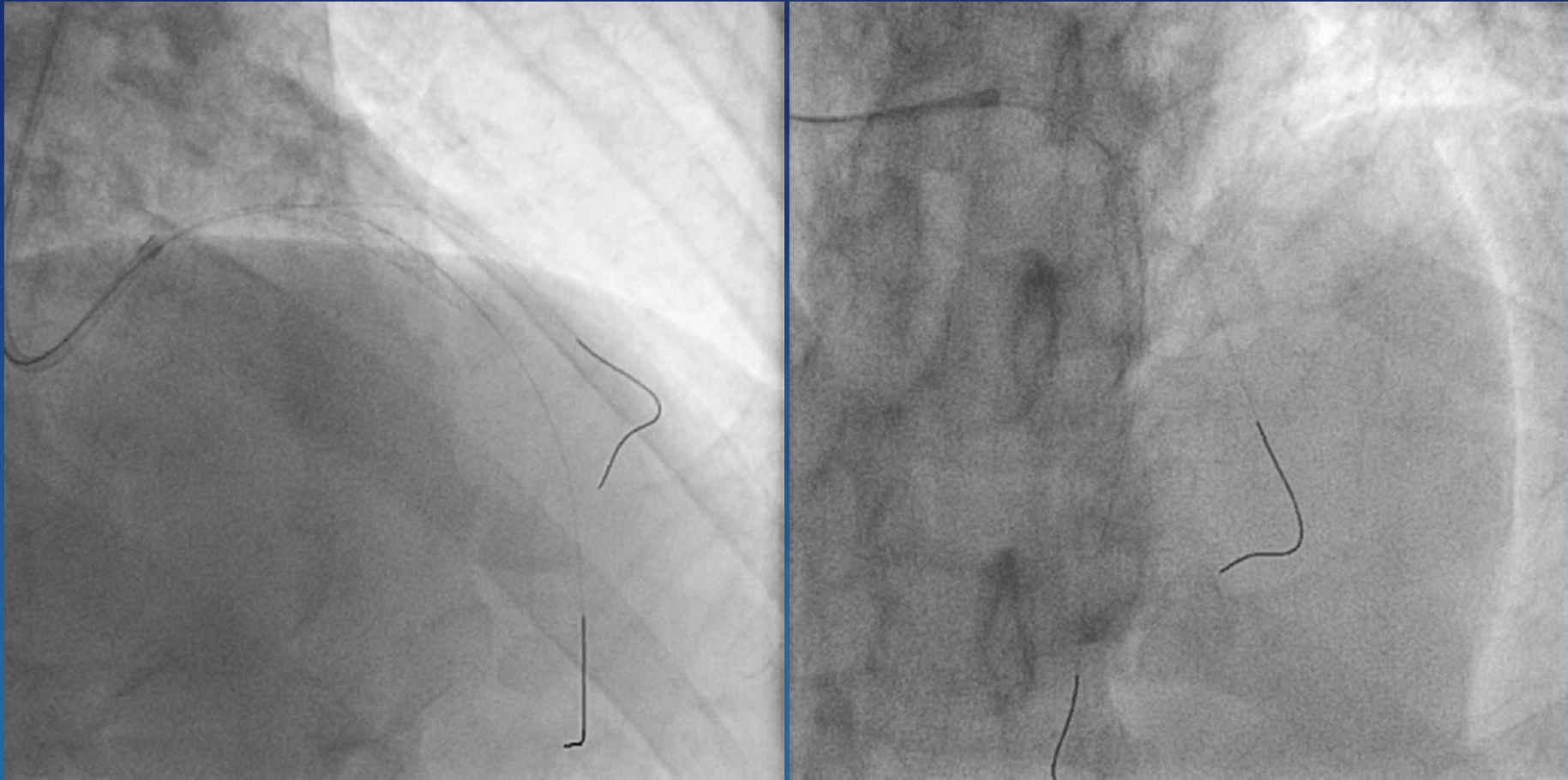
Genoss 3.5 x 15, 10 atm



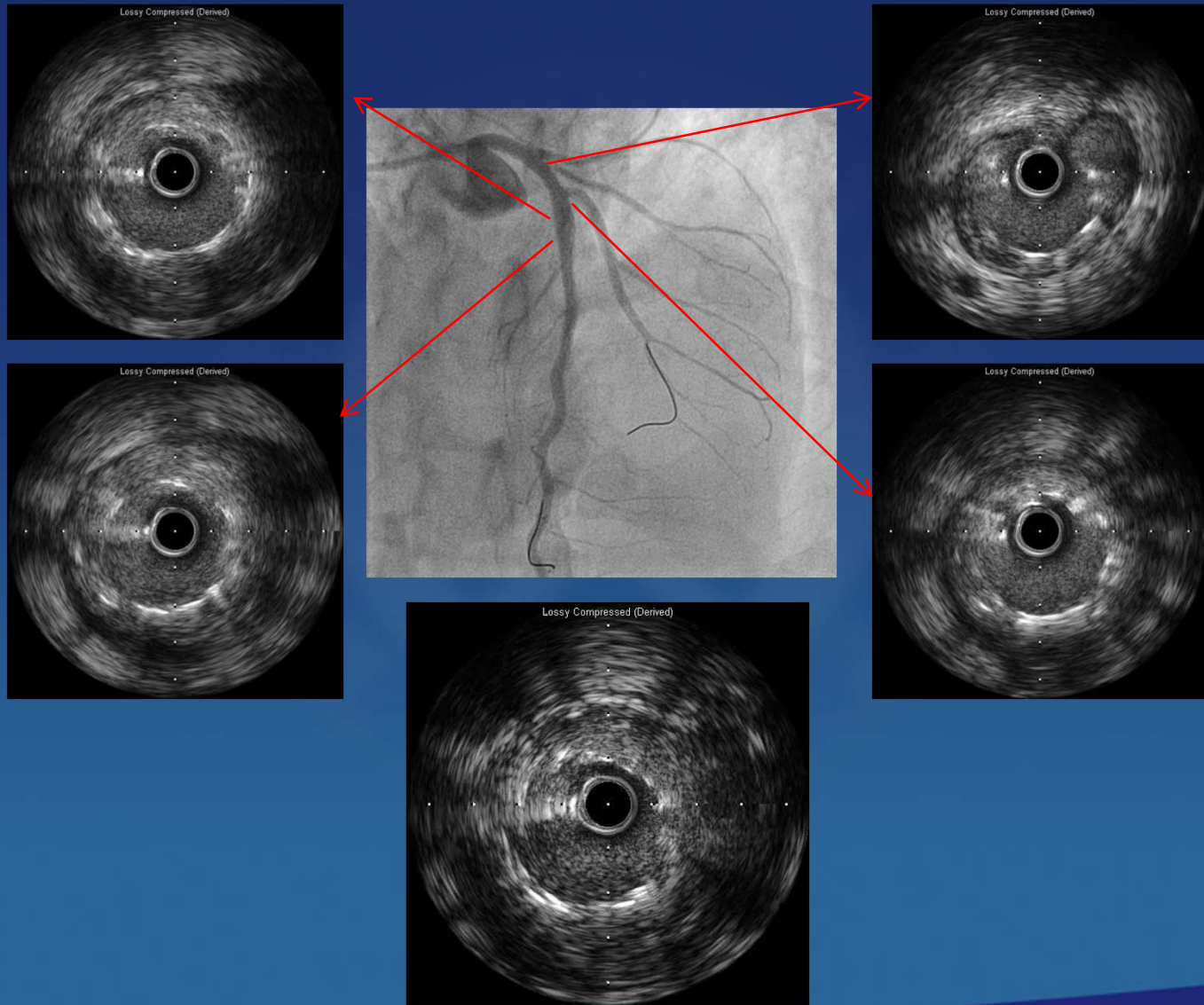
Sprinter 3.5 x 15mm, 10 atm



Final Angiography



Final IVUS



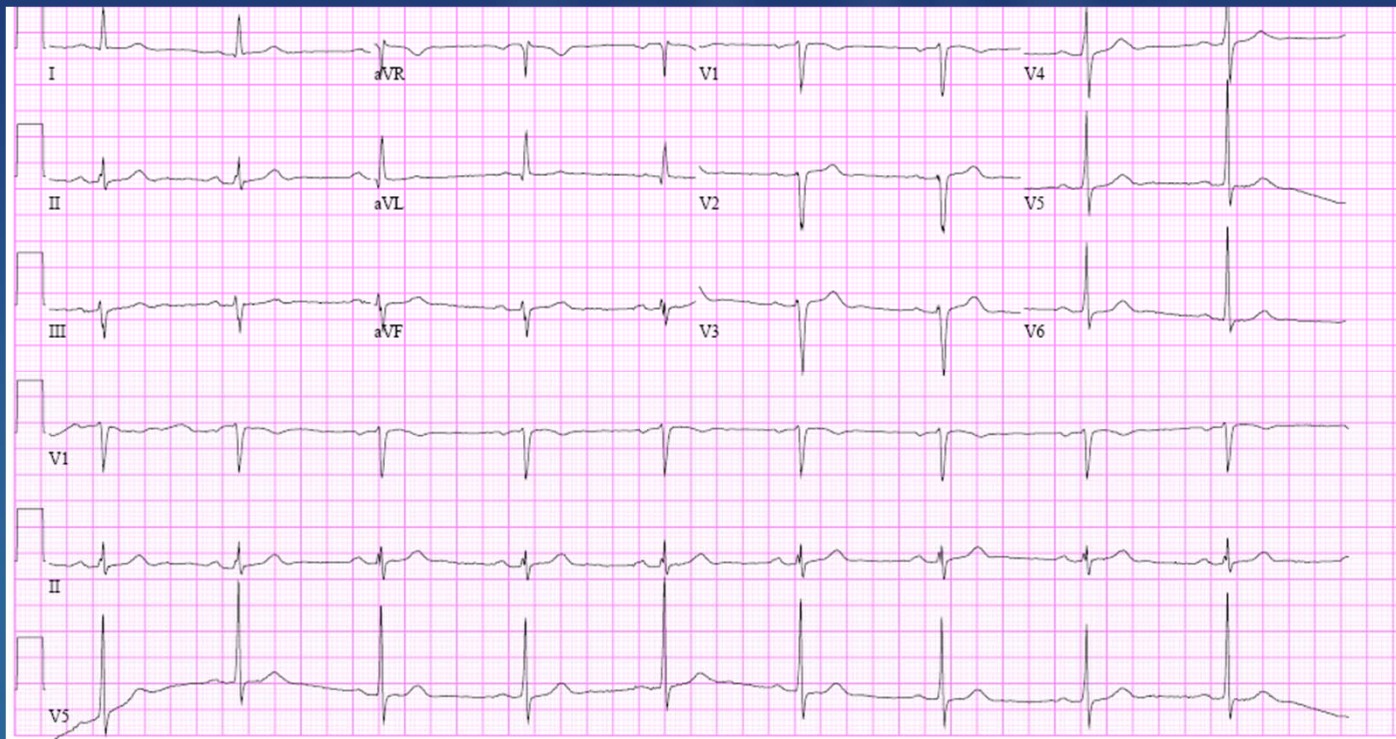
Discussion Points

- The simultaneous occurrence of aneurysmal dilation and incomplete apposition at Cypher stent sites may suggest a patient-specific sensitivity to polymer or rapamycin.
- This malapposition may facilitates very late stent thrombosis
- In the treatment of this specific lesion, we chosen Genous stent, EPC (endothelial progenitor cell) capture stent, for achievement of rapid and broad endothelization.

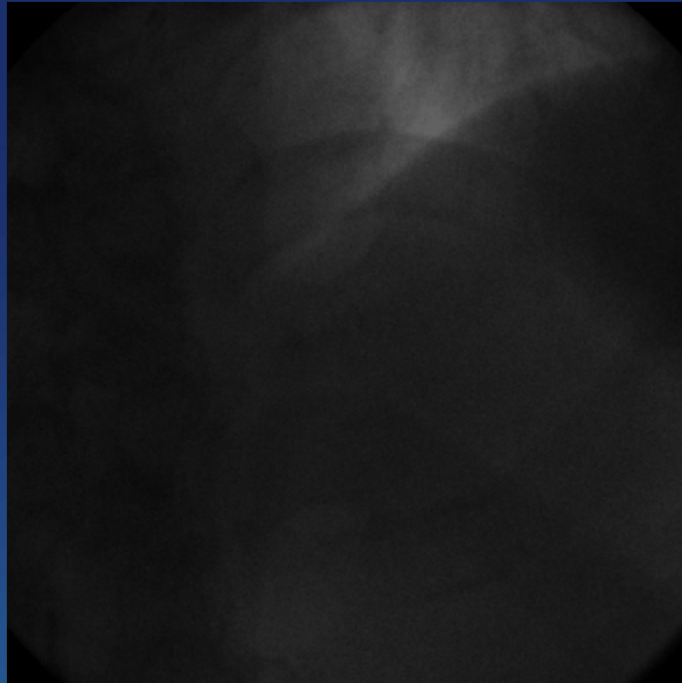


Case 5

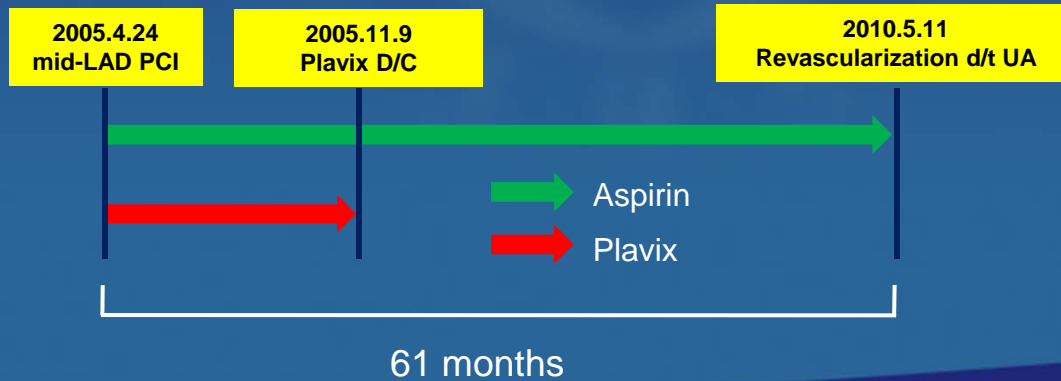
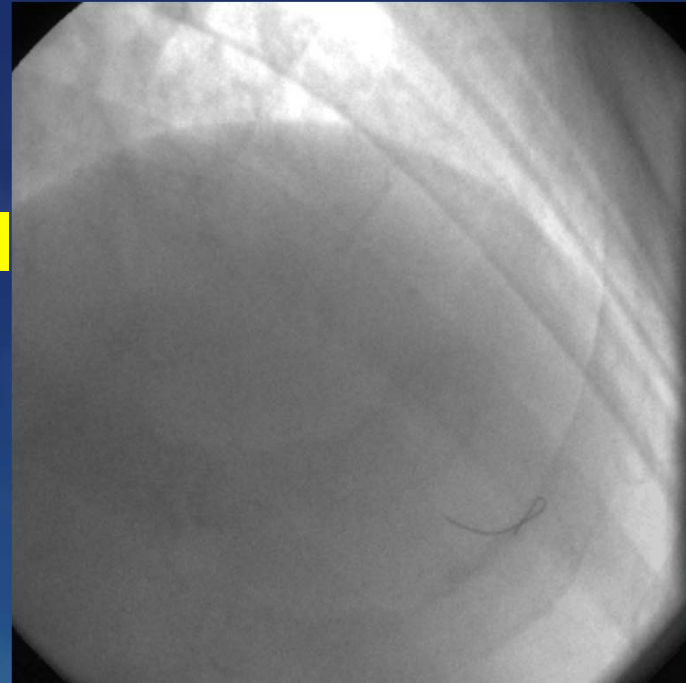
- 57 Male
- C.C: Resting chest pain lasting for 30 minutes
- Risk factors
 - Hypertension, dyslipidemia → P.O. medication
- s/p PCI on mid-LAD due to non-STEMI (2005.4.22)



Index Procedure (2005.4.22)



Cypher 3.5 x 23mm



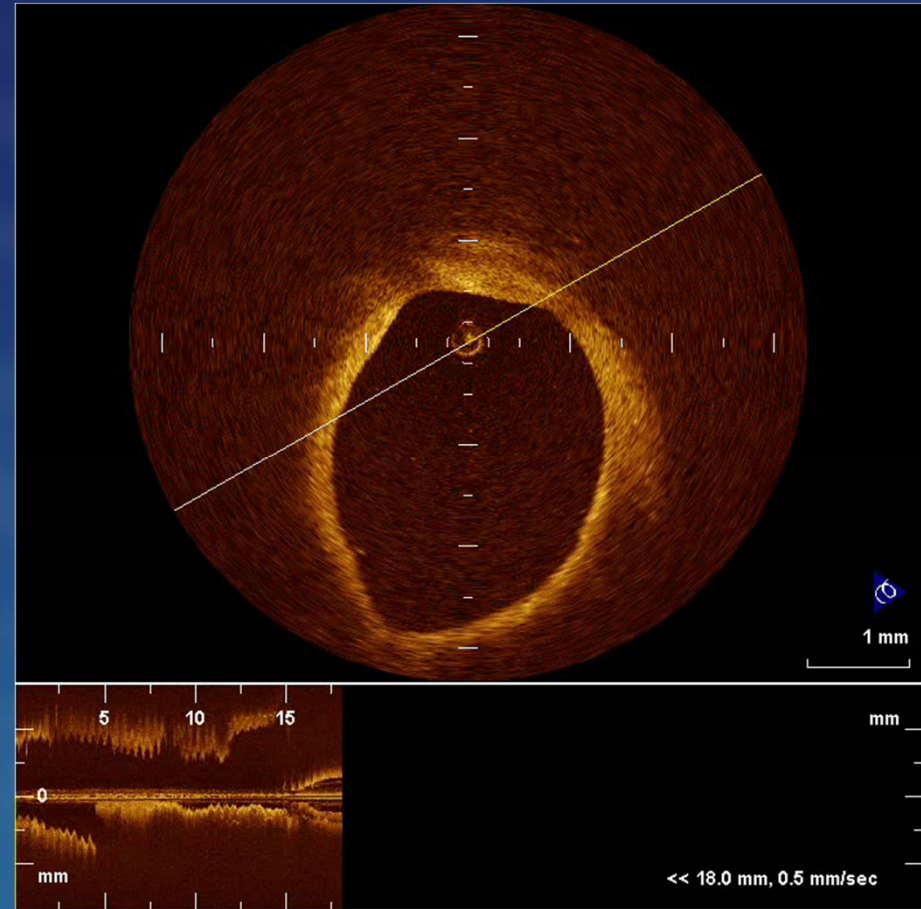
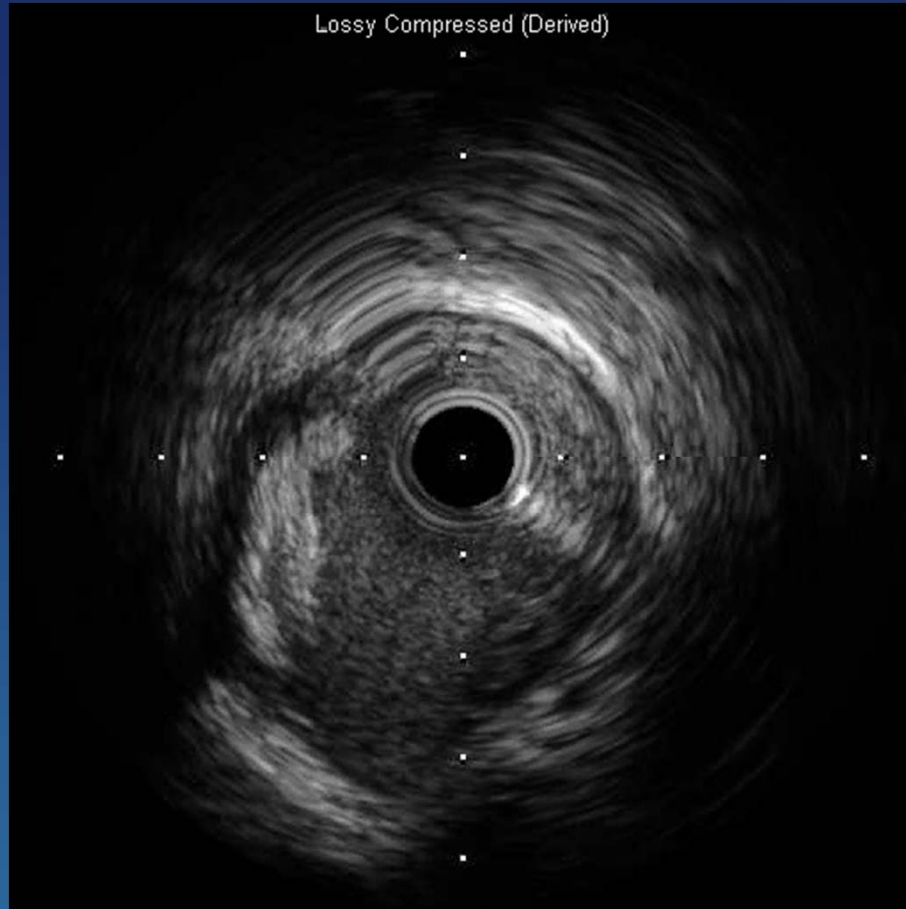
Coronary Angiography (2010.5.11)

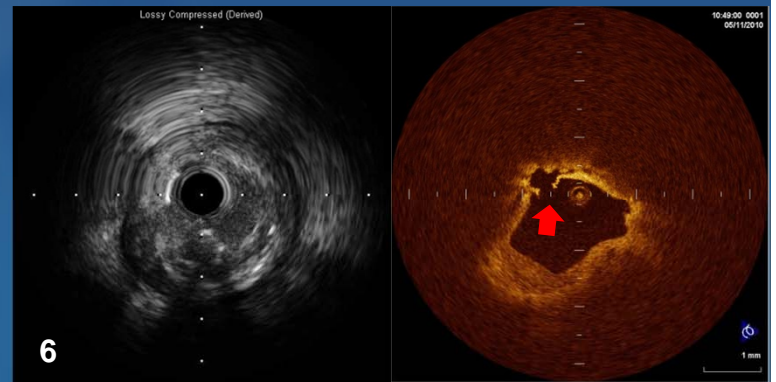
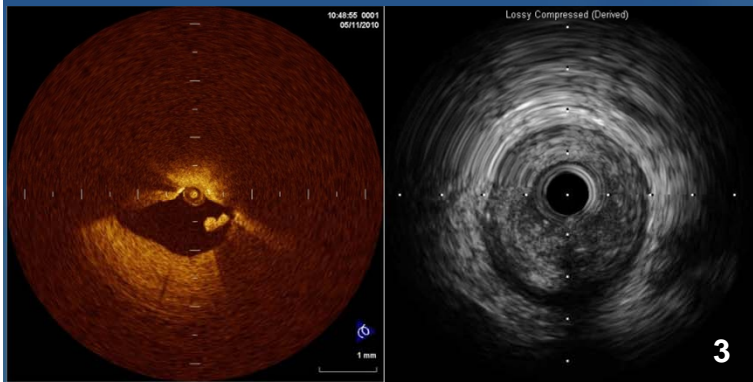
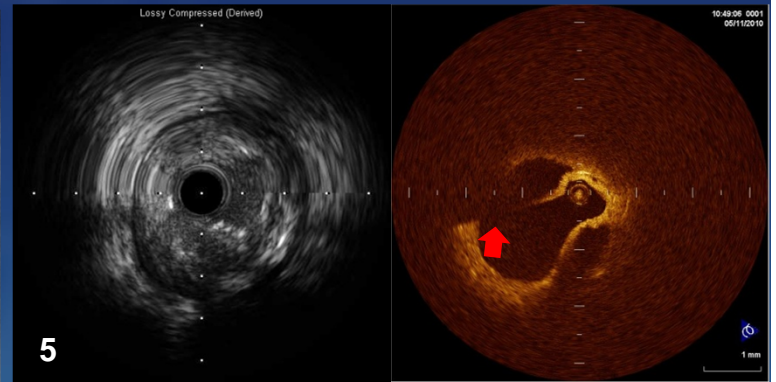
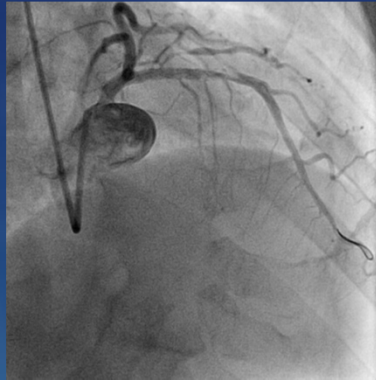
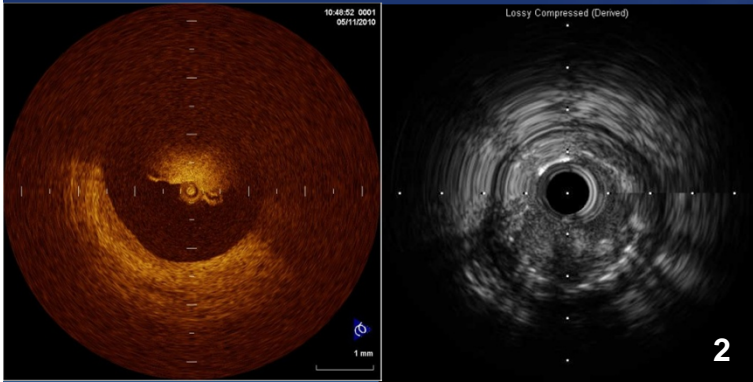
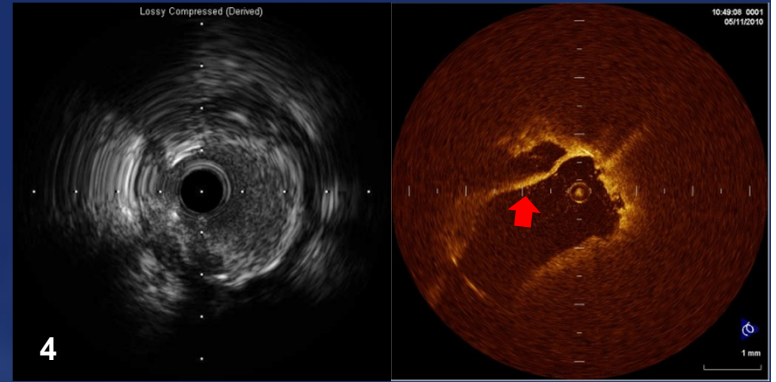
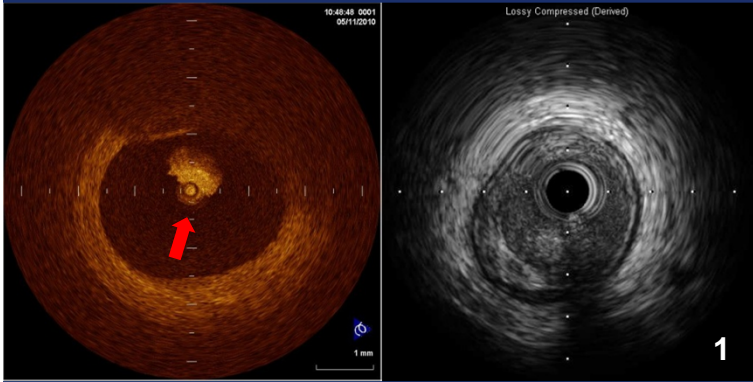


4AL1SH



OCT and IVUS

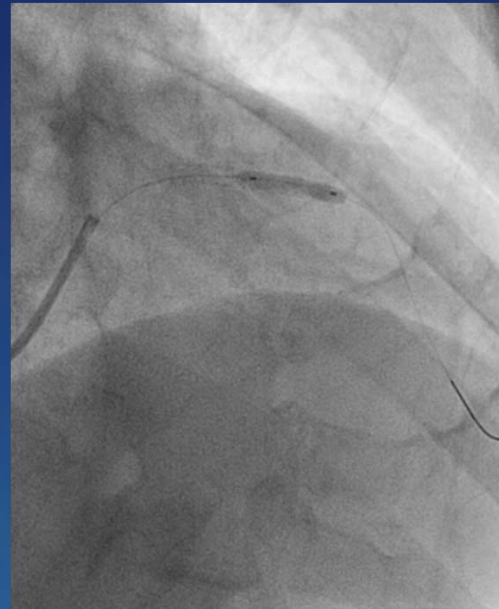




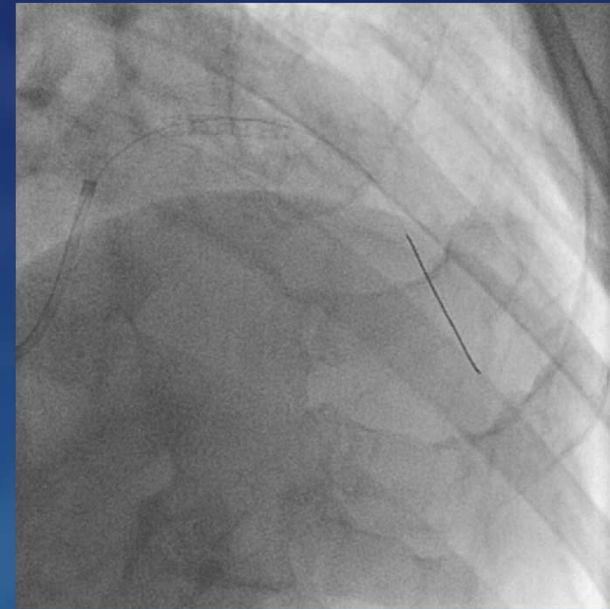
Thrombosuction and Balloon



Thrombosuction with Thrombuster II



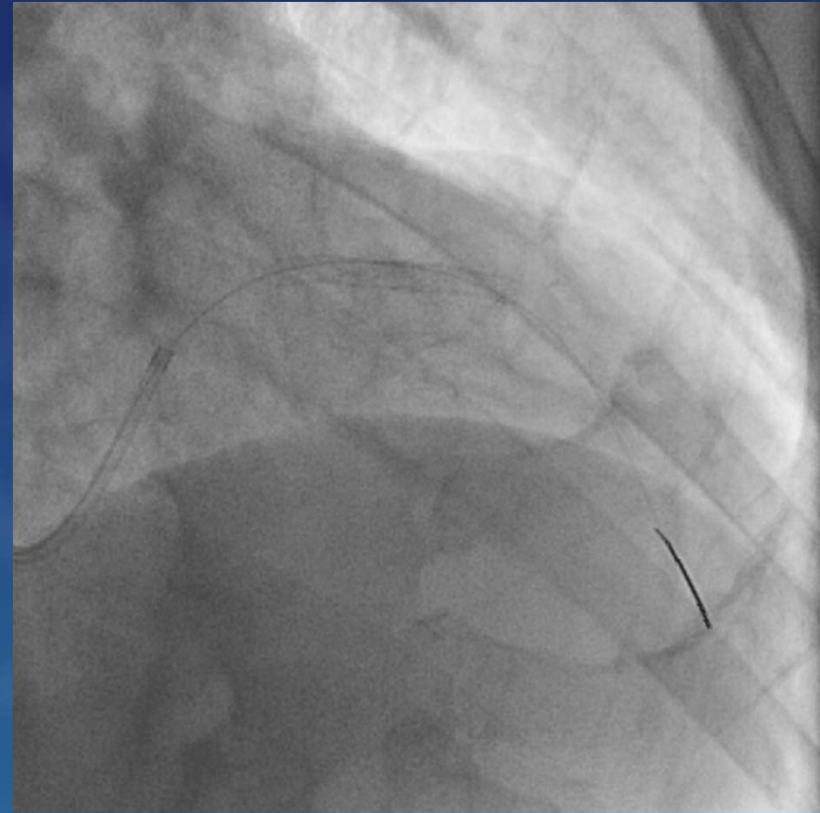
Powerline 3.0 x 15mm, 10 atm



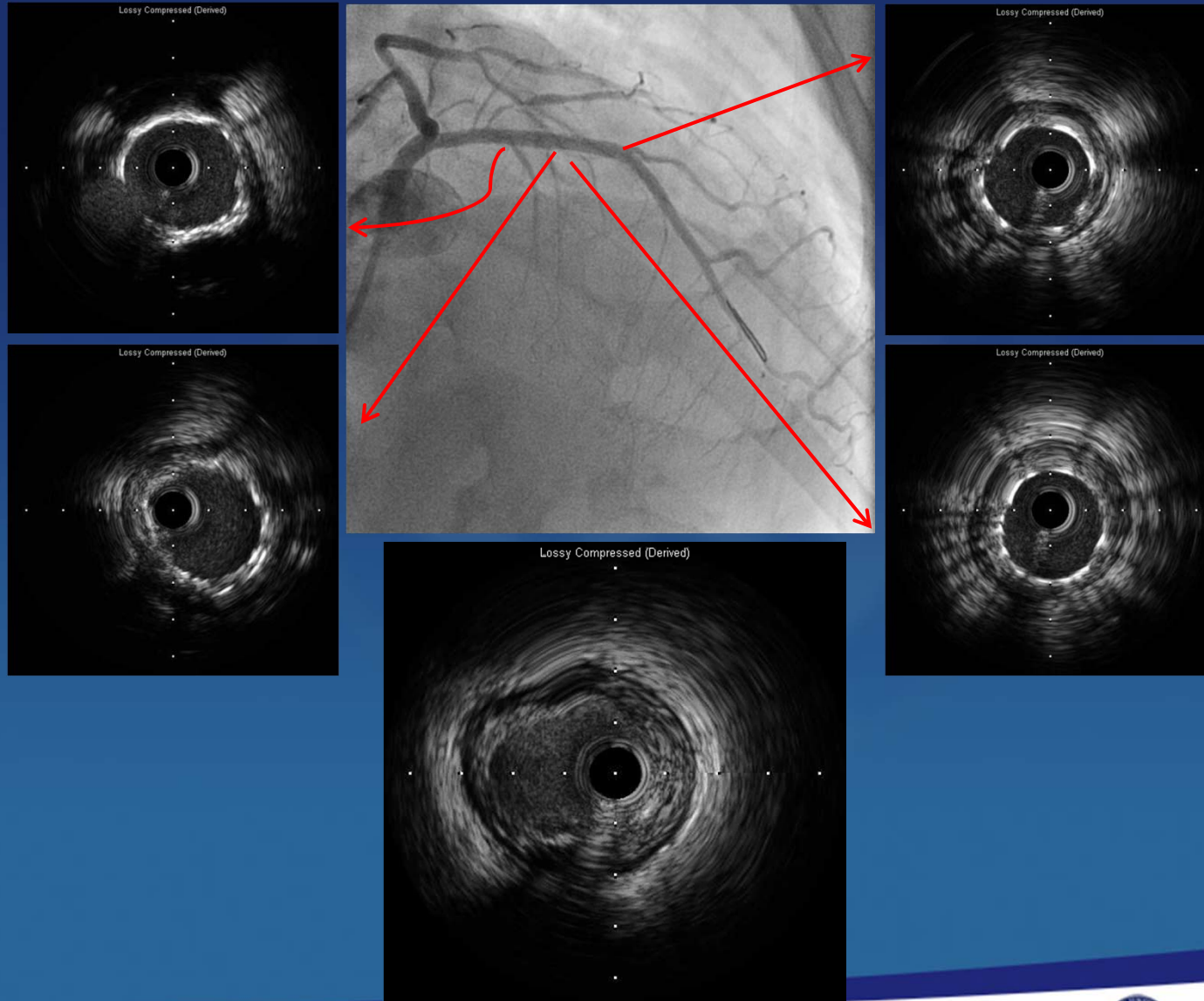
Stent and Final Angiography



Resolute 3.0 x 15mm, 12 atm



Final IVUS



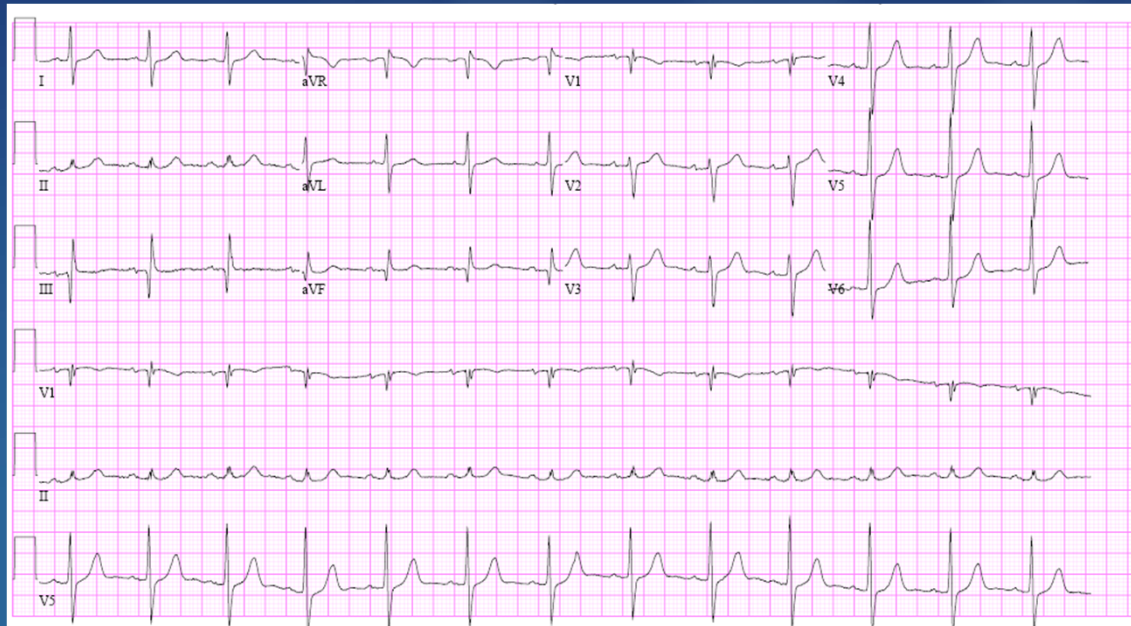
Discussion Point

- Very late stent thrombosis in previous DES stent, may occur due to rupture of NIH or neo-plaque site



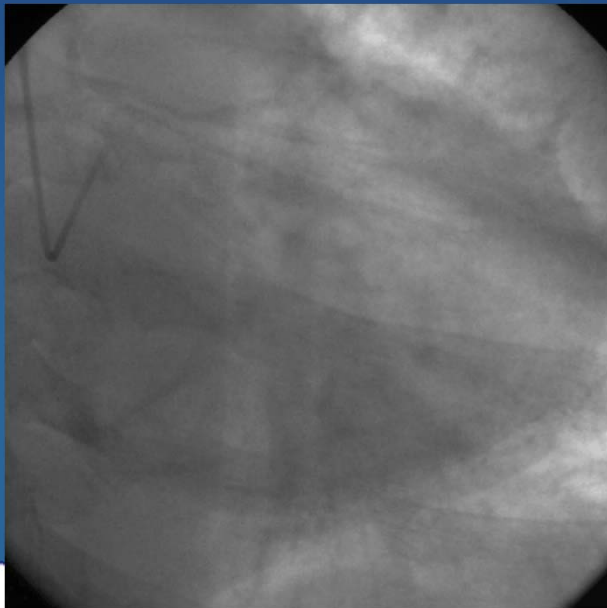
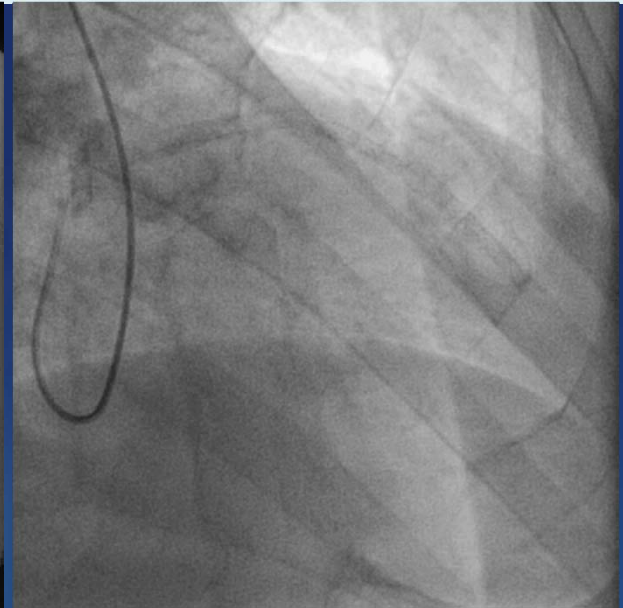
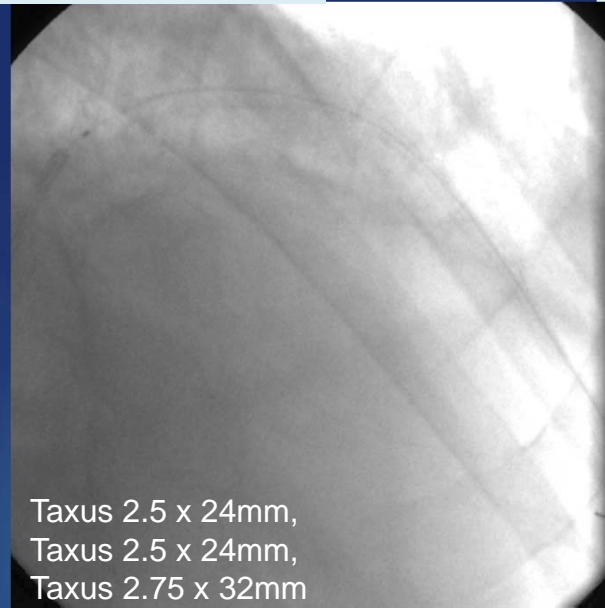
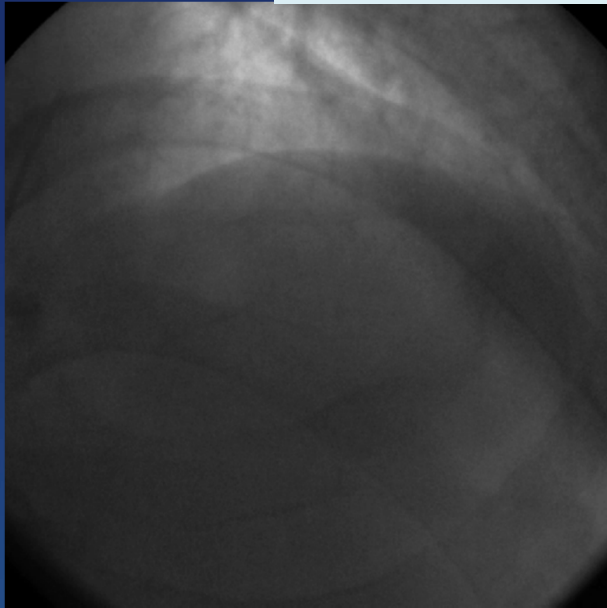
Case 6

- 70 Male
- C.C: Atypical chest pain
- Risk factors
 - Hypertension, Diabetes → P.O. medication
- s/p PCI on proximal to mid-LAD and proximal LCX due to stable angina



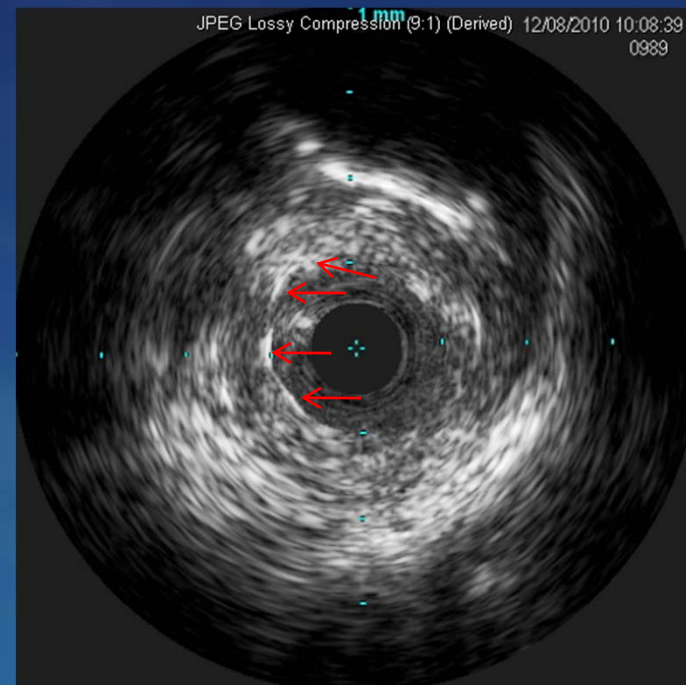
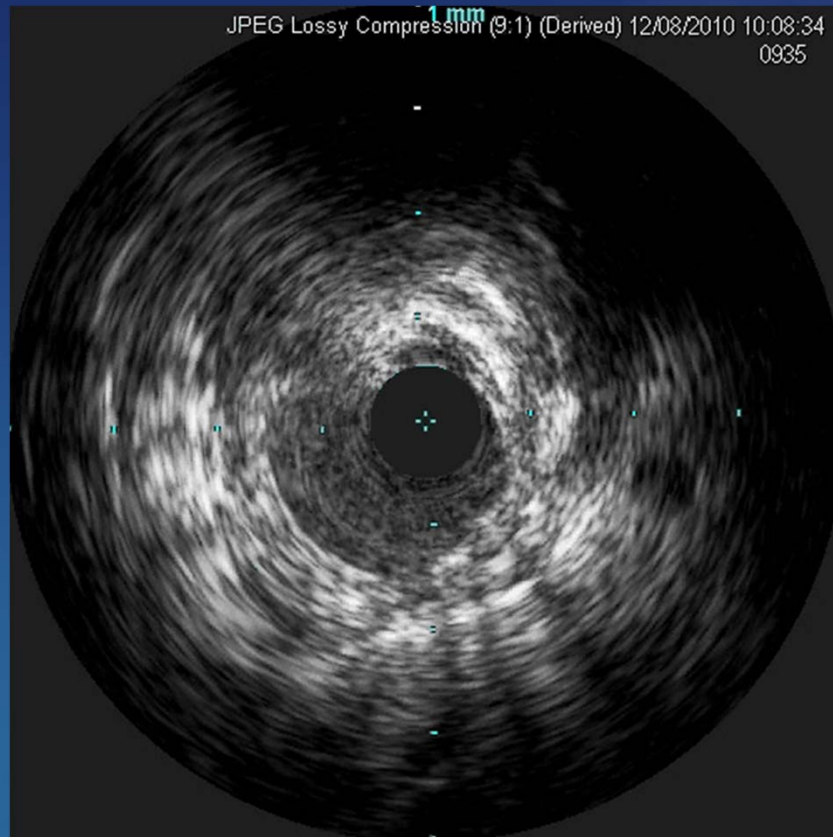
2005.2.28
Angiography and PCI

Follow Up Angiography
(70 months)



IVUS (70 months)

- LAD instent late catch up calcium



Discussion Points

- Even in the DES era, neo-plaque formation may occur similarly this case in long term follow up
- Plaque calcium might be one of the variables affecting the amount of NIH and neo-plaque formation

