Hope for the best, But prepare for the worst :

- What should be prepared before PCI for CHIP -

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Hiroyoshi Kawamoto MD, Kentaro Tanaka MD, Satoshi Matsuoka MD, Hiroaki Nakajima MD,
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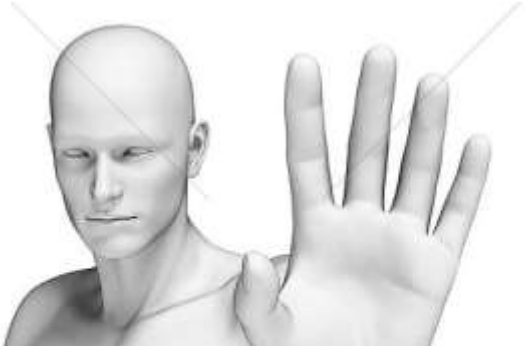
Unexpected Accident

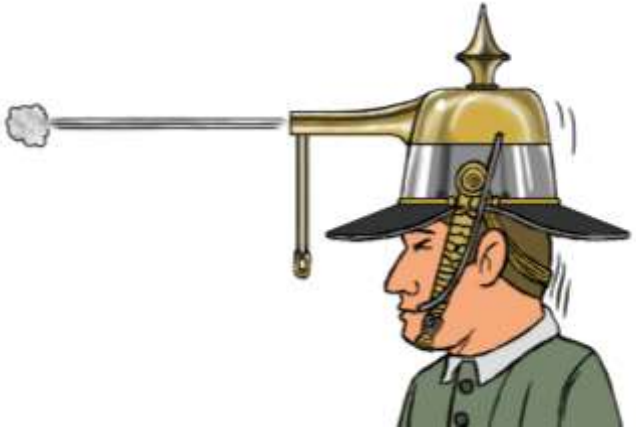
- Unexpected adverse event (UAE) -

Everything that can possibly go wrong will go wrong.

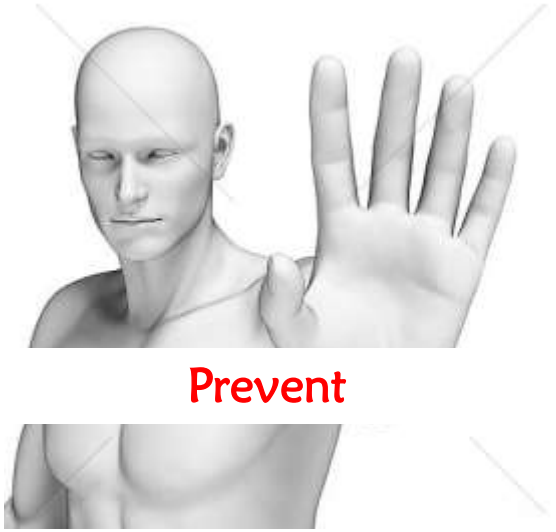
Murphy's Law



Prevent



Technique With Experience



Prevent

Unhappy Event 1.

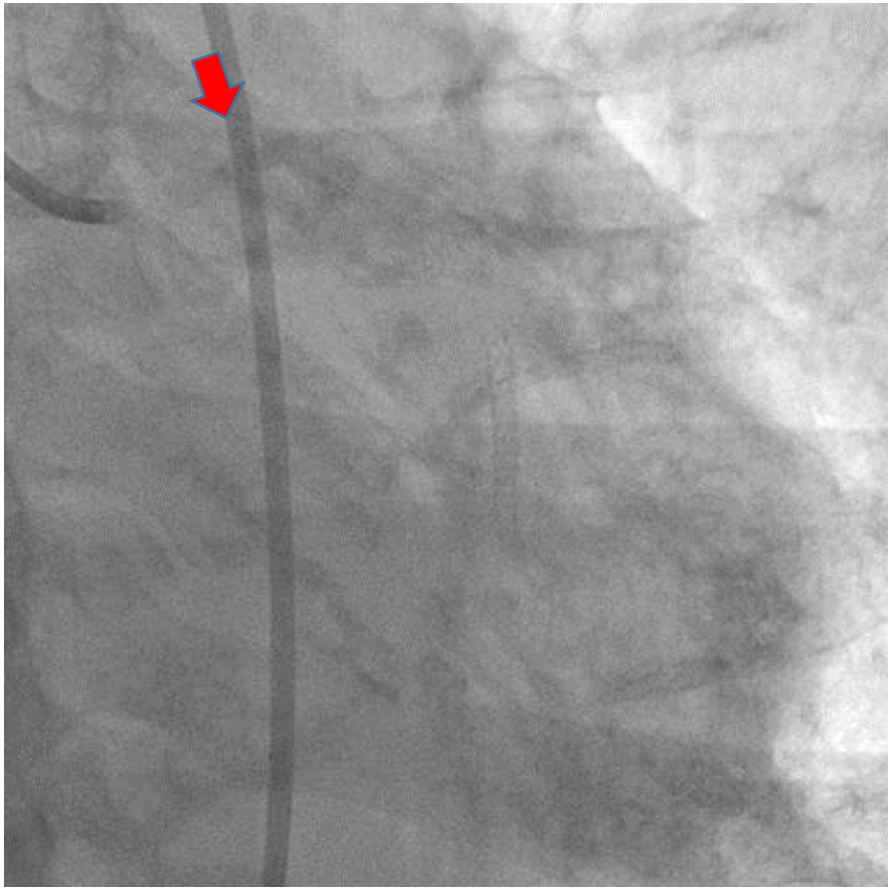
We need to Know the possibility of negative remodeling or unhappy location of calcification

Use IVUS before hands…. Make your PCI much safer

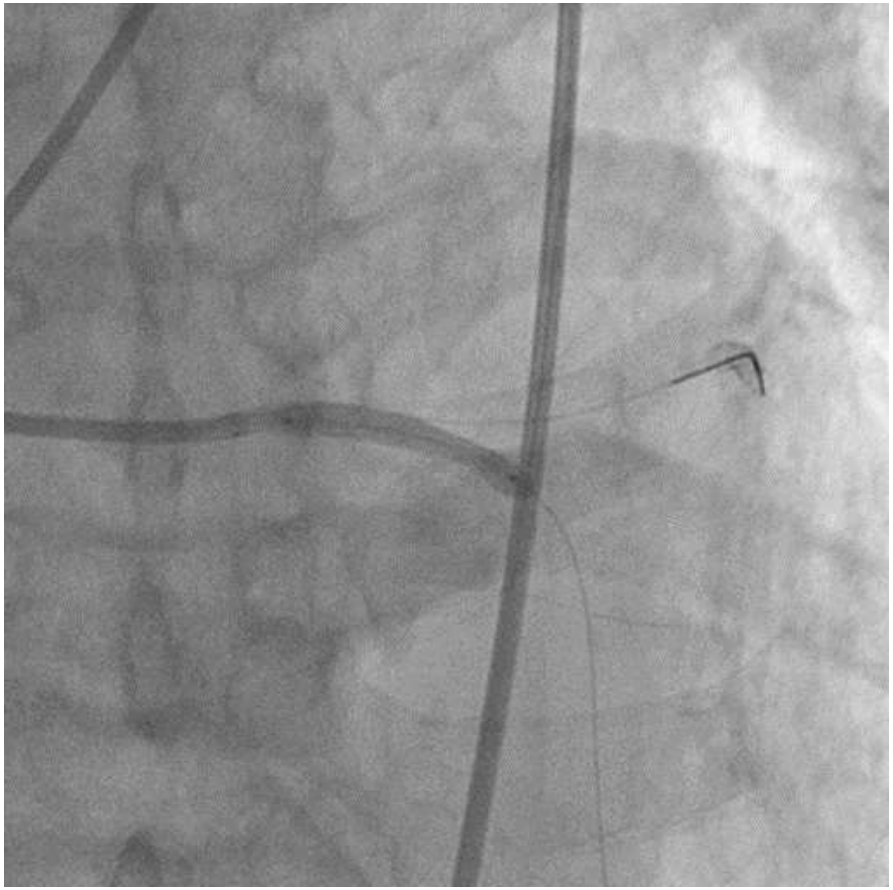
Case 1 : Big Perforation in LAD prox. after Direct Stenting

- Ellis classification Type Ⅲ -

Pre



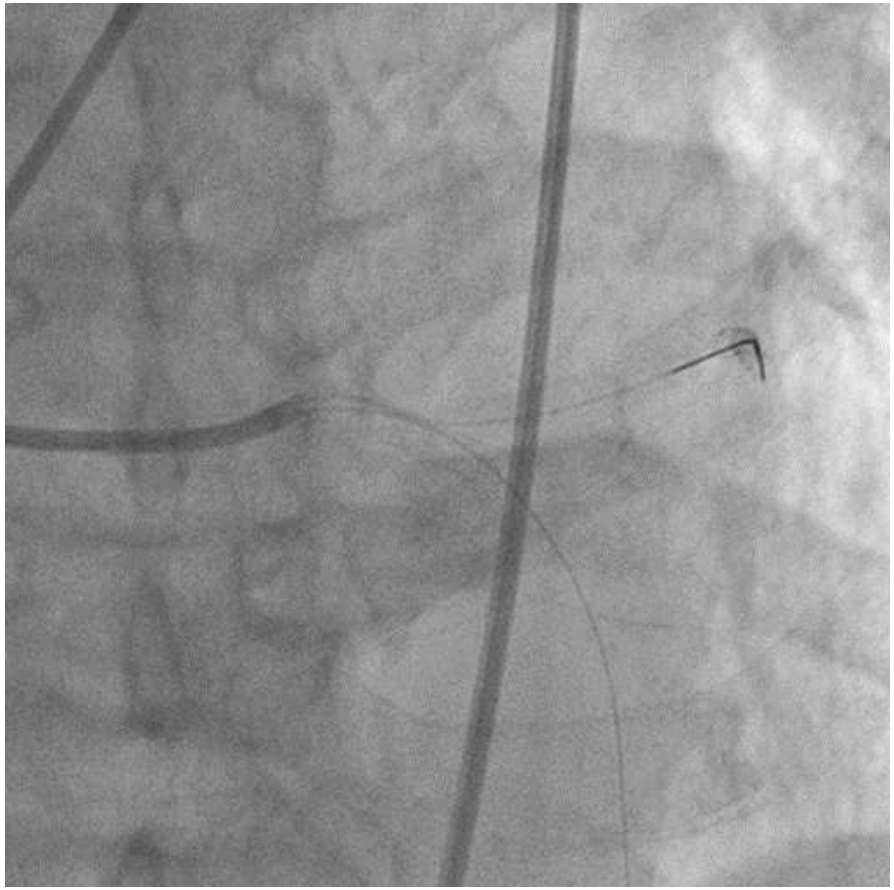
Direct stenting 3.5mm DES in LAD



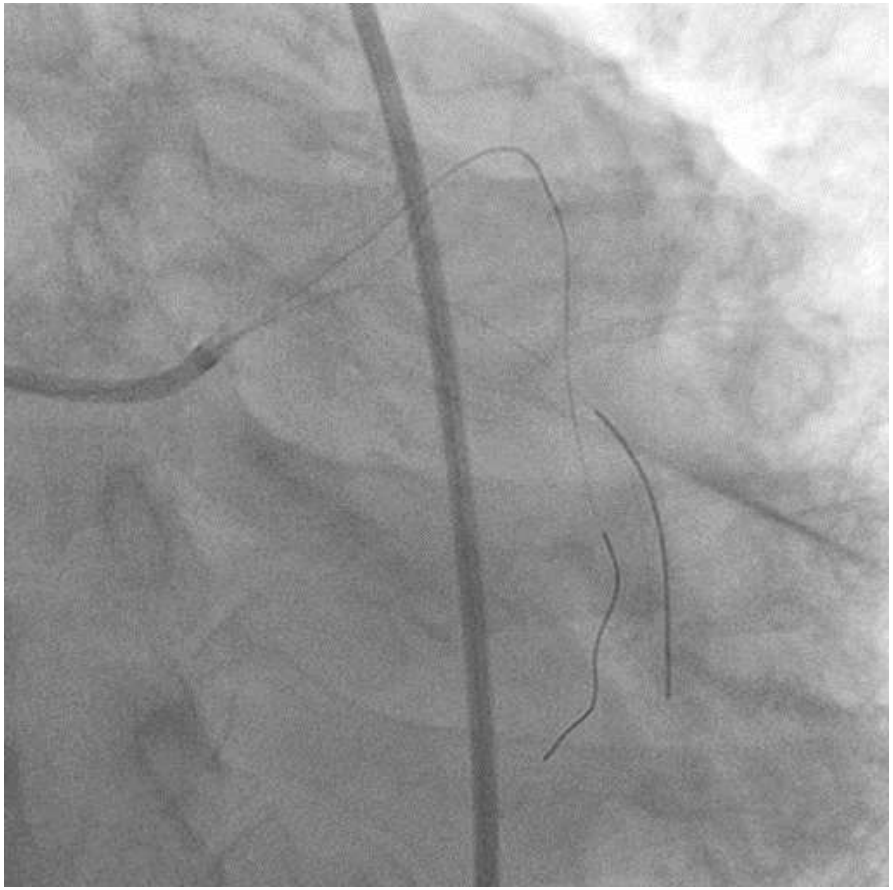
Case 1 : Big Perforation in LAD prox. after Direct Stenting

- Ellis classification Type Ⅲ -

Blow out type perforation



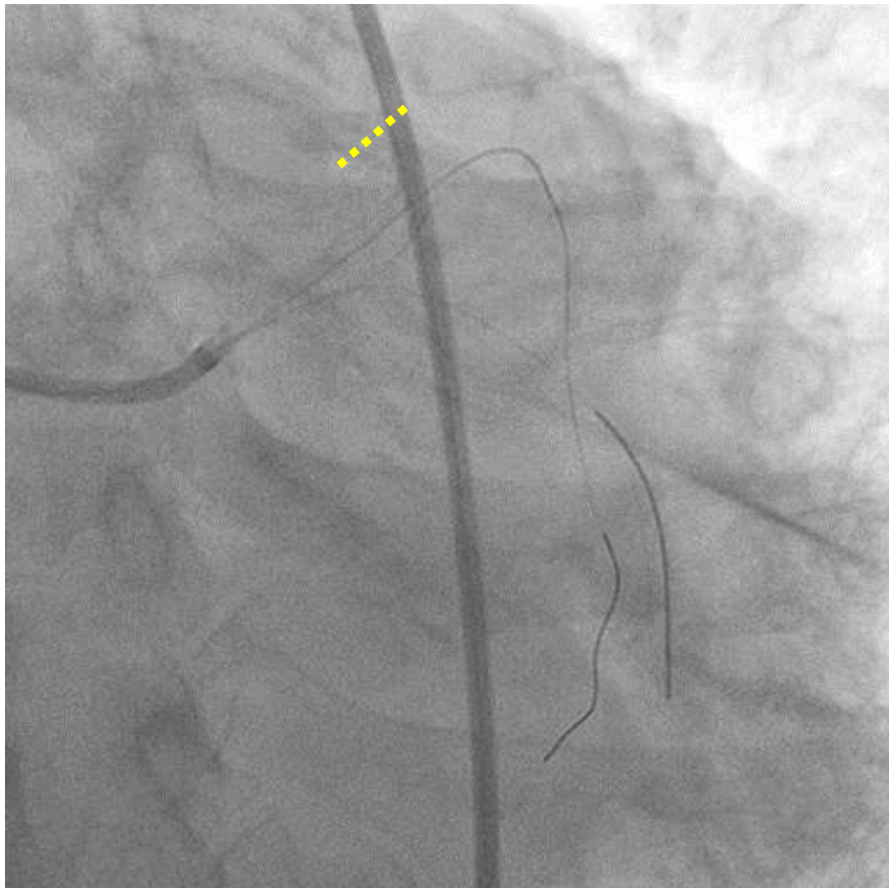
Within 10 seconds, Next, Check AP caudal view



Case 1 : Big Perforation in LAD prox. after Direct Stenting

- Ellis classification Type Ⅲ -

Why ?? Checking AP caudal view...



Need to Check the possibility for Protecting LCX even after GRAFT Stenting

Immediately recognized the situation.....

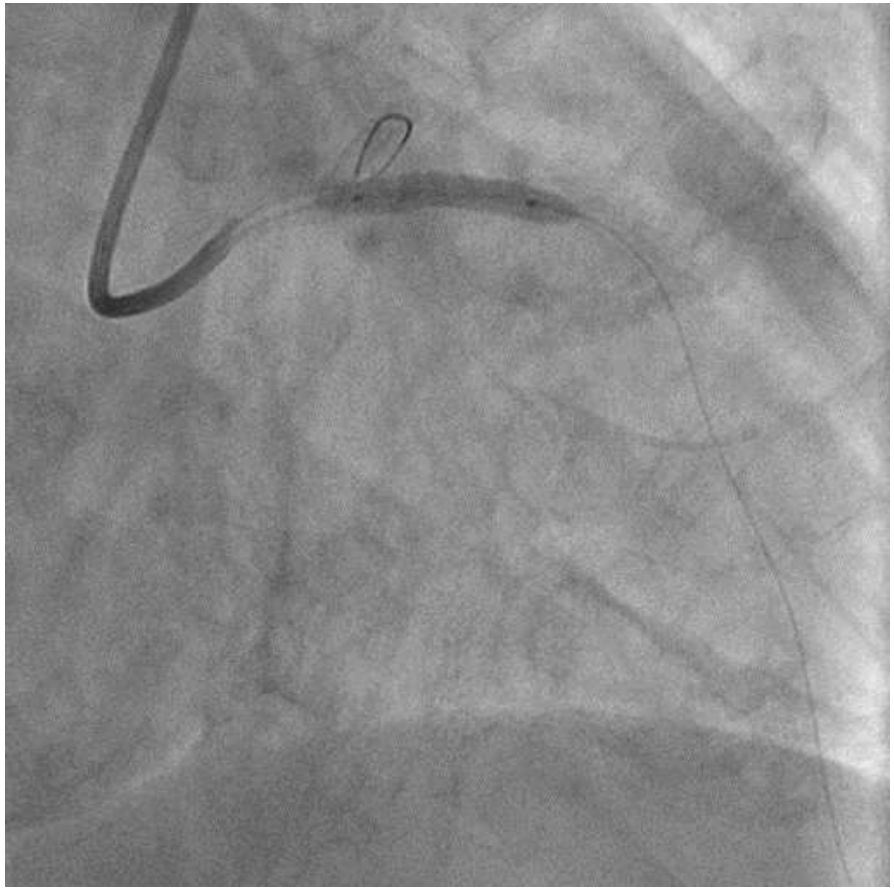
Smart technician bring me Graft stent with silent understanding within a minutes

After **untying the situation**, it's seemed to be nothing happen , Pts back general word

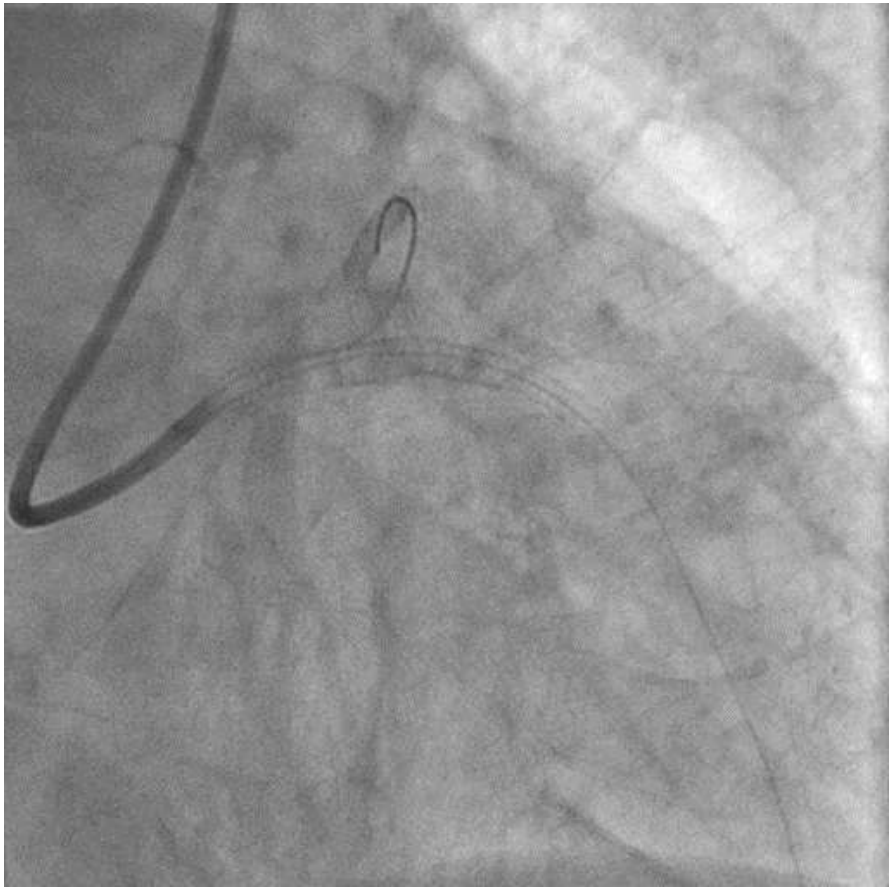
Case 1 : Big Perforation in LAD prox. after Direct Stenting

- Ellis classification Type Ⅲ -

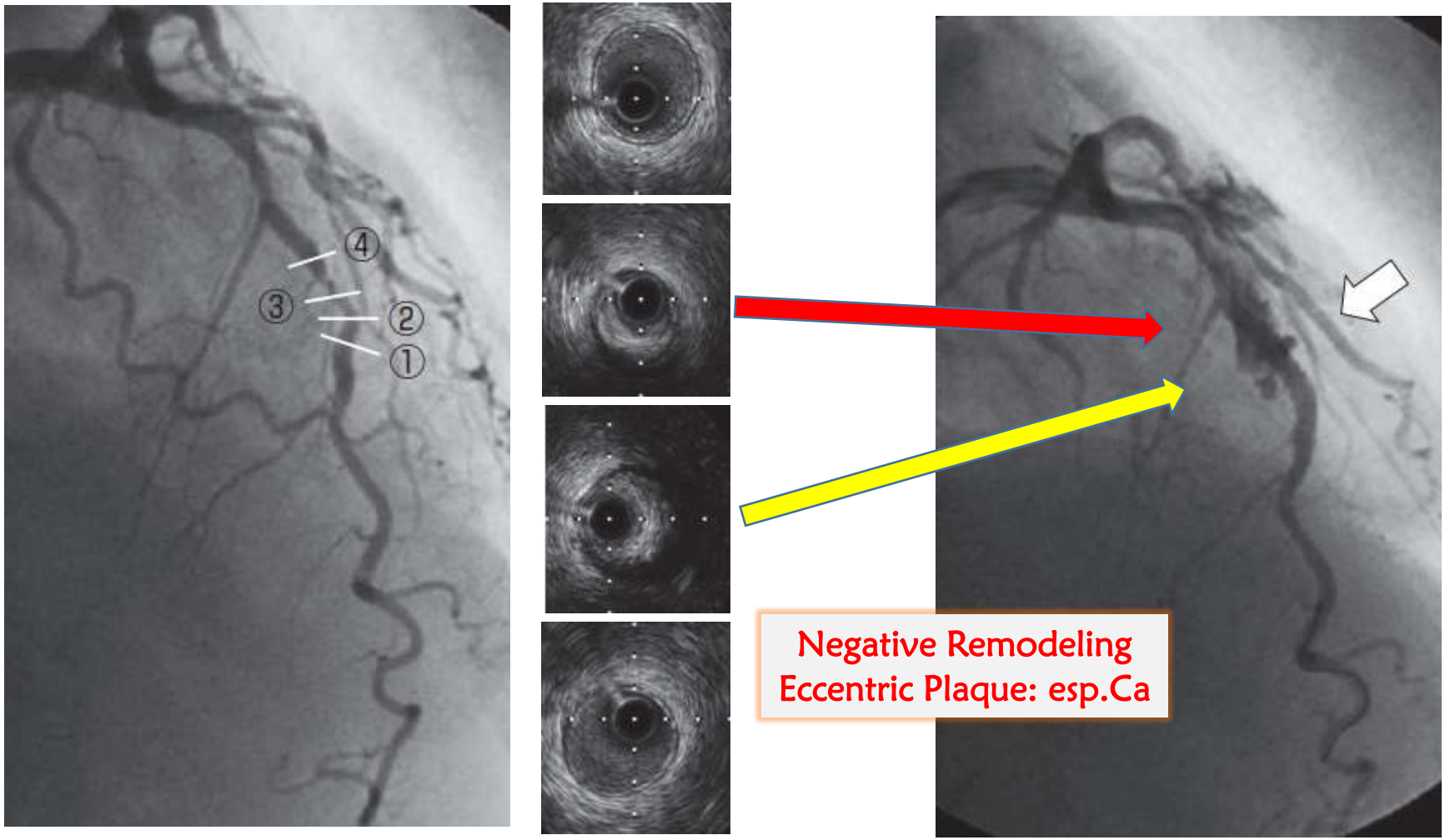
Graft stent implantation



Final Figure



Coronary Perforation is Predictable



Toshihiro Suga et al Herts Original 2013

Prediction

1. Knowing possibility of Perforation
2. Negative Remo. Eccentric CA

Prevent

1. Use IVUS
2. Undersize Intervention

Weapon

1. Graft stent
2. Guide Extension
3. IABP , IMPELLA

Technique

1. Deliver Bulky Graft stent
2. Pericardiocentesis
3. **Quickness !!!**

Unhappy Event 2.

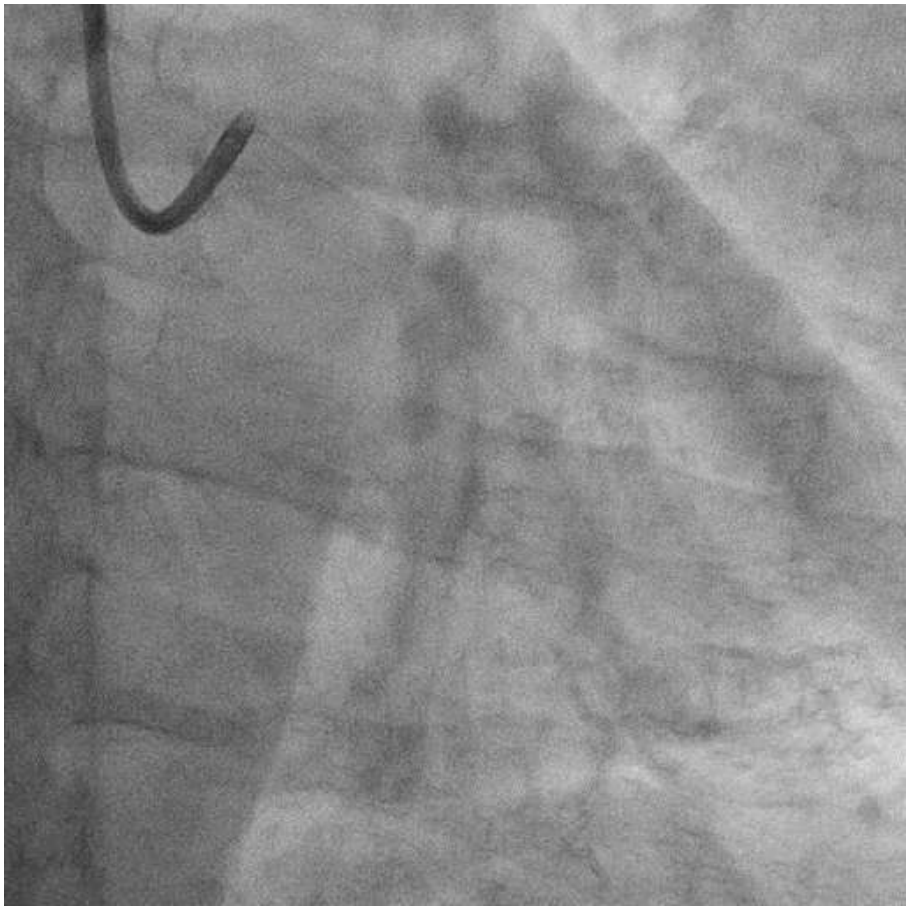
We need to Know the possibility of Losing Side Branch
in case of calcified lesion opposite of CARINA

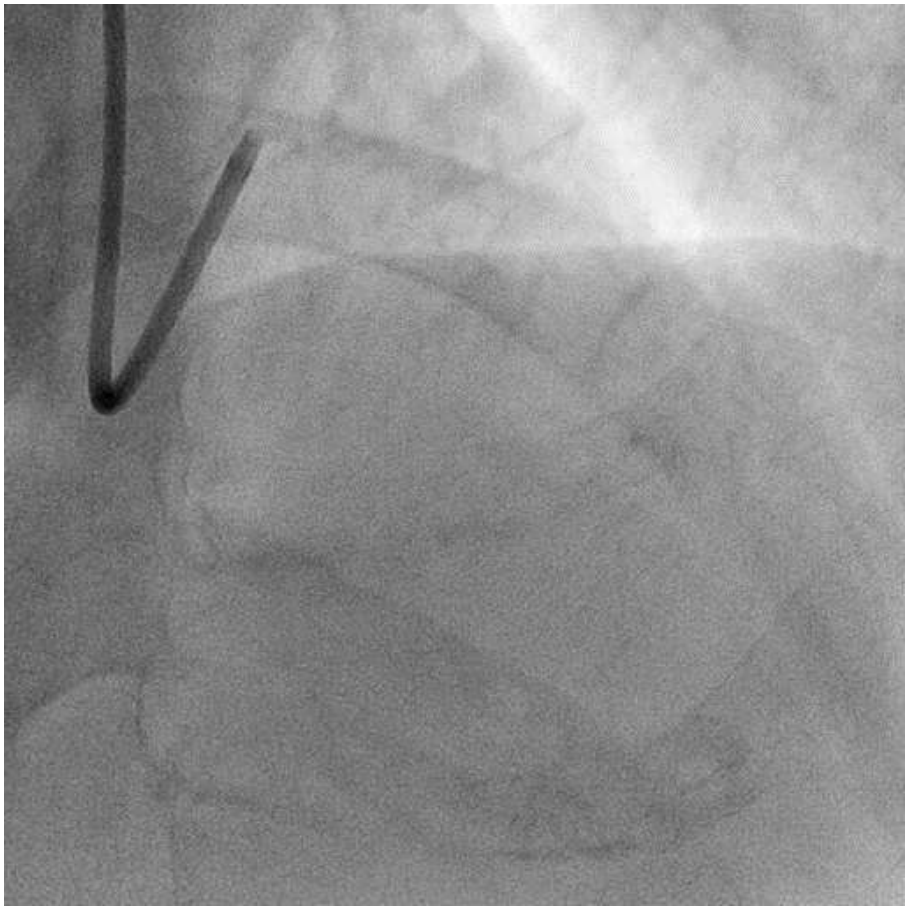
Use IMaging before hands…. Make your PCI much safer

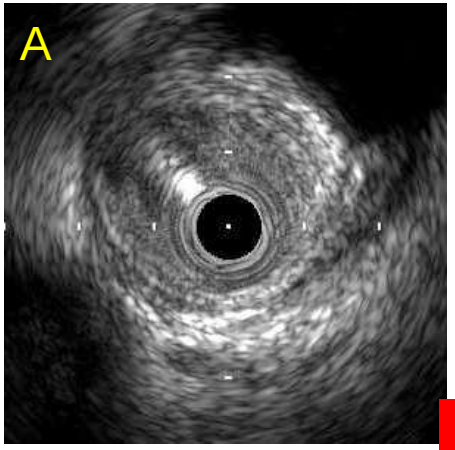
Case 2 : LMT body stenosis w/o stenosis of LCX ost.

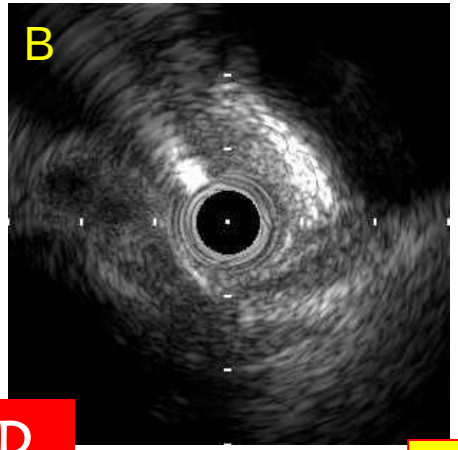
: with calcified lesion on ceiling

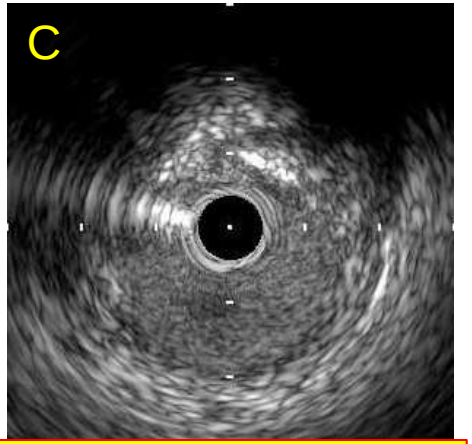
Looks like a very simple LMT body stenosis with some lesion of LCX ostium.





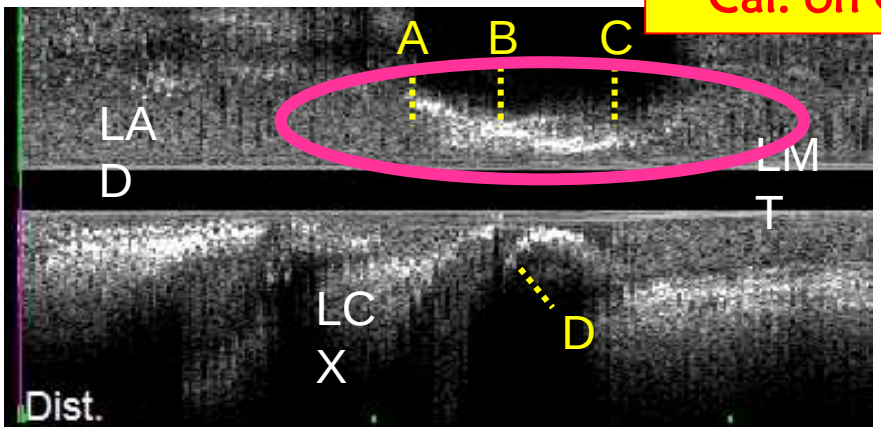


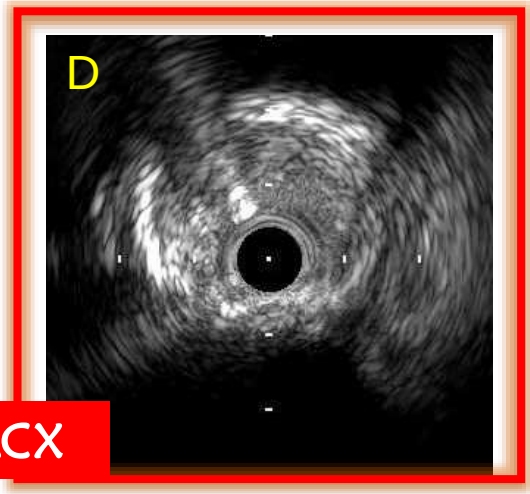




LAD

Cal. on Ceiling of LMT



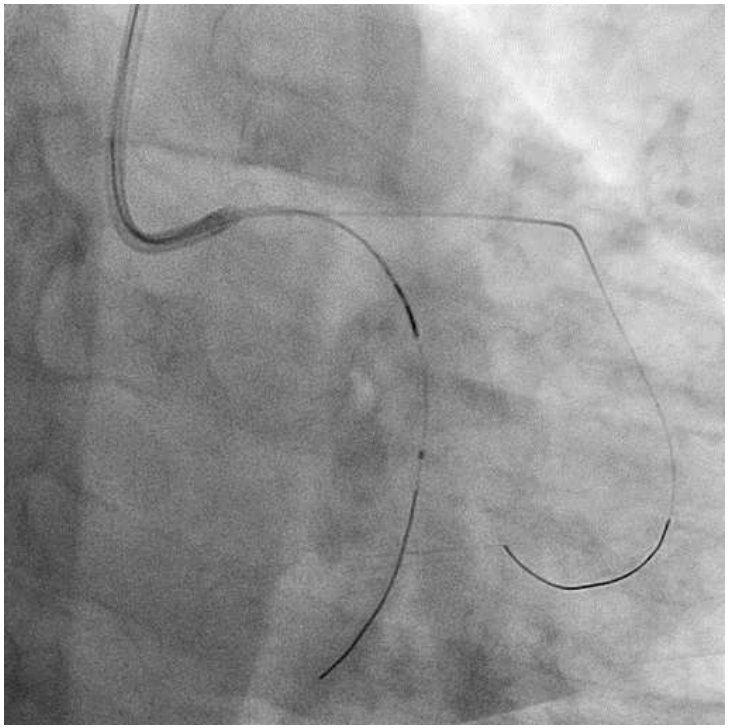


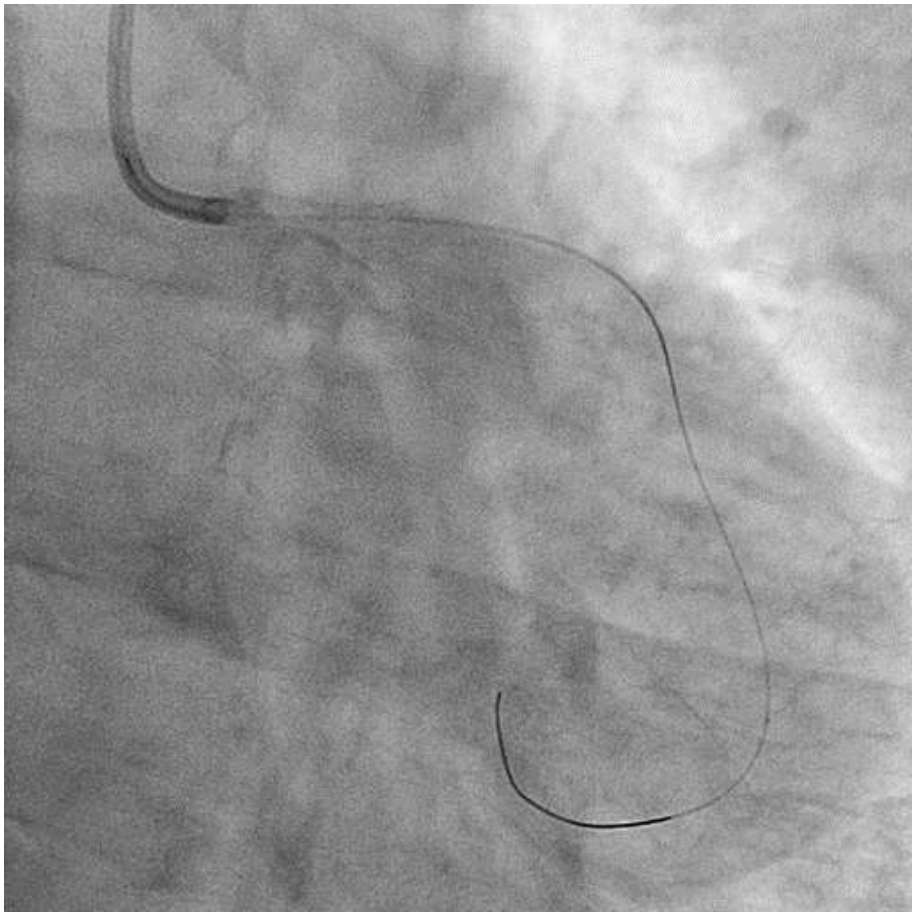
LCX

It never rains but it pours

- Troubles never come singly -

Protection GW in LCX accidentally come out , but continued LMT stenting. Then...

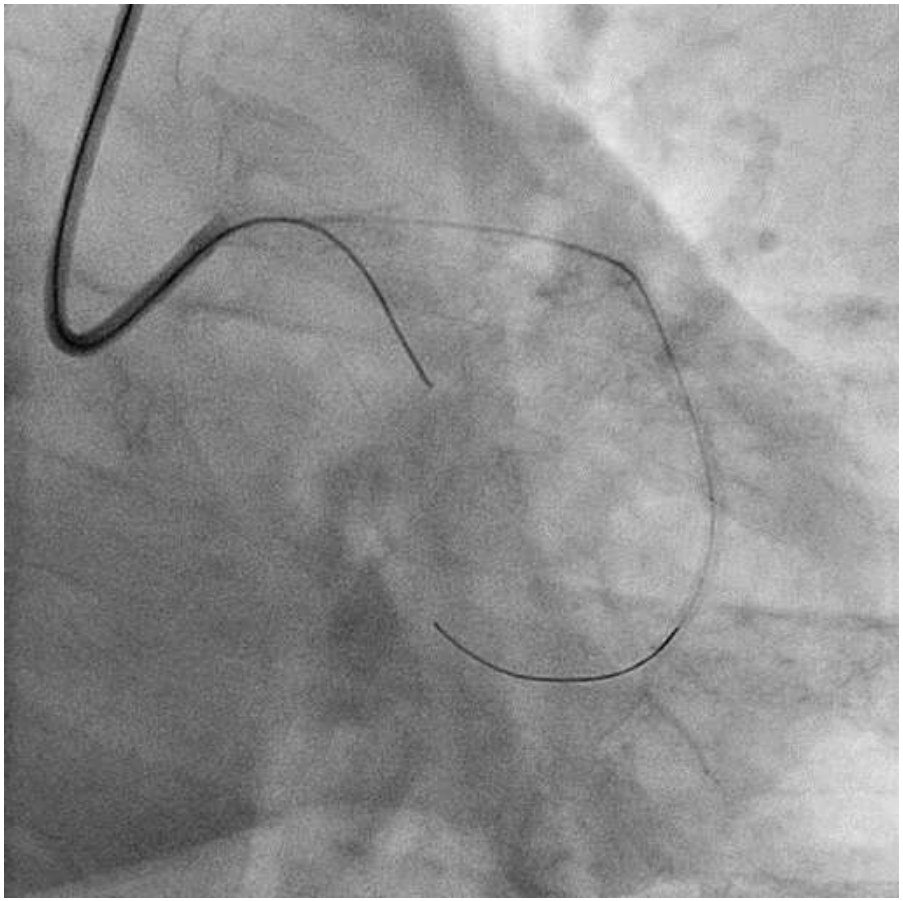


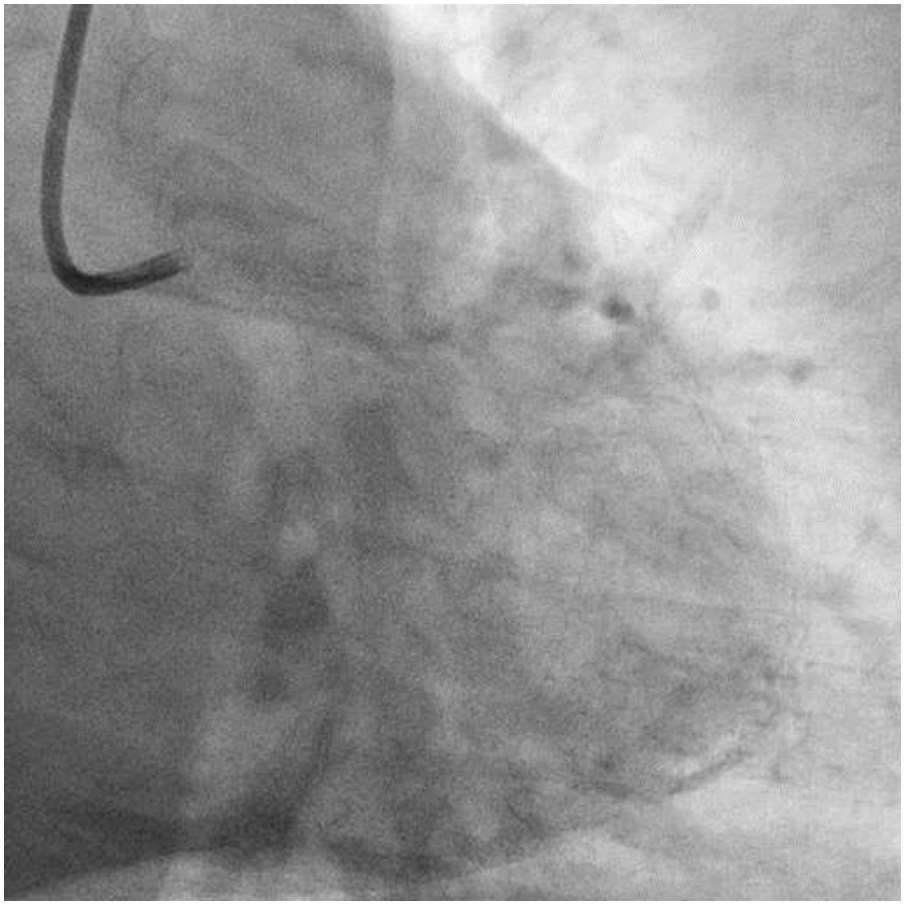


Case 2 : LMT body stenosis w/o stenosis of LCX ost.

: with calcified lesion on ceiling

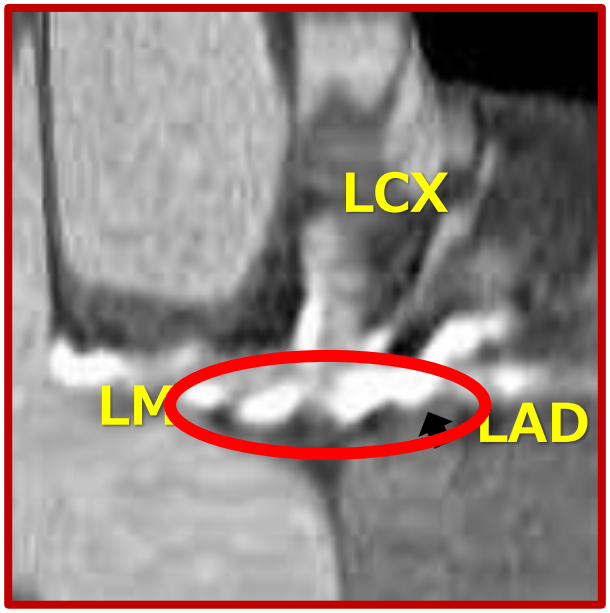
Thanks to the technique of CTO PCI, successfully recanalized with CTO GW

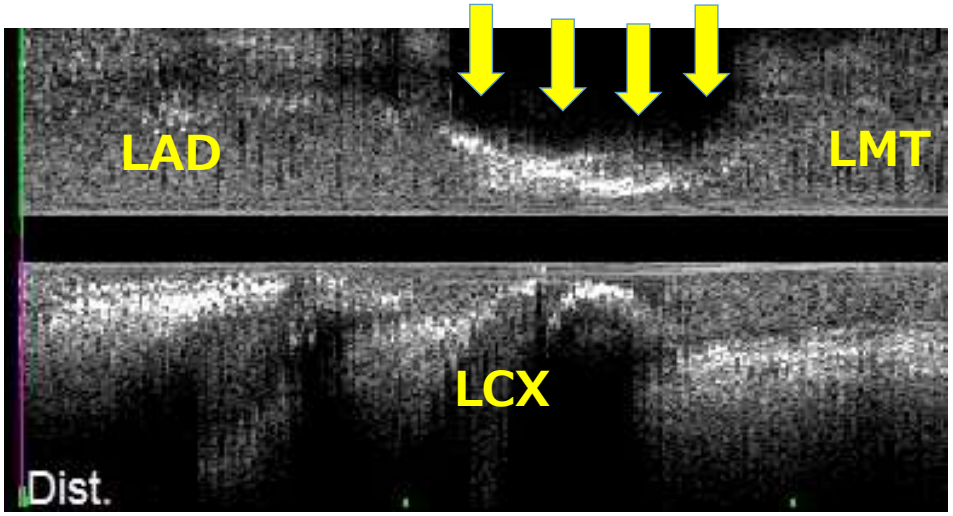




Interference Factor: Calcification

- Calcification opposing to a side branch -



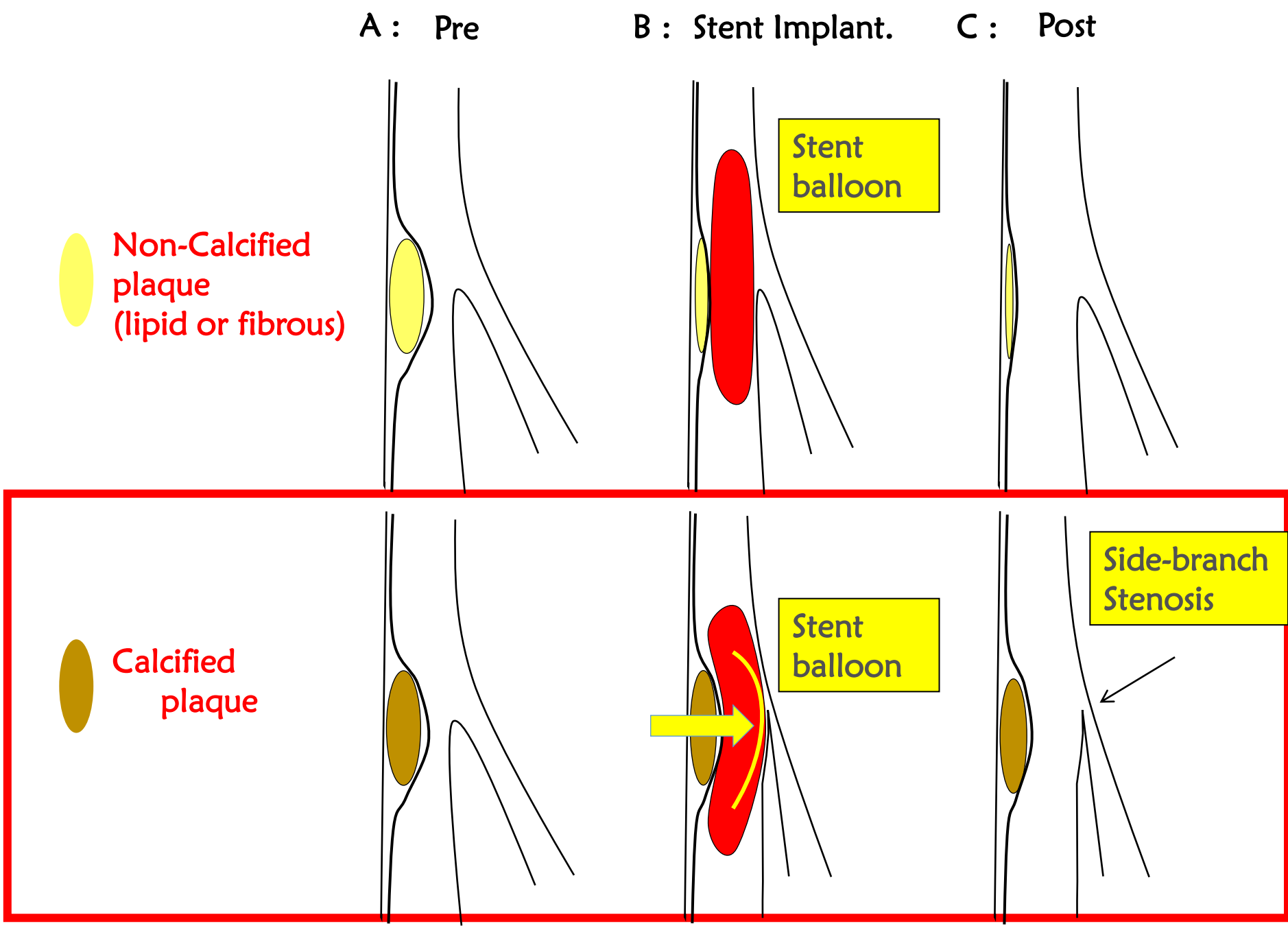


Impact of r
bifurcation

Calcium Plaque opposite of carina
Predictive Risk Factor of Side Branch Occlusion

iol. 2014 Oct

	Univariate Logistic Regression			Multivariate Logistic Regression		
	OR	95% CI	p-value	OR	95% CI	p-value
Age	0.99	0.94-1.04	0.632			
Gender#	1.47	0.55-3.95	0.449			
Hypertention	0.94	0.36-2.47	0.901			
Diabetes Mellitus	0.72	0.29-1.82	0.491			
Dyslipidemia	0.46	0.18-1.18	0.106			
Smoking	1.09	0.39-3.03	0.867			
EF (%)	0.97	0.91-1.03	0.294			
Angle (angiographic) <70	9.13	1.93-43.28	0.005	**11.83**	**2.00-70.02**	**0.007**
Angle QCA	0.98	0.96-1.00	0.021			
Calium detected by Angiogram	2.2	0.68-7.16	0.189			
True bifurcation	2.17	0.81-5.82	0.125			
Pre dilatation	1.2	0.47-3.07	0.699			
Pre-stent implantation Main branch, %DS	0.99	0.93-1.05	0.777			
Pre-stent implantation Side branch, %DS	1.05	1.01-1.10	0.018	**1.07**	**1.02-1.13**	**0.012**
Average stent diameter	1.92	0.51-7.21	0.335			
Average stent length	0.99	0.93-1.06	0.776			
Max inflation pressure	1.01	0.89-1.14	0.863			
Calcium Plaque Evaluated by OCT	11.25	2.86-44.25	<0.001	**12.32**	**2.58-58.83**	**0.002**



Y. Fujino, S. Nakamura et al. Int J Cardiol. 2014

Calcification on the Ceiling of LMT

Calcification opposing to a side branch is a strong predictive risk factor of occlusion of the side branch in the case of LMT bifurcation PCI.

Kensuke Takagi M.D.

FACC

Coronary Artery Disease 2015

Yusuke Fujino M.D.

FACC

Int J Cardiol 2014

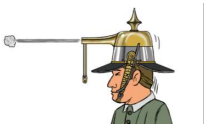
JACC Cardiovasc Interv 2014

Prediction

1. Knowing possibility of SB Occulu.
2. In case of ….
   Ca. on the LMT ceiling

Prevent

1. Use IVUS, OCT, CT
2. GW protection



Weapon

1. Co-CT, IVUS, OCT
2. CTO GW
3. IABP , IMPELLA

Technique

1. CTO GW technique
2. Technique of Bifur. PCI
3. Intensive Care

Unhappy Event 3.

In case of No Stamp LAD CTO, and is we need "Retro-Approach"

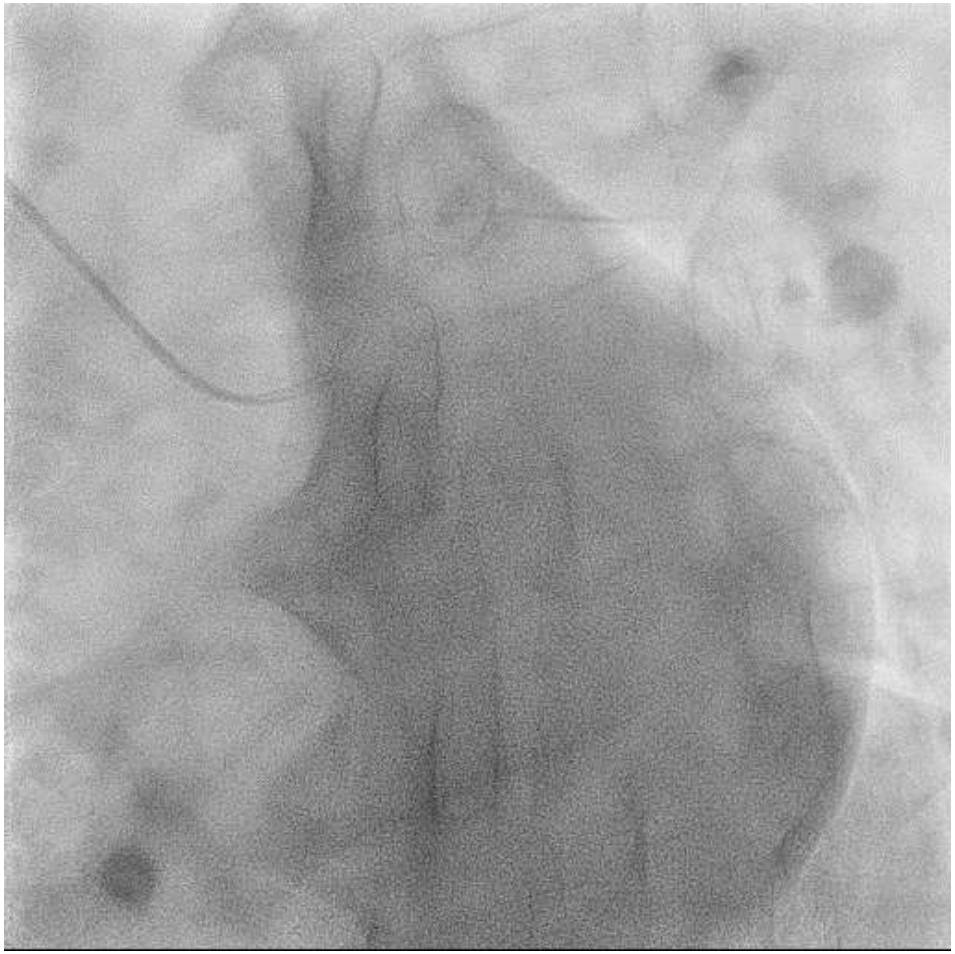
We should manage "Reverse Cart" in LAD CTO site only.

If situation happen, need Hawk eye for navigating true lumen with IVUS

And 6th sense for

Case 3 : No Stunp LAD CTO with big epicardial collateral from RCA

- Retrograde Approach related complication: Risk of LOSE LCX -



69 y.o. CCS-Ⅱ Effort Angina

Coronary Risk Factor

Hypertension, Dyslipidemia, DM

Renal Function

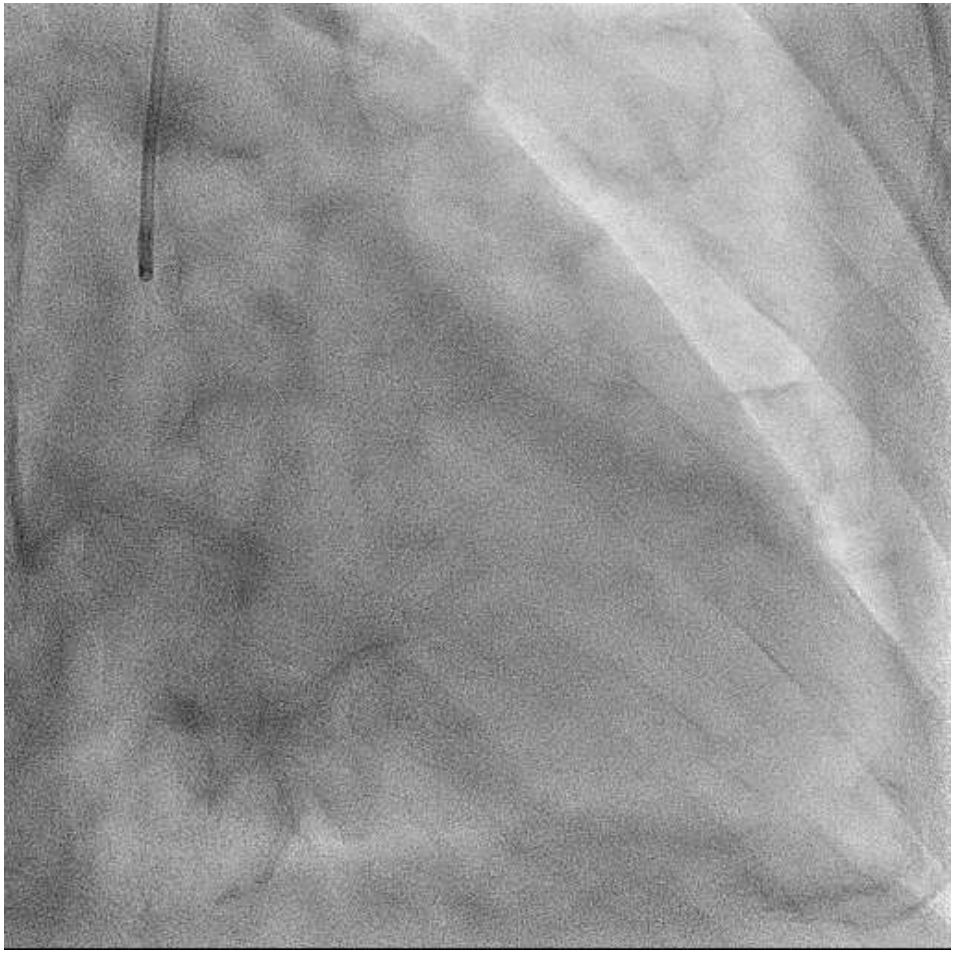
Cr: 0.98mg/dl eGFR: 59L/min./1.73m^2

LV Function

EF 65% , No Asynergy, No VHD

Case 3 : No Stunp LAD CTO with big epicardial collateral from RCA

- Retrograde Approach related complication: Risk of LOSE LCX -



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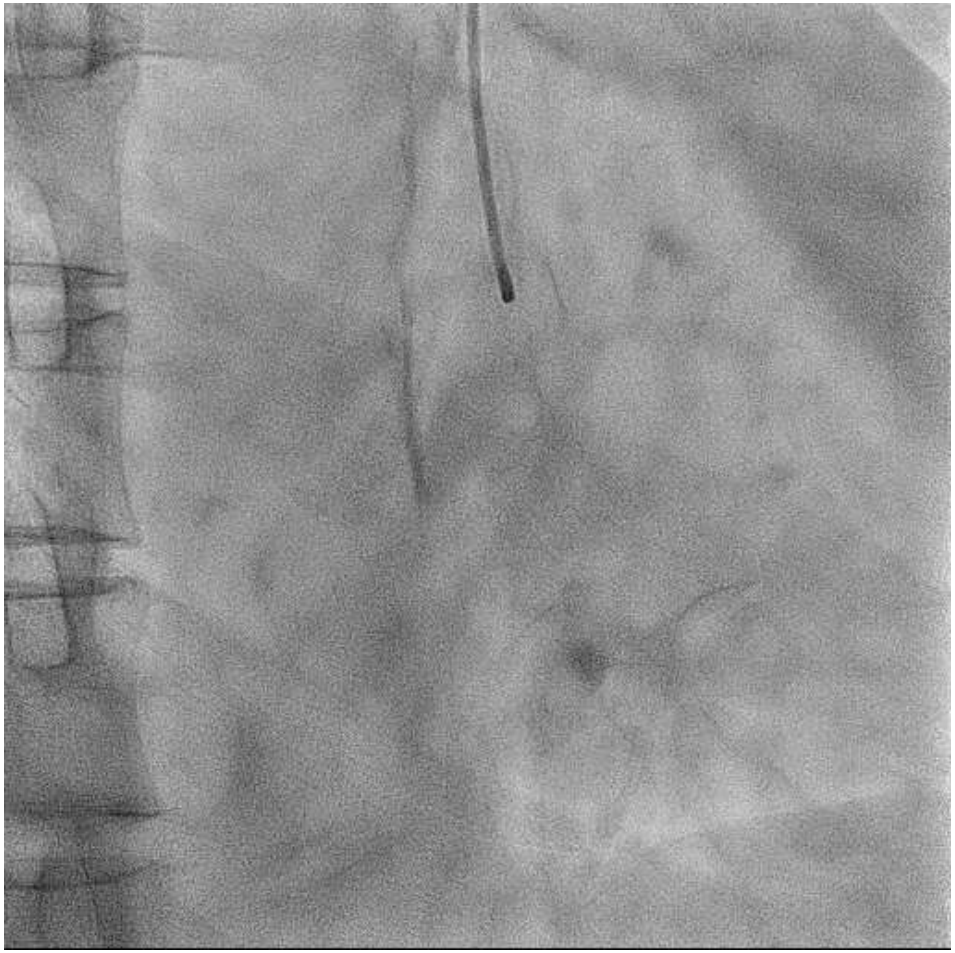
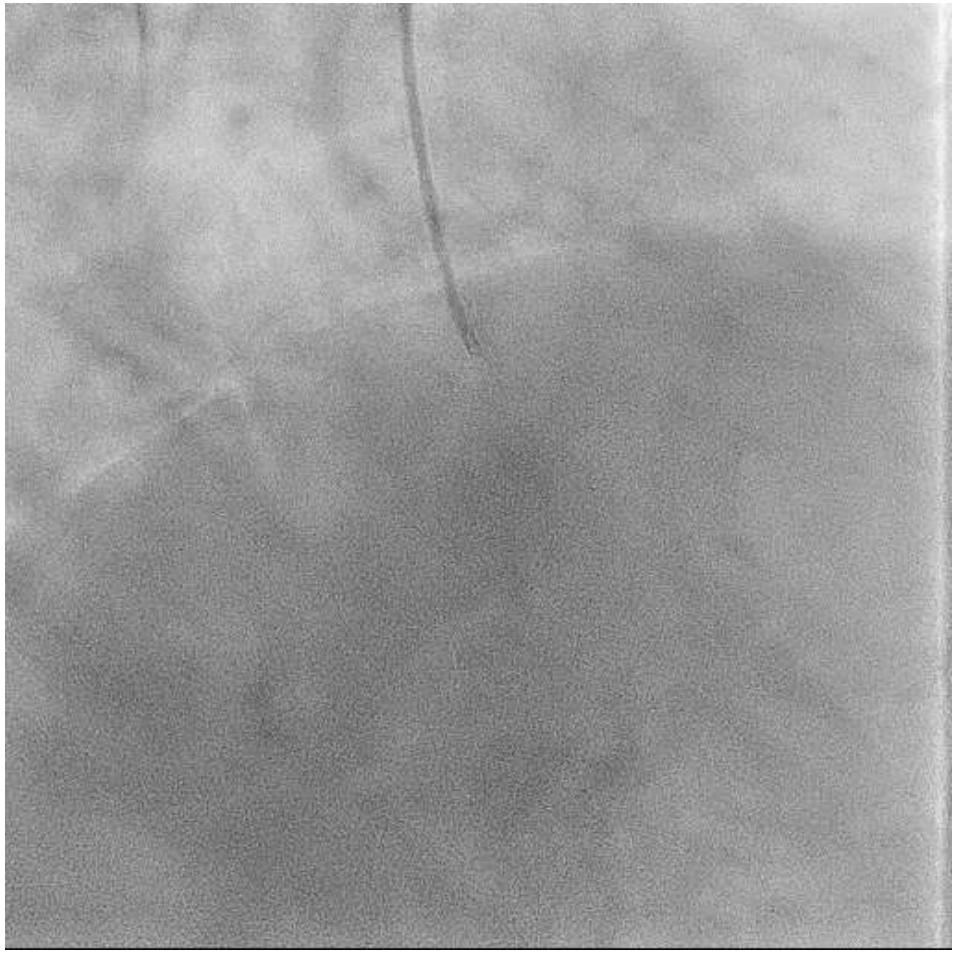


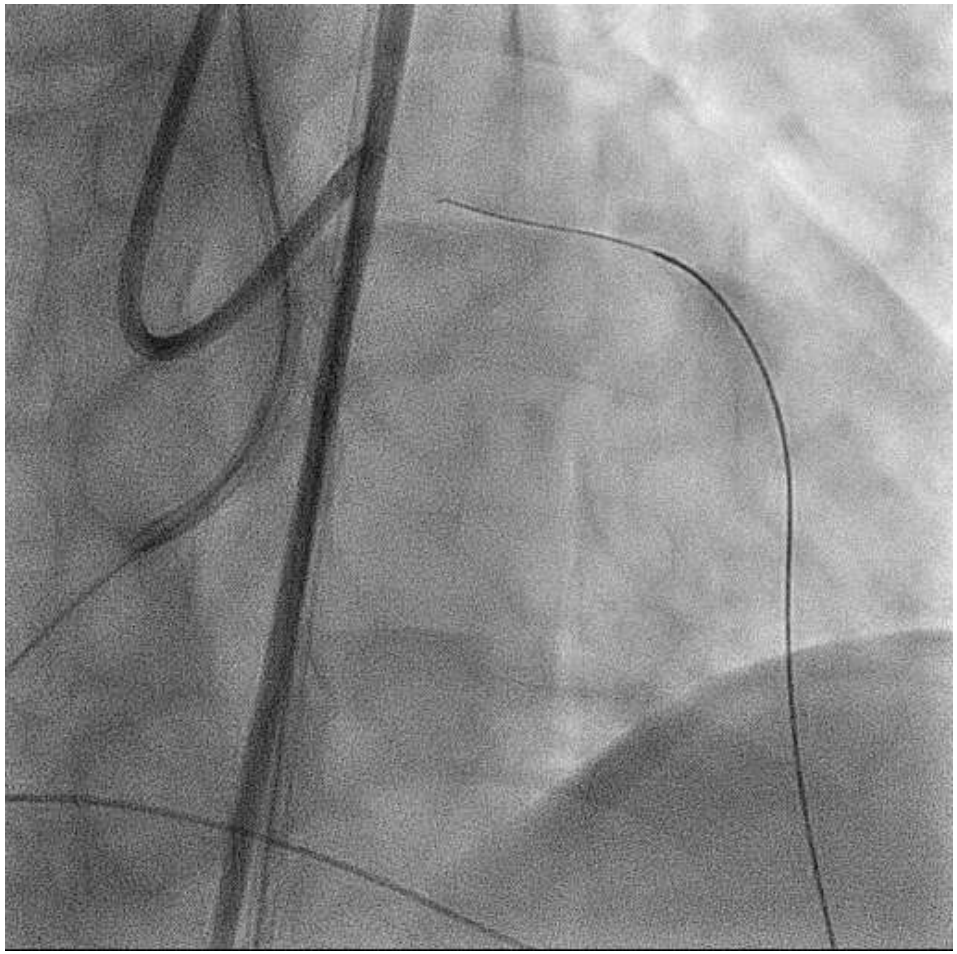


Case 3 : No Stunp LAD CTO with big epicardial collateral from RCA

- Retrograde Approach related complication: Risk of LOSE LCX -

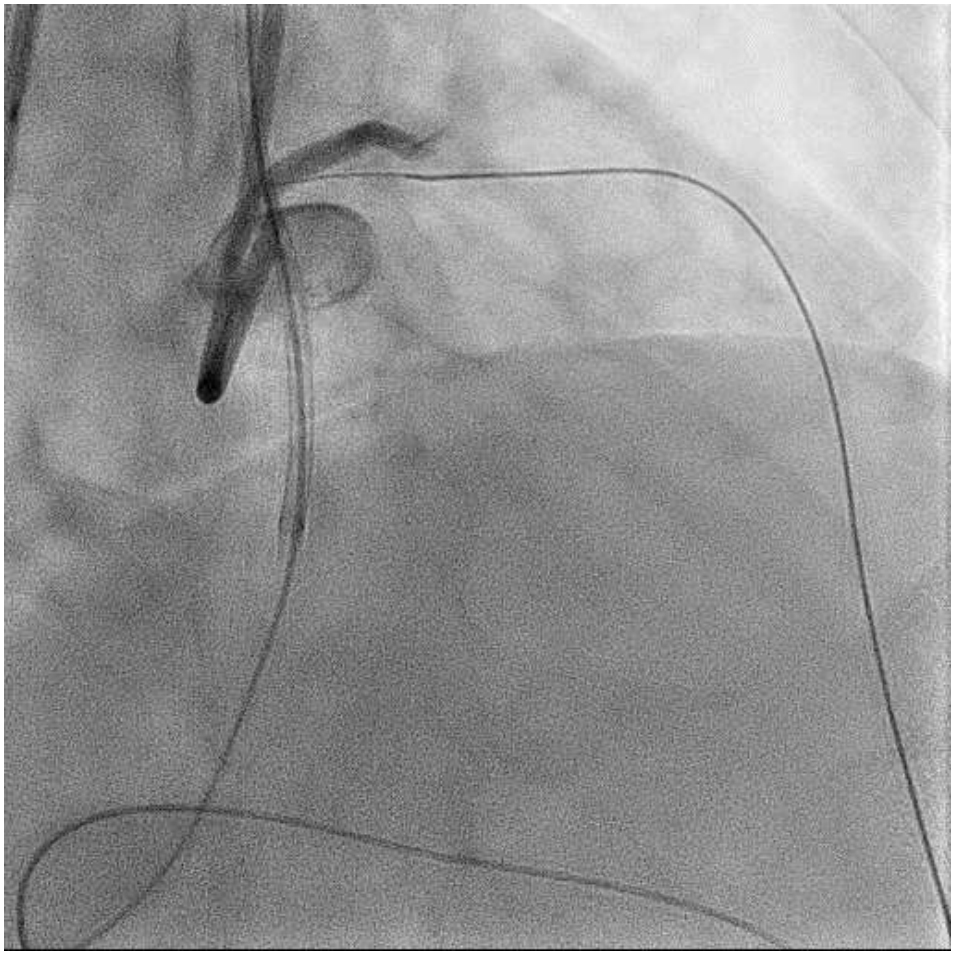
GC: Ante: 7Fr. EBU3.5 Retro: 7Fr. SAL1.0

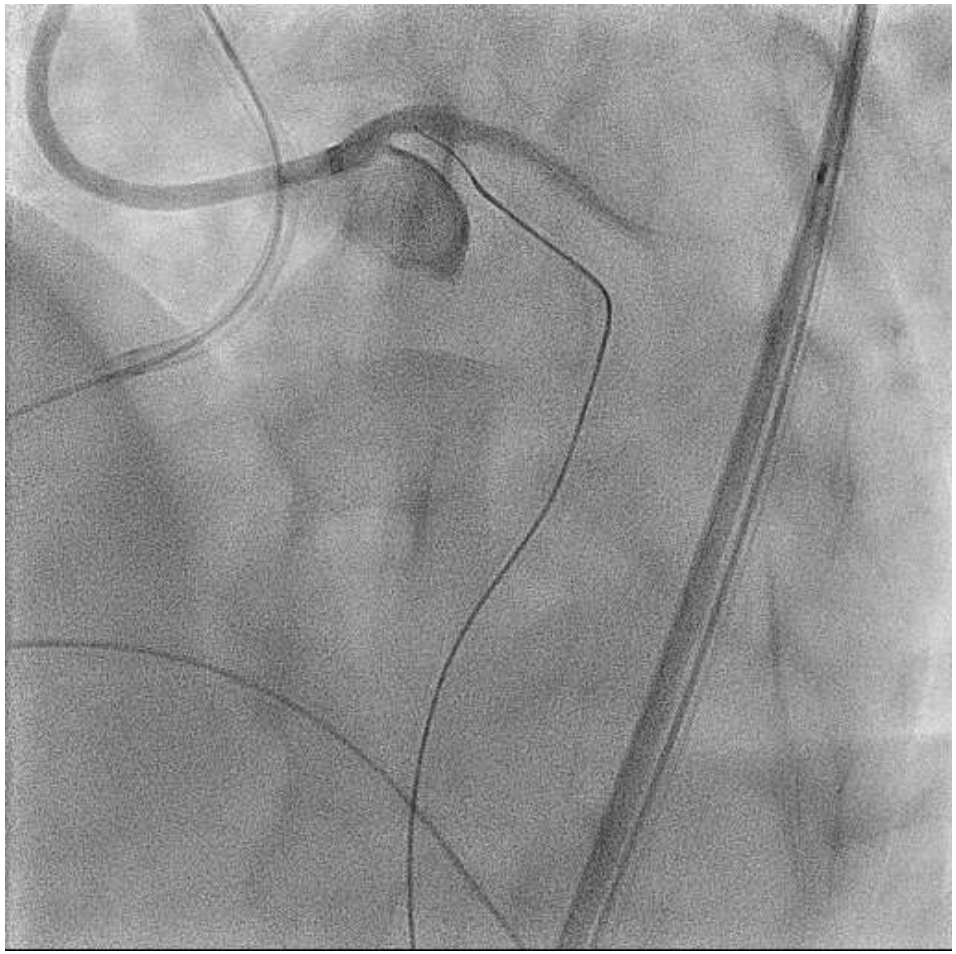
GAIA Next 2



Case 3 : No Stunp LAD CTO with big epicardial collateral from RCA

- Retrograde Approach related complication: Risk of LOSE LCX -

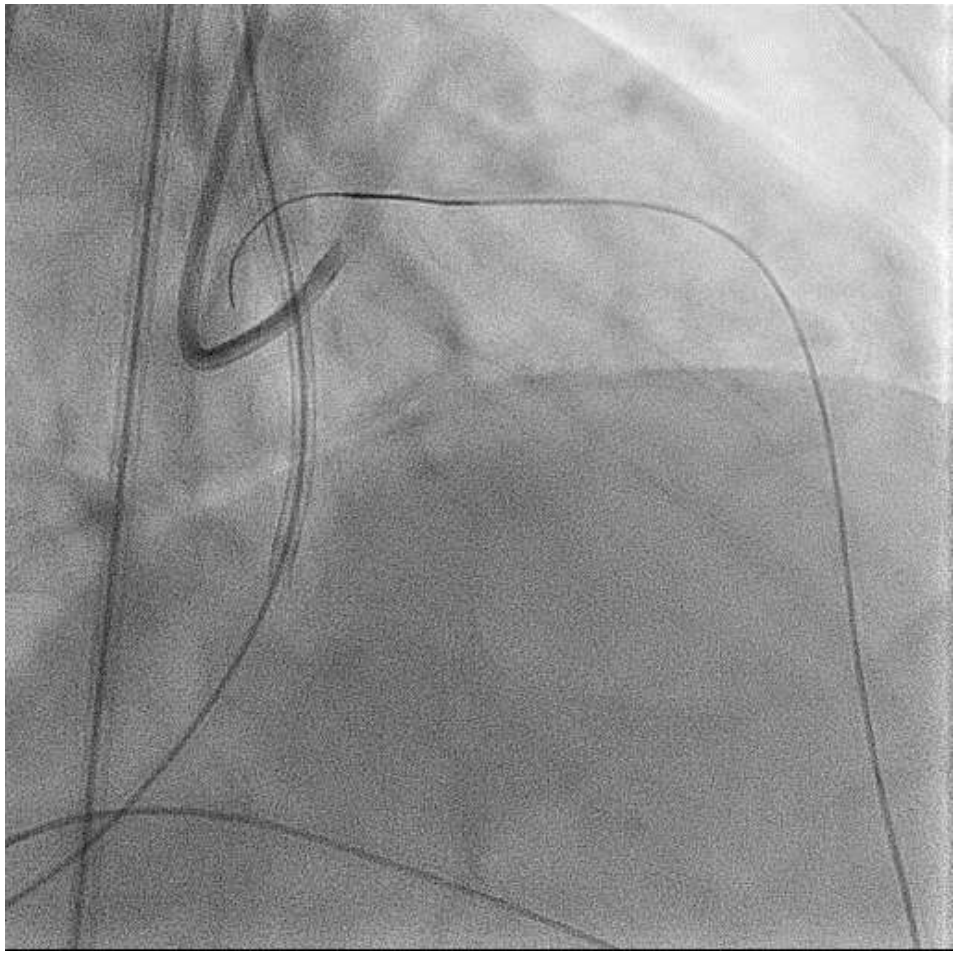




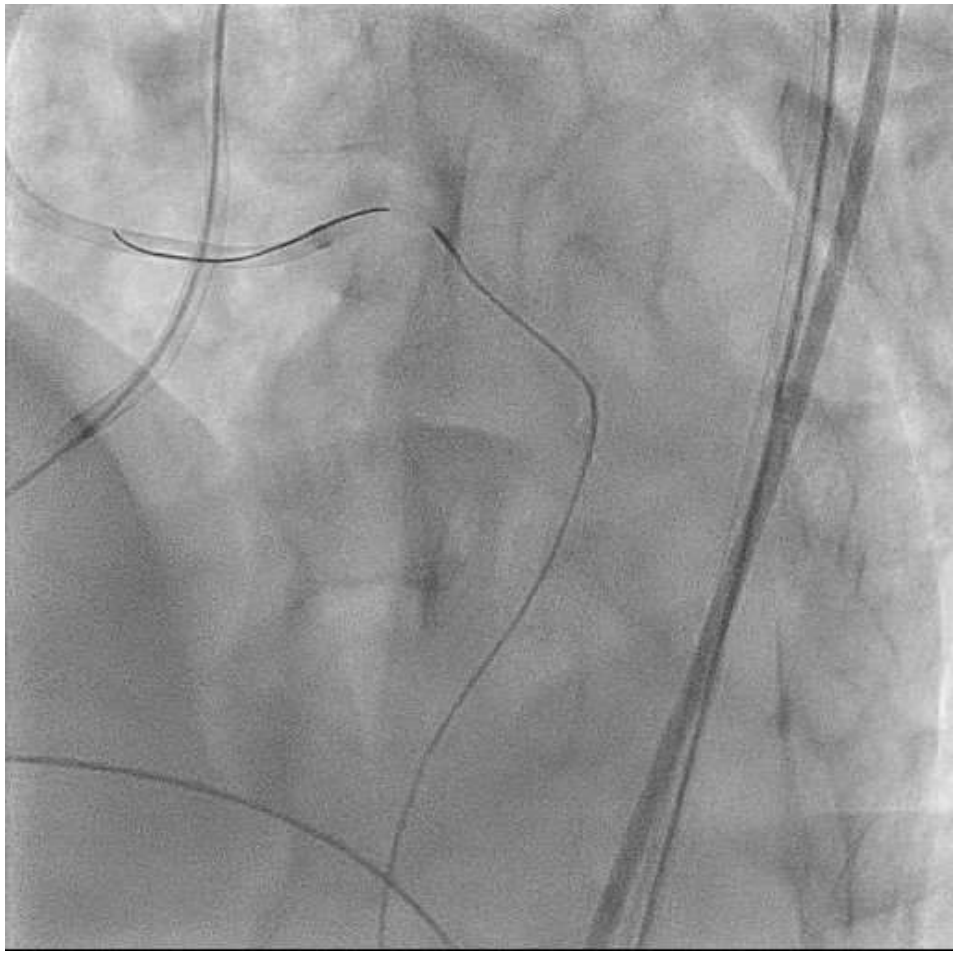
Case 3 : No Stunp LAD CTO with big epicardial collateral from RCA

- Retrograde Approach related complication: Risk of LOSE LCX -

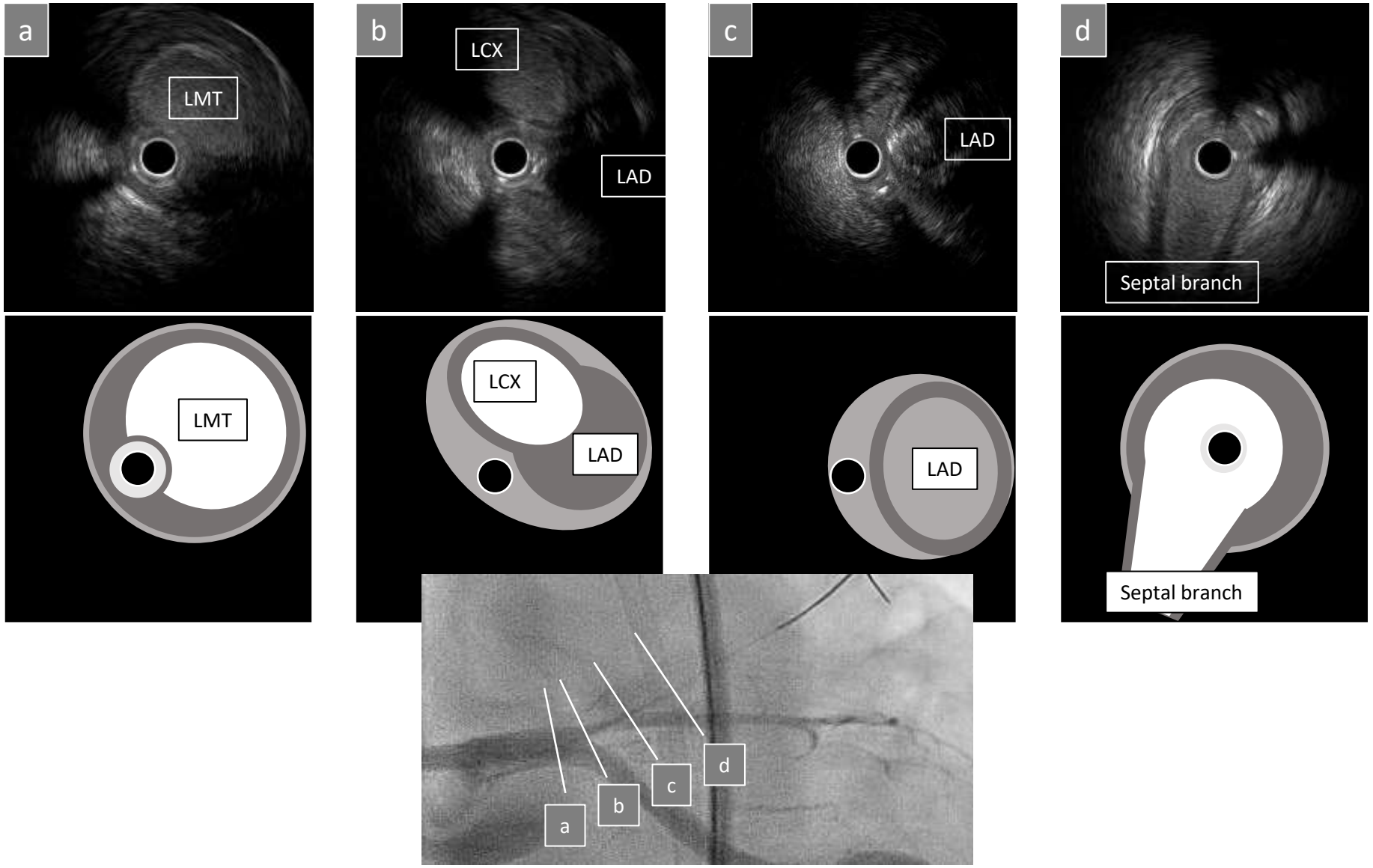
- Retrograde wire pass



- Externalization with RG3



IVUS after 2.0mm balloon dilatation



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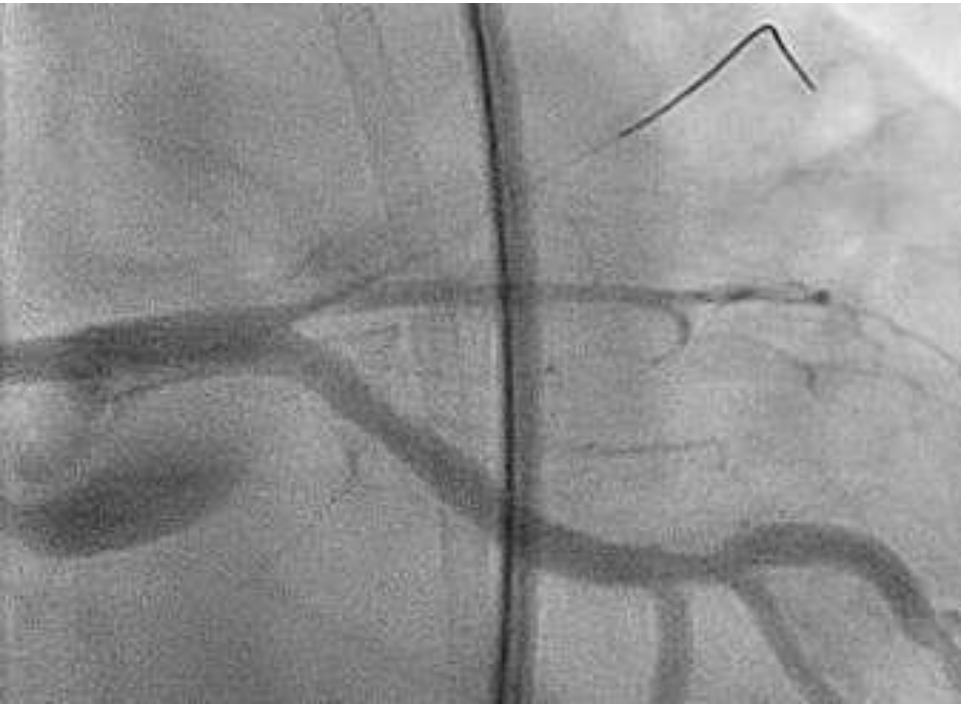

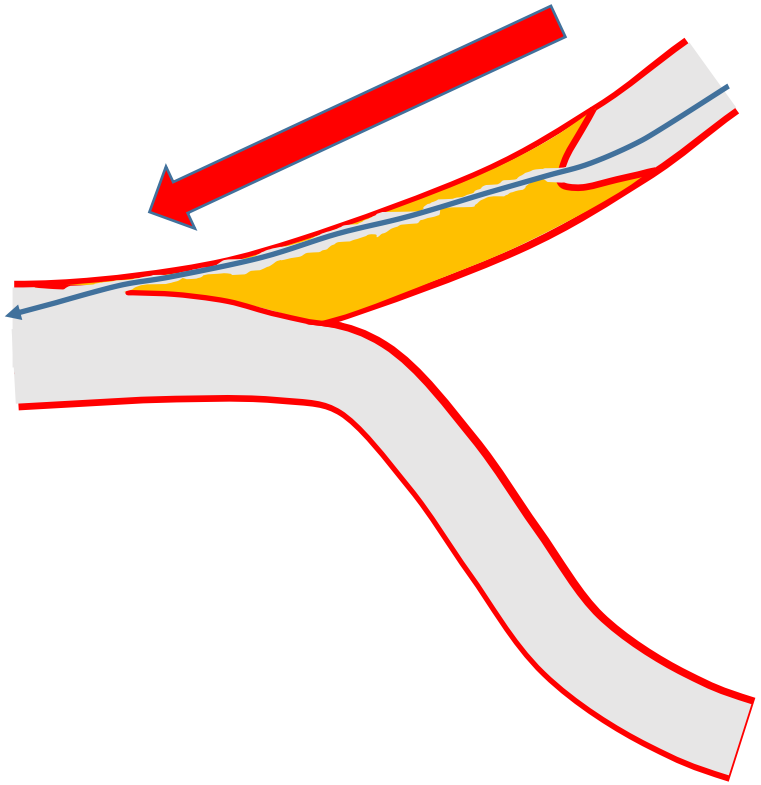

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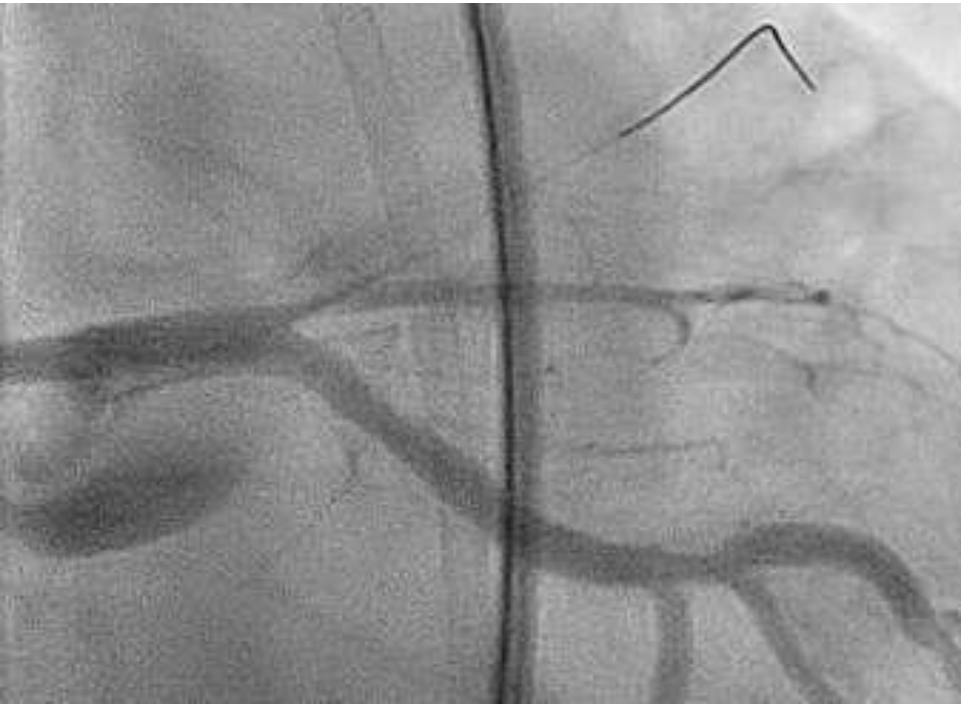
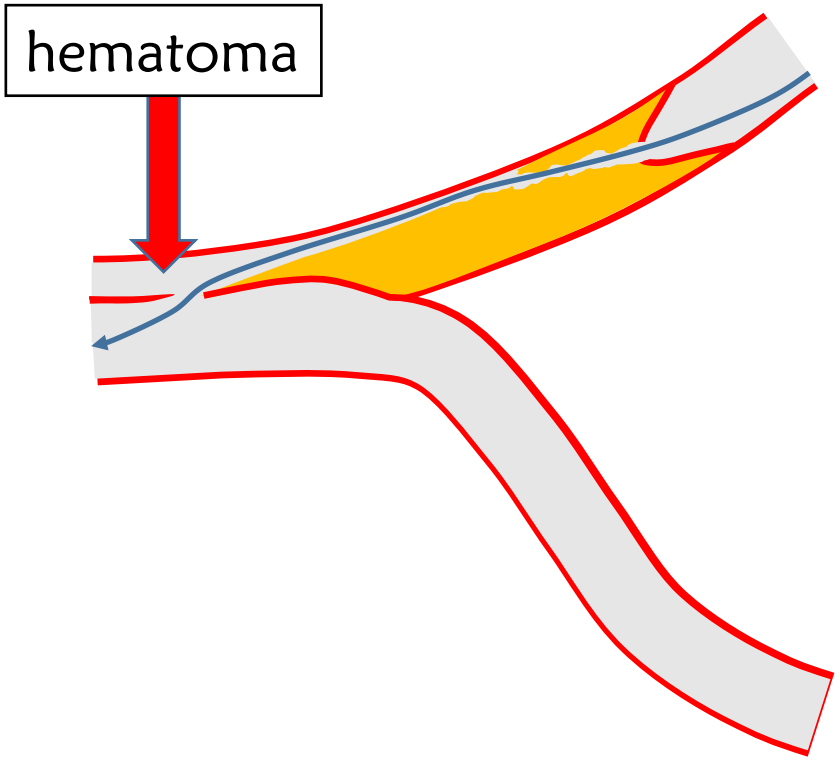
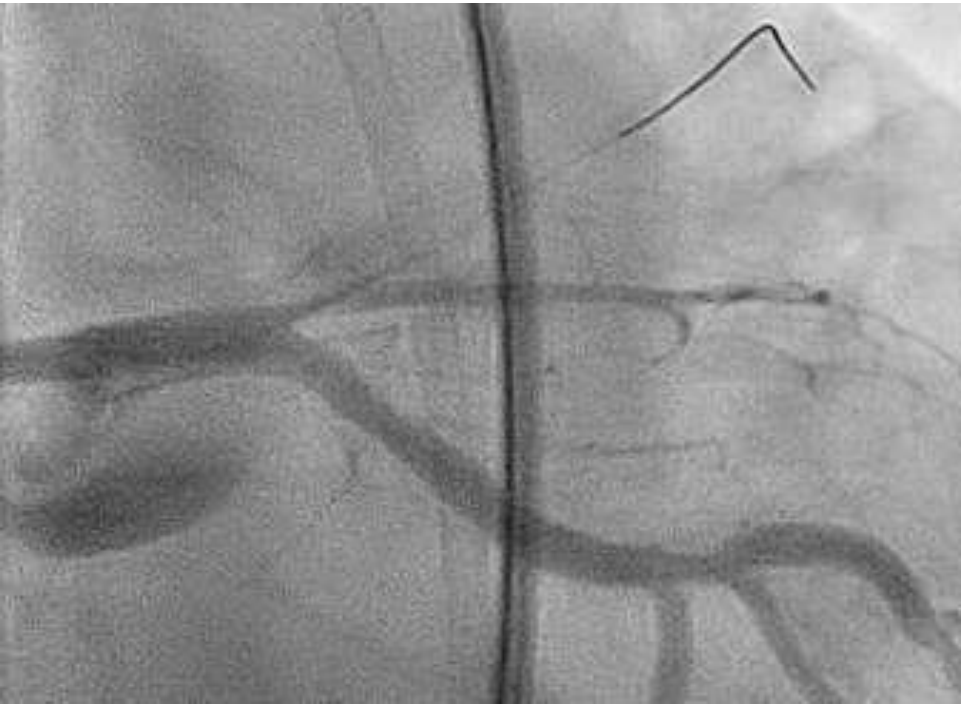
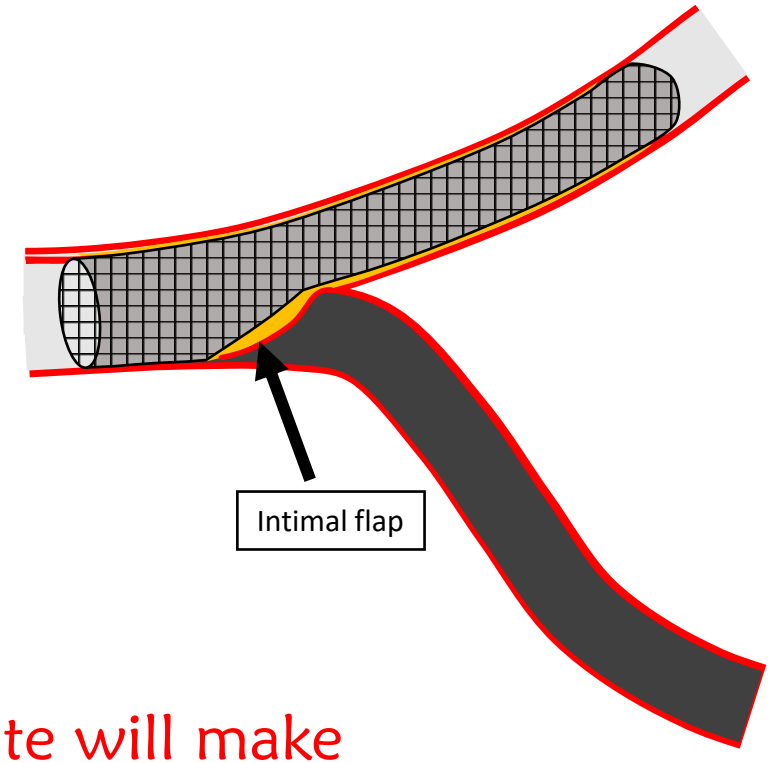




If we continue the procedure….. With this GW…

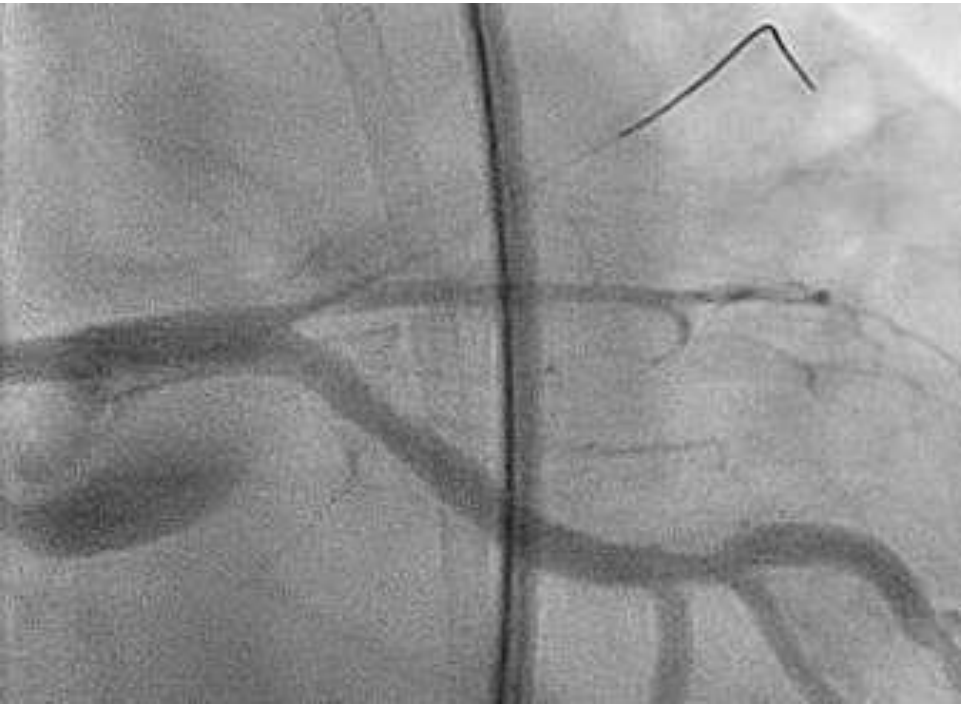


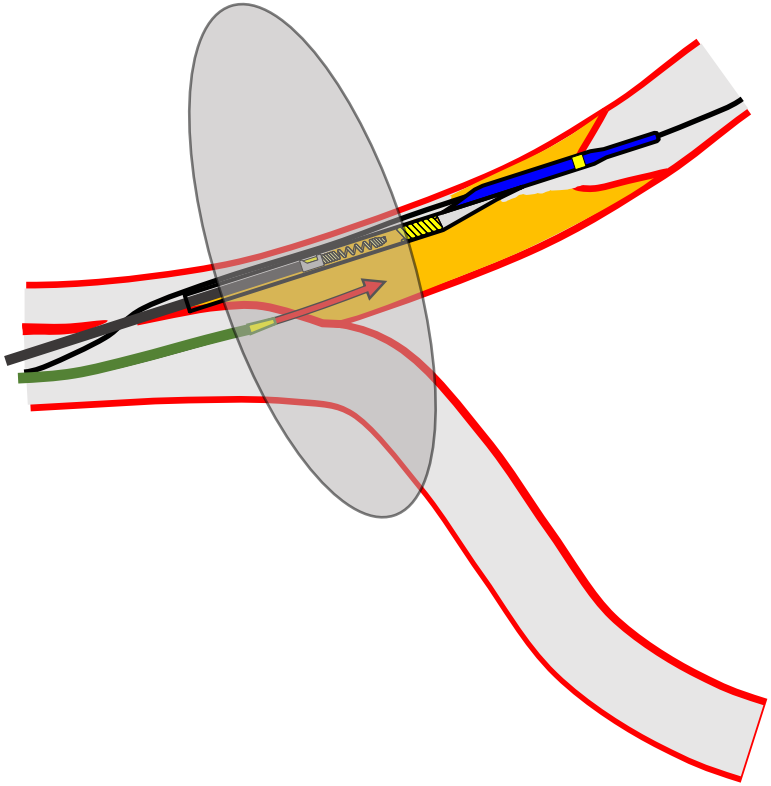


Stenting to this route will make

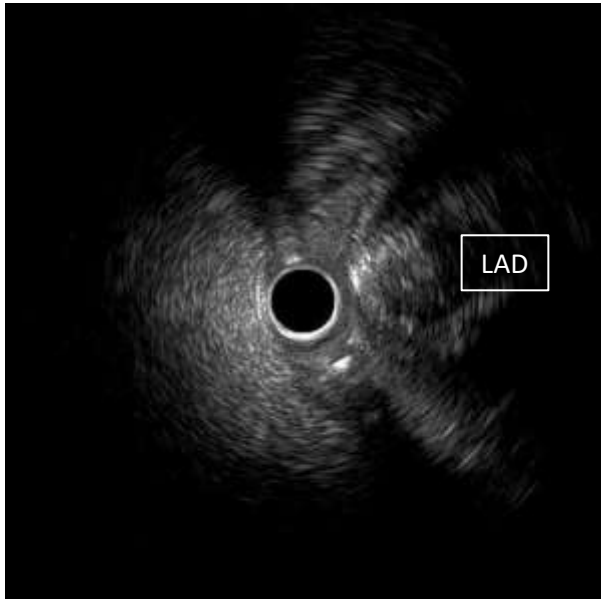
LCX occlusion by intimal flap shift.

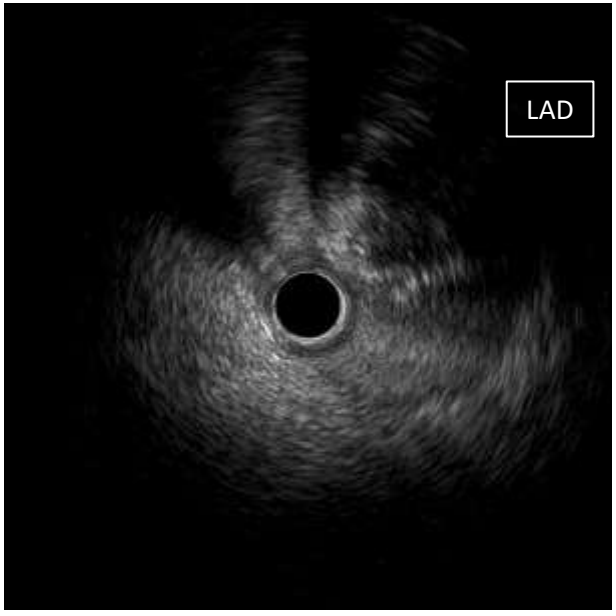
IVUS guided Correction of GW Position

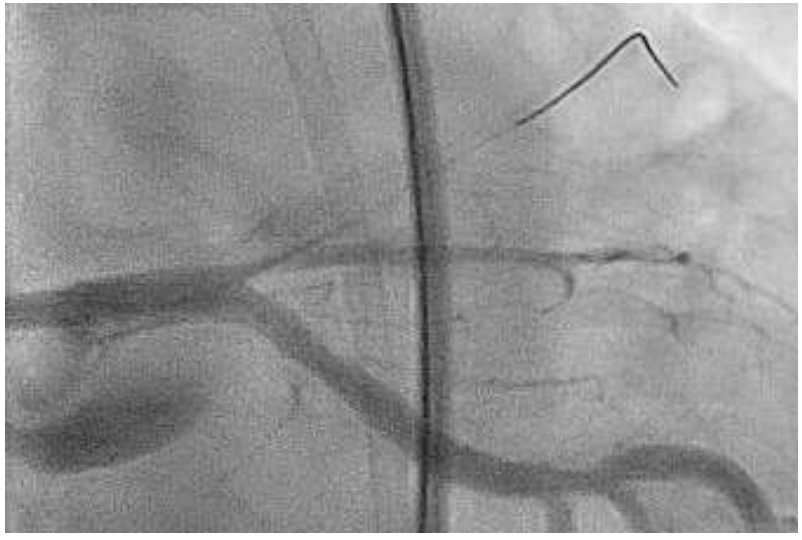


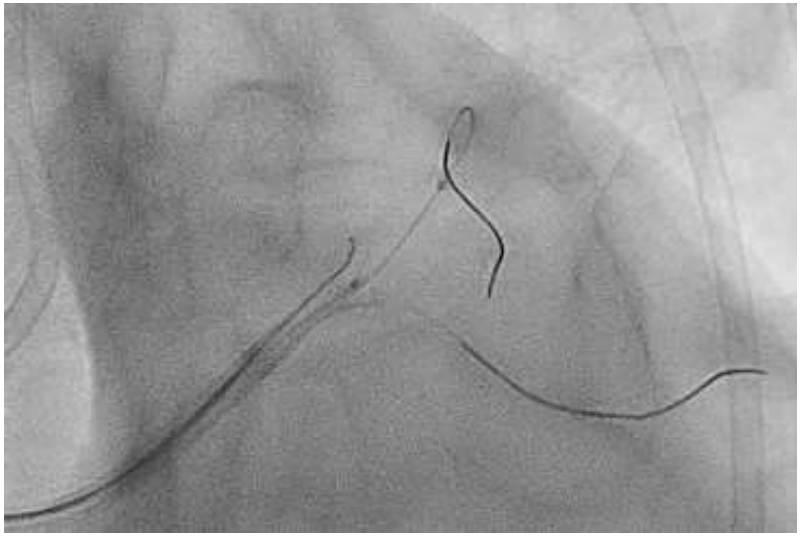


IVUS guided Correction of GW Position



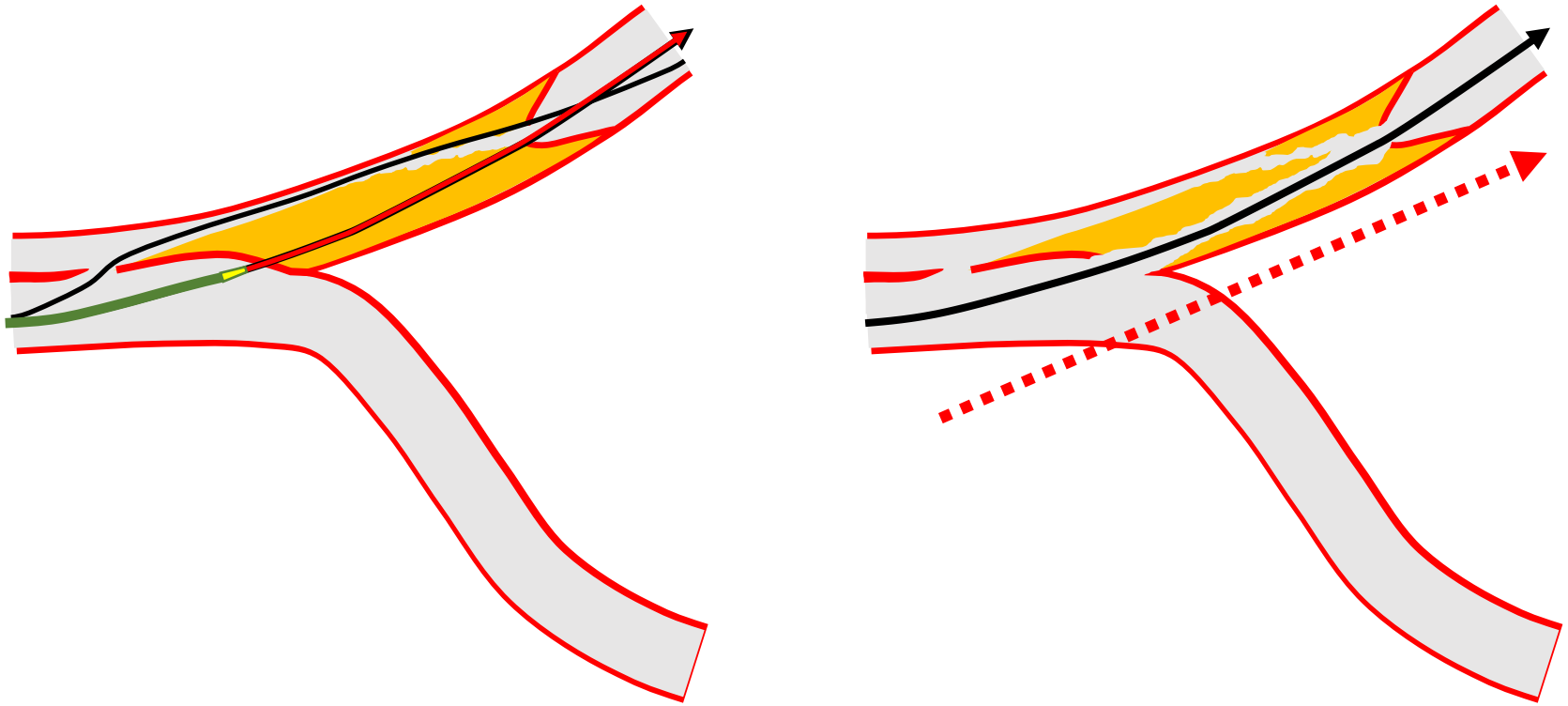




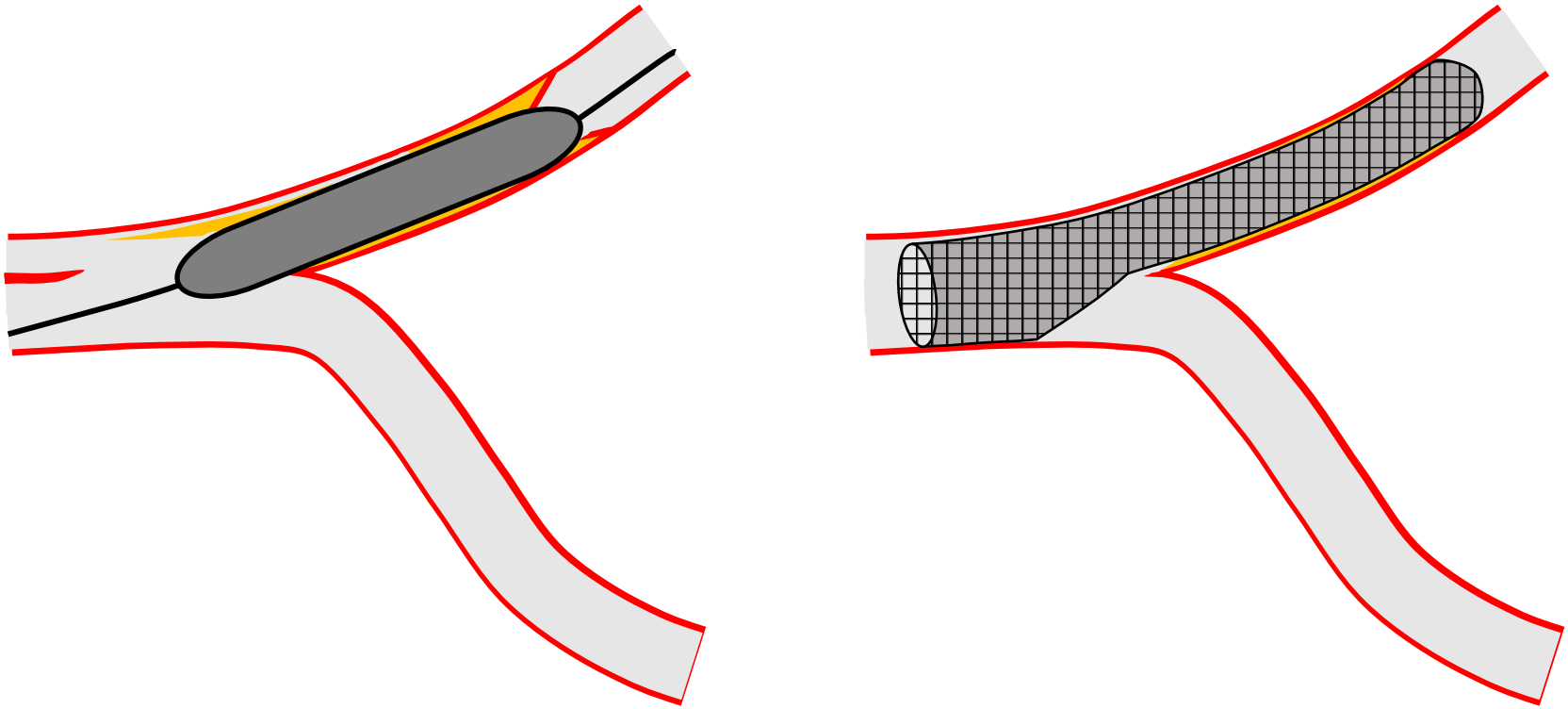


IVUS guided Correction of GW Position

-IVUS guide intra-plaque penetration-



Stent Implantation in intra-plaque

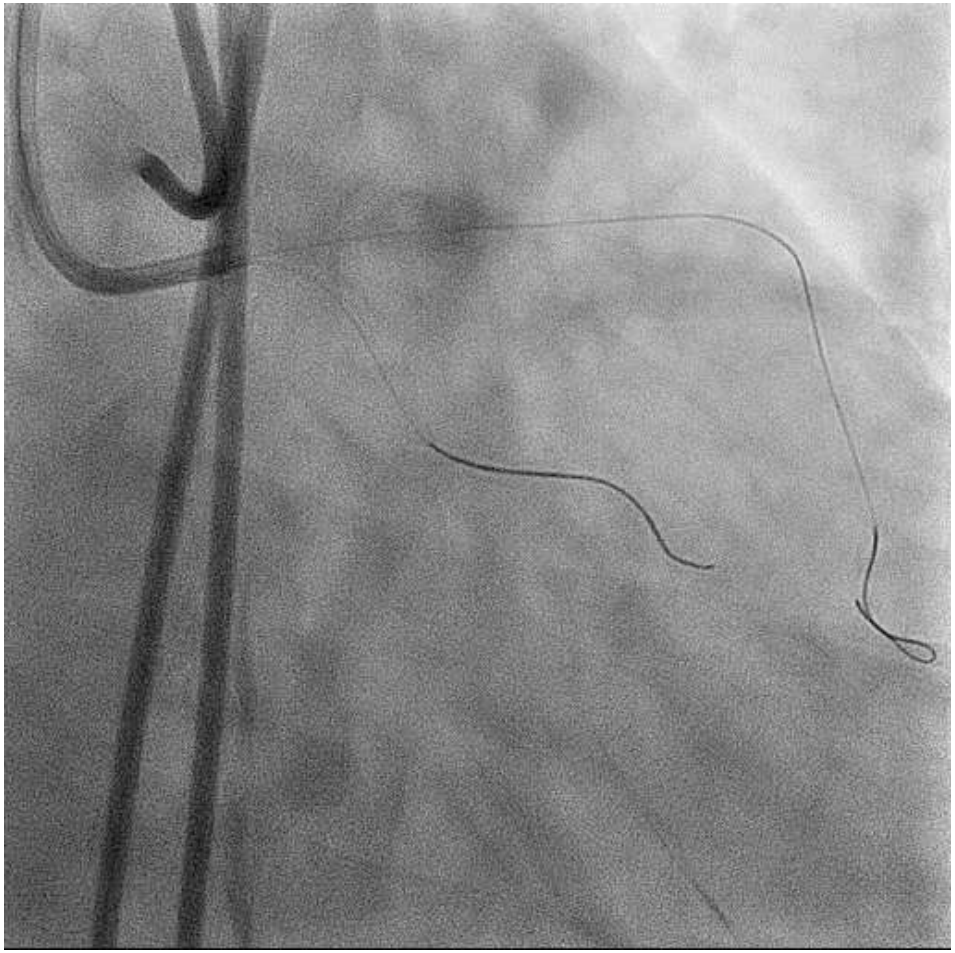


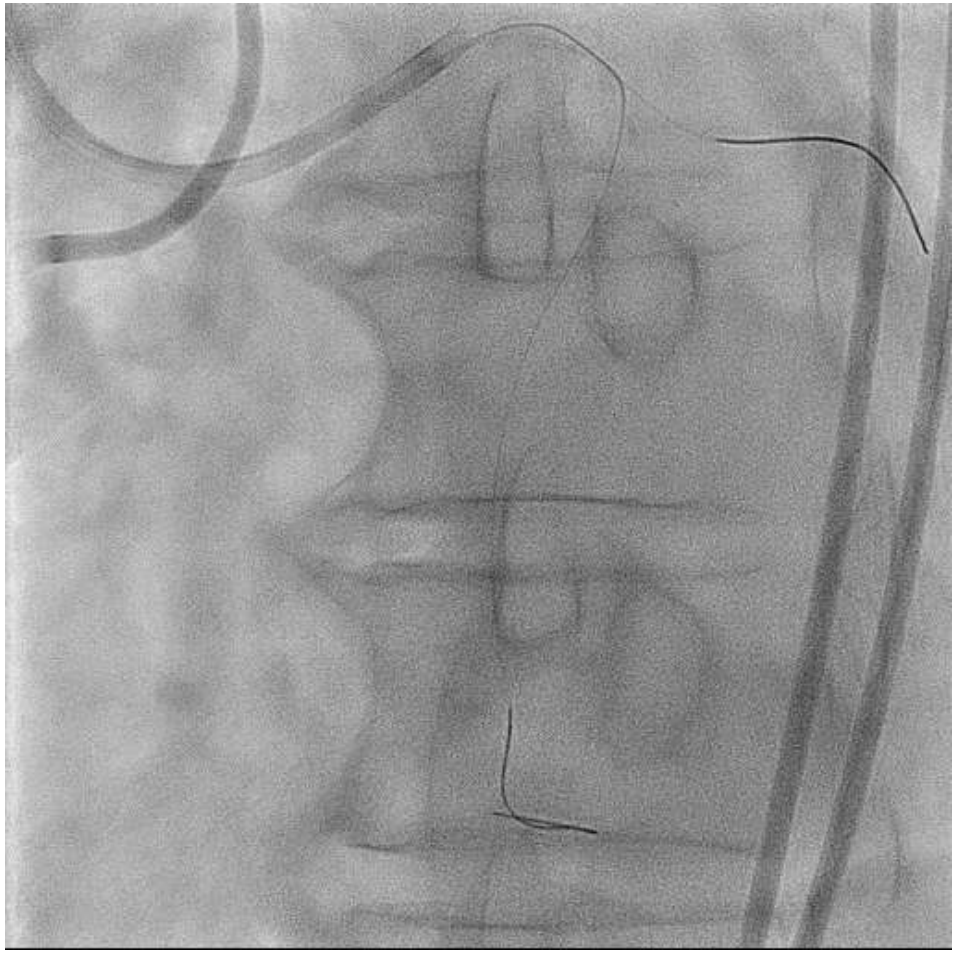
Stenting to this route will leave LCX ostium open.

Case 3 : No Stunp LAD CTO with big epicardial collateral from RCA

- Retrograde Approach related complication: Risk of LOSE LCX -

Both GW were in the true lumen

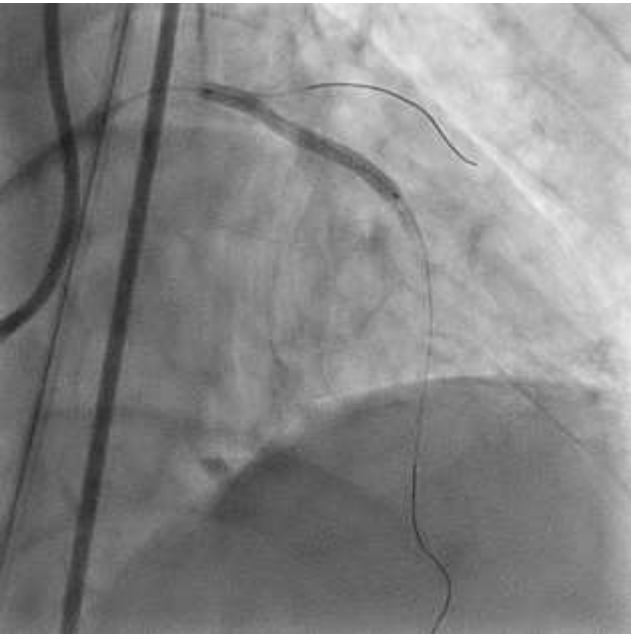
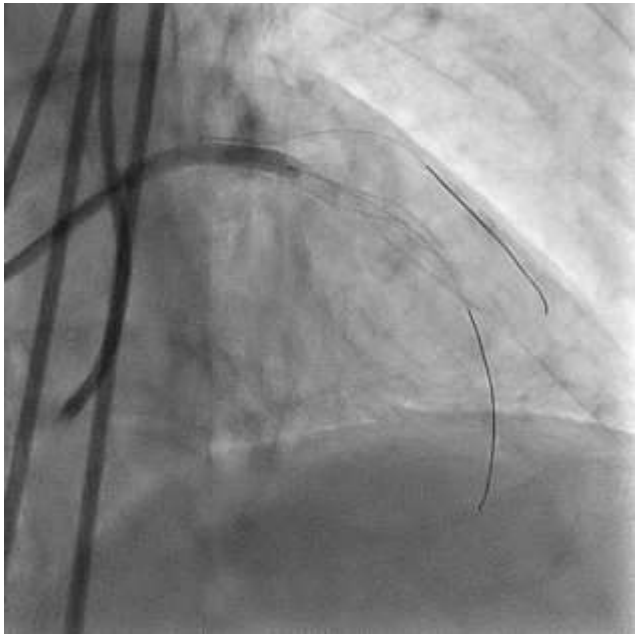
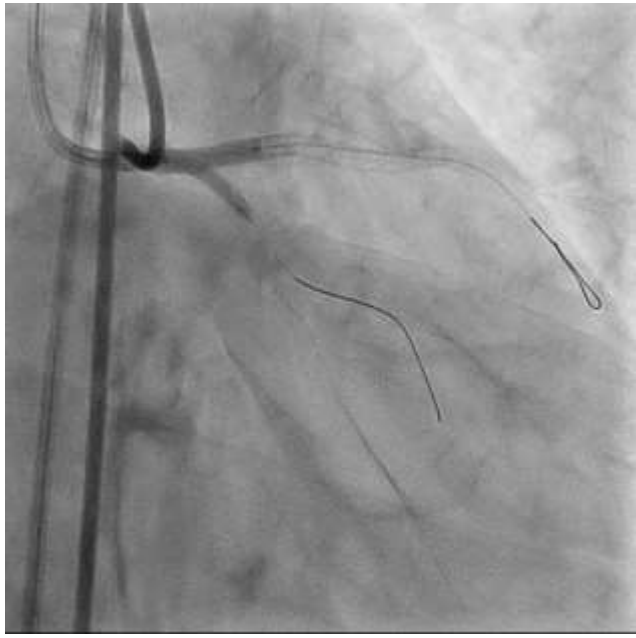




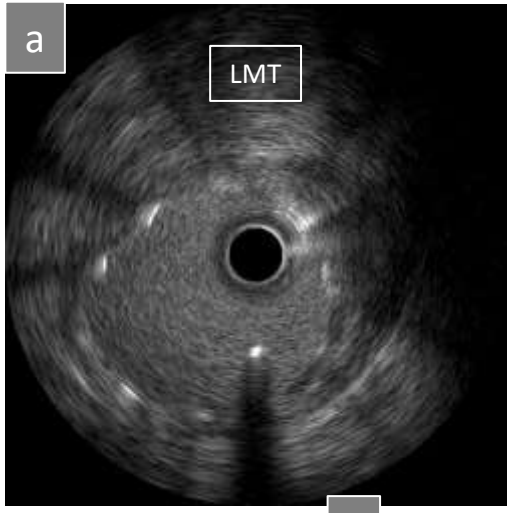
Case 3 : No Stunp LAD CTO with big epicardial collateral from RCA

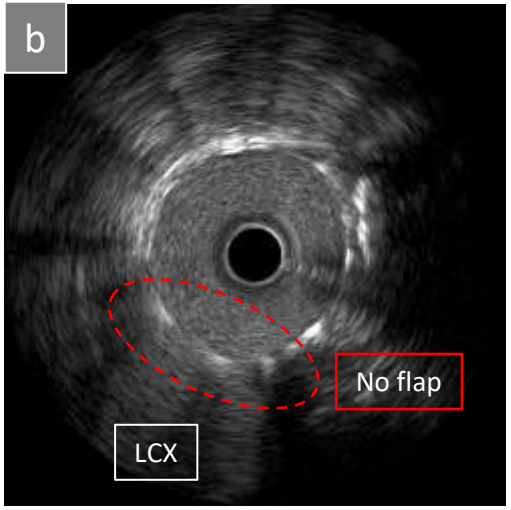
- Retrograde Approach related complication: Risk of LOSE LCX -

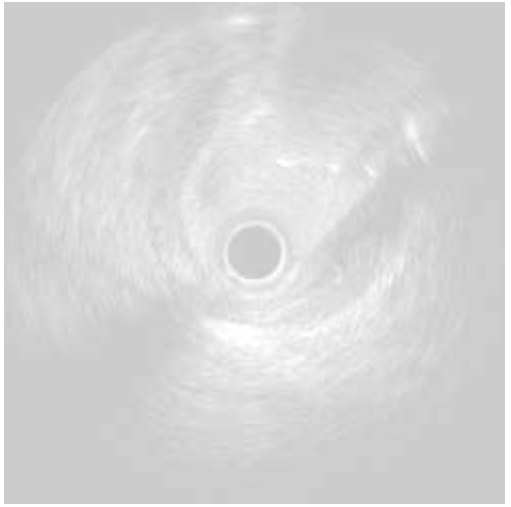
Stenting : Onyx 3.0/30 and Onyx 3.5/22 and KBI

Post IVUS







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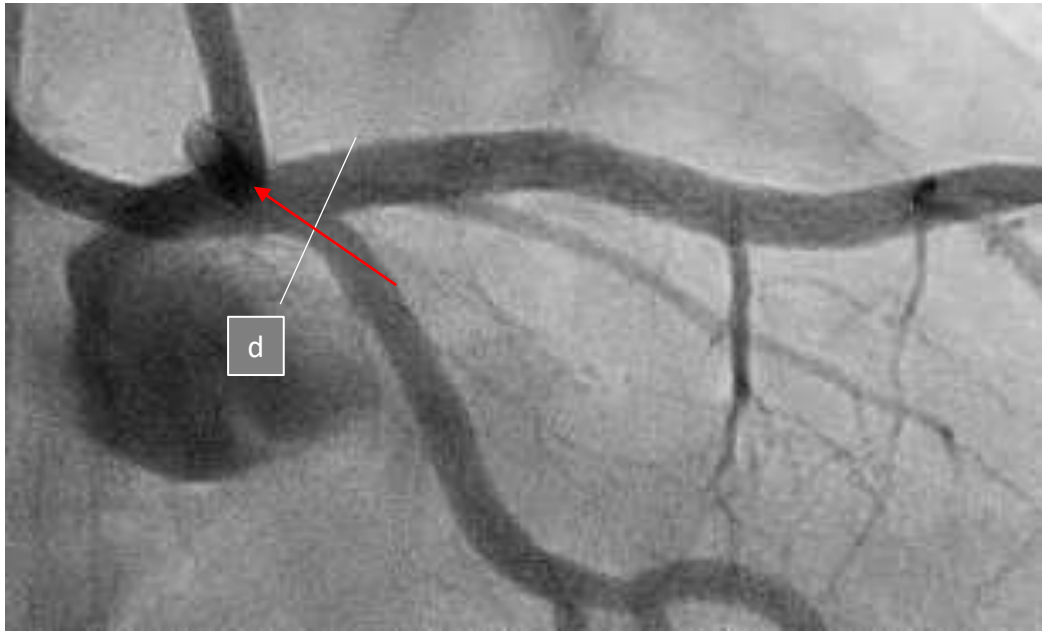
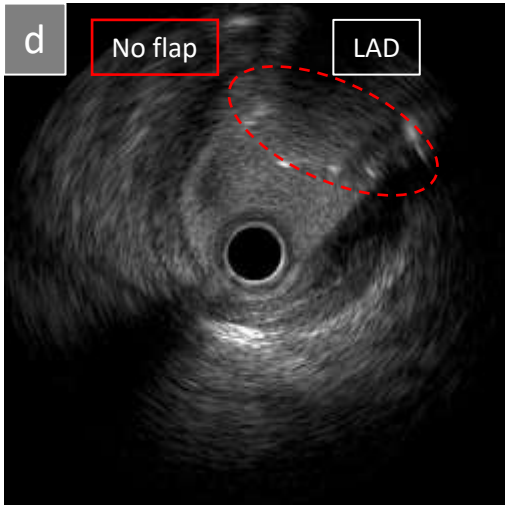
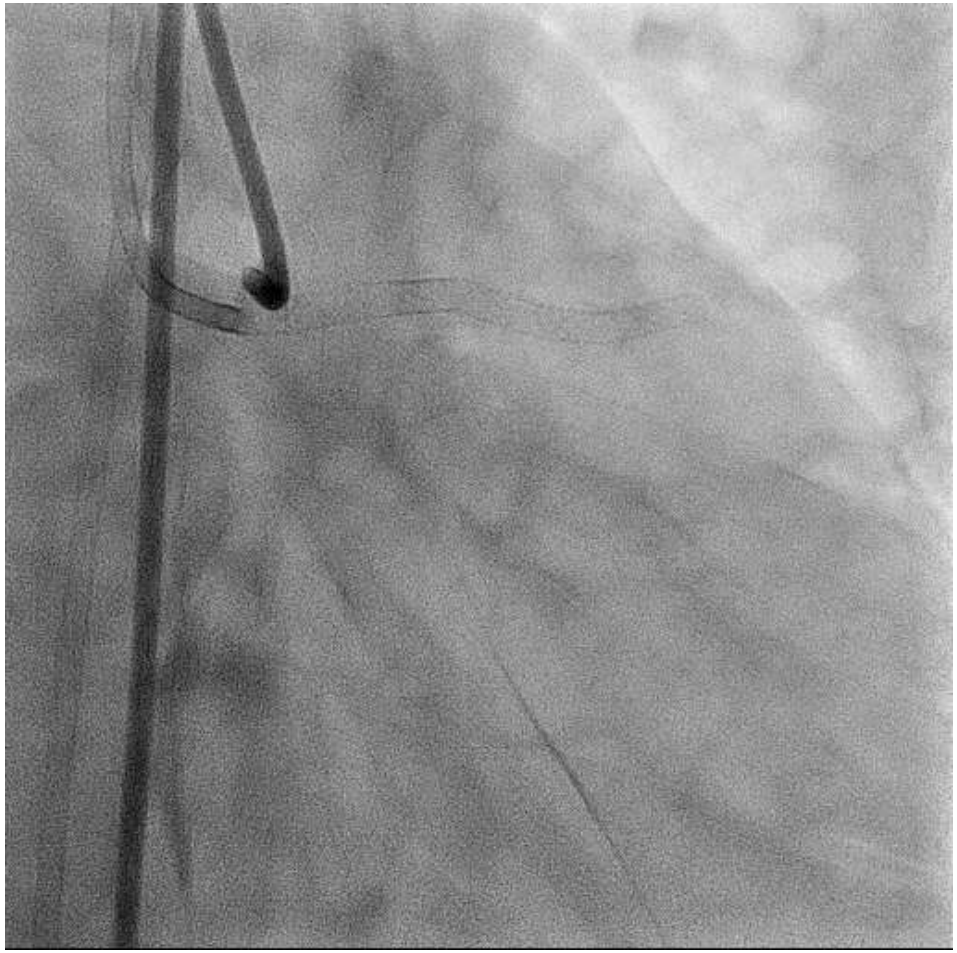


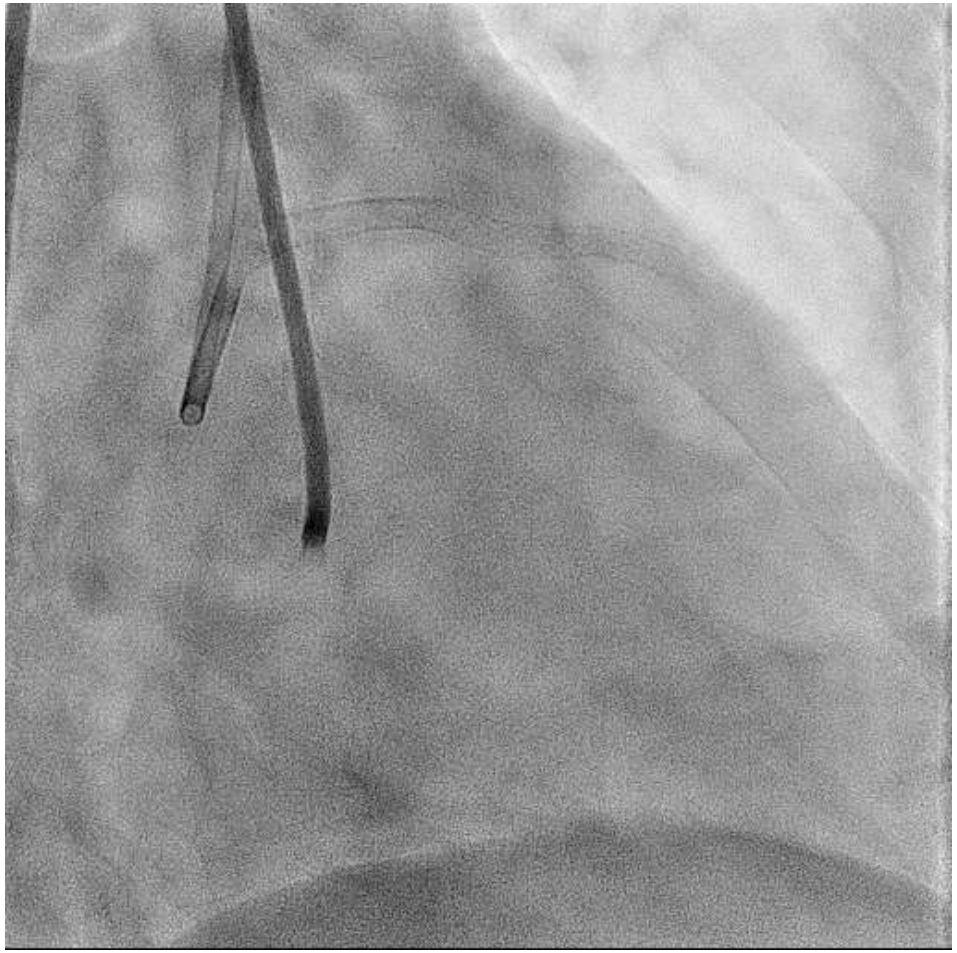


Case 3 : No Stunp LAD CTO with big epicardial collateral from RCA

- Retrograde Approach related complication: Risk of LOSE LCX -

Final Angiogram





Prediction

1. Possibility of Sub-Intima tracking
2. Knowing General Rule

Prevent

1. Use IVUS, OCT, CT
2. Re-wiring with IVUS

Weapon

1. Hawk Eye
2. IVUS, OCT
3. GW protection to LCX

Technique

1. IVUS guide rewiring
2. Sophisticated GW Technique
3. Intensive Care

What is the Key Elements ???

For prediction, For preventing as security against accidents

Quickness !! Quickness !! Quickness !!

Case 4 : 68yo: F LMT-CTO, Very Low EF (EF20%)

Almost 20 years ago, in some University inAsia

Diag. : Unstable AP, Acute on Chronic Heart Failure

Clinical Course :

2003: Admission doe to AHF on Chronic HF

CAG: LMT CTO : EF ～30%

2004: Admission doe to AHF again on worse Chronic HF

CAG: LMT CTO : EF ～20%

Consult Cardiac surgeon: Surgeon refused CABG
because of High Euroscore 12: estimated mortality ≧ 50%

Coronary RF:	DL, Current Smoker, DM, Obesity, FH
Renal F:	Cr. 1.12 : moderate reduced renal function
Euro Score :	11: Estimated mortality more than 50 %

Case 4 : 68yo: F LMT-CTO, Very Low EF (EF20%)

Repetitive HF patient: Acute on chronic HF stage

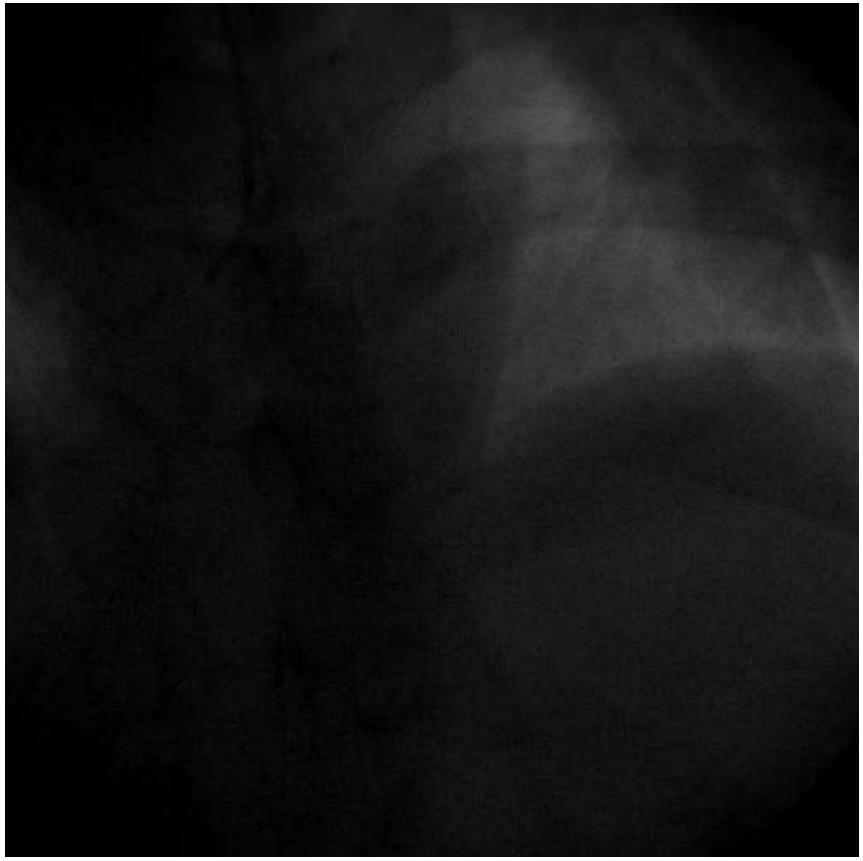
LVG : EF: 20%

LMT CTO

Case 4 : 68yo: F LMT-CTO, Very Low EF (EF20%)

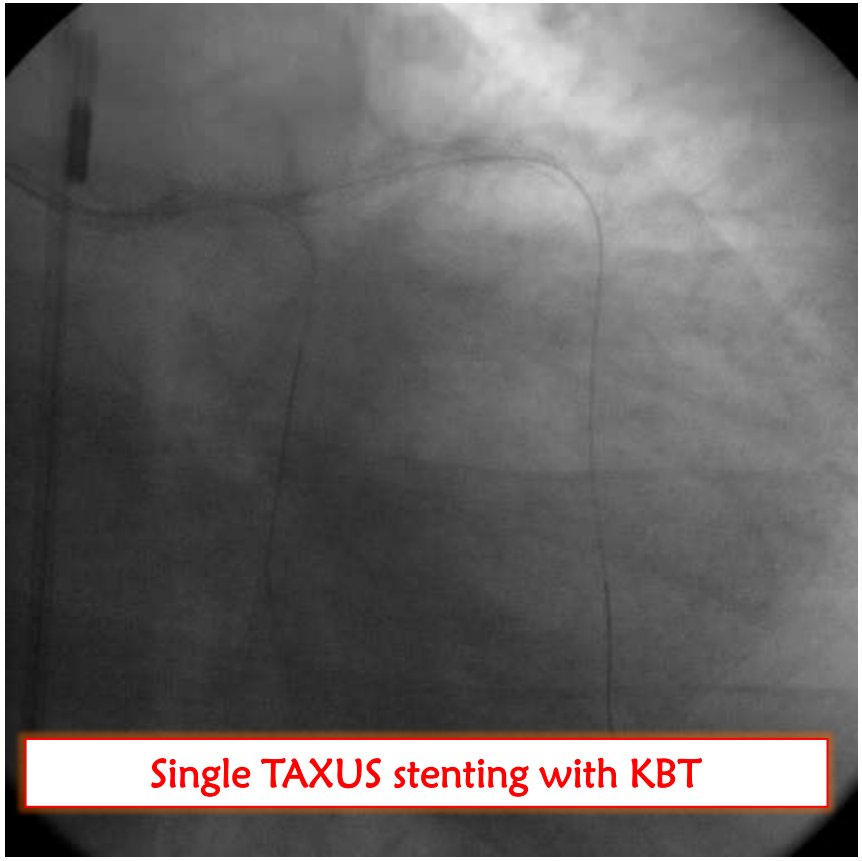
Repetitive HF patient: Acute on chronic HF stage

Faint Collateral from RCA



PCI: Open LMT to LAD and LCX

With IABP support



Case 4 : 68yo: F LMT-CTO, Very Low EF (EF20%)

Repetitive HF patient: Acute on chronic HF stage

LVG :1Year Later (EF improved 40%)

CAG : 1 Year Later

What is the Key Elements ???

For prediction, For preventing as security against accidents

Smart Use of appropriate supporting device !!

Case 5 : Acute on chronic HF due to severe 3VD

With 3 CTO and very impaired LV function (EF: 23.1 %)

Diag. : 61 yo. M : Angina and Dyspnea: Acute on chronic HF

Clinical Course : 2000 : Started Medication for Chr. HF in different HP

2013, 2018, 2019 : Admission due to HF in different HP

CAG no check, no intervention

2020 : Refer to NTH due to 4th Acute on chronic congestive HF

with very severely impaired LVEF (23%)

SYNTAX score: 48 EuroⅡ score: 16.62% STS Score : 12.9%

Coronary RF : HT, DL, **IDDM** (HbA1c 8.6%), FH, Current Smoker

Renal F : Cr. 1.39 (eGFR 42ml/min/ 1.73m^2)

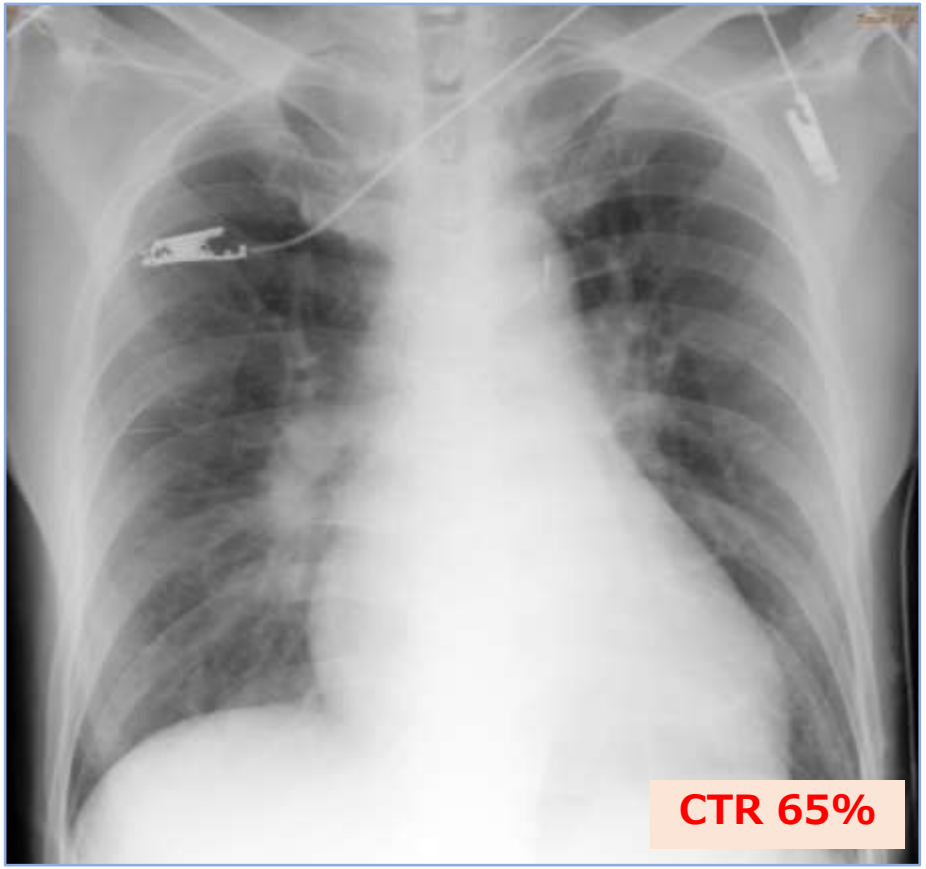
LV function : EF 23.1 % diffuse severe hypokinesis, Dd/Ds 60/52mm
MR mild-moderate (tethering 9mm), TR mild, PG 43mmHg

Blood Test : BNP **514.3** pg/ml LDL-chol **130** mg/dl, HDL-chol 60 mg/dl,

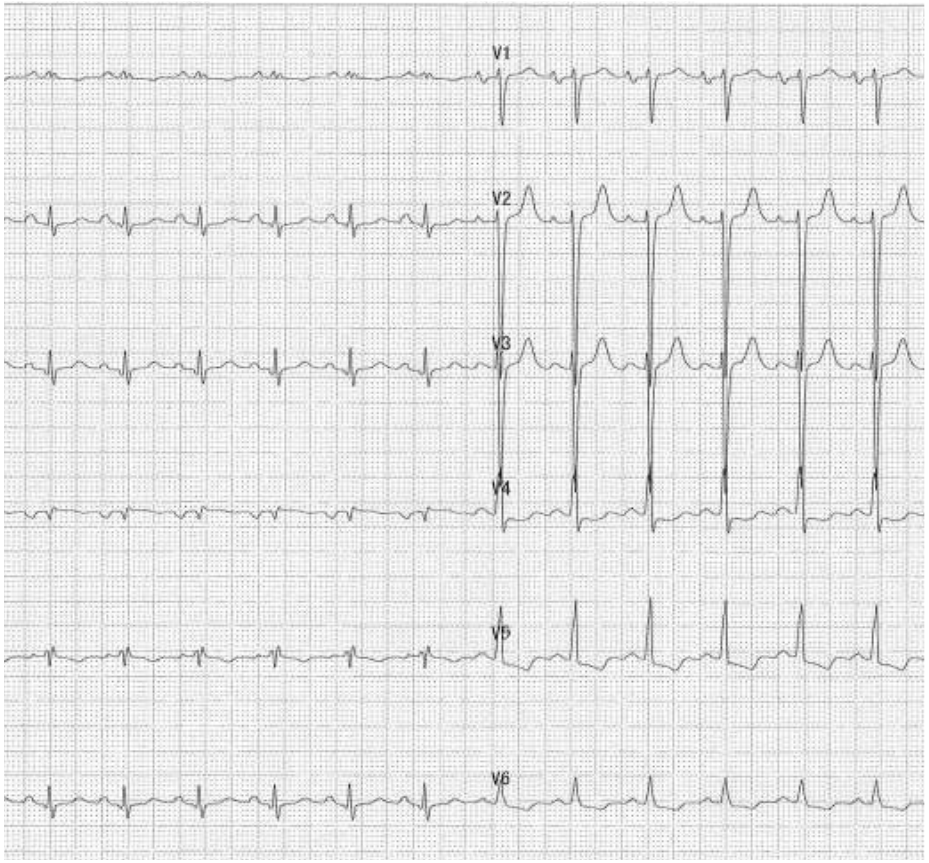
Case 5 : Acute on chronic HF due to severe 3VD

With 3 CTO and very impaired LV function (EF: 23.1 %)

Chest XP



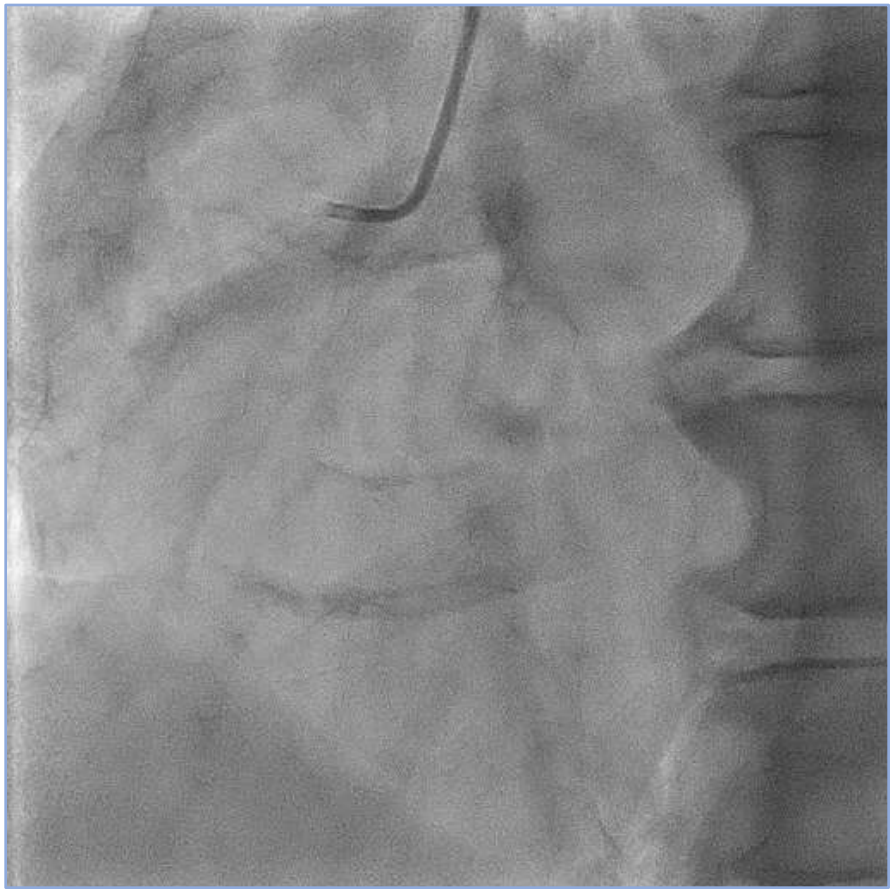
ECG

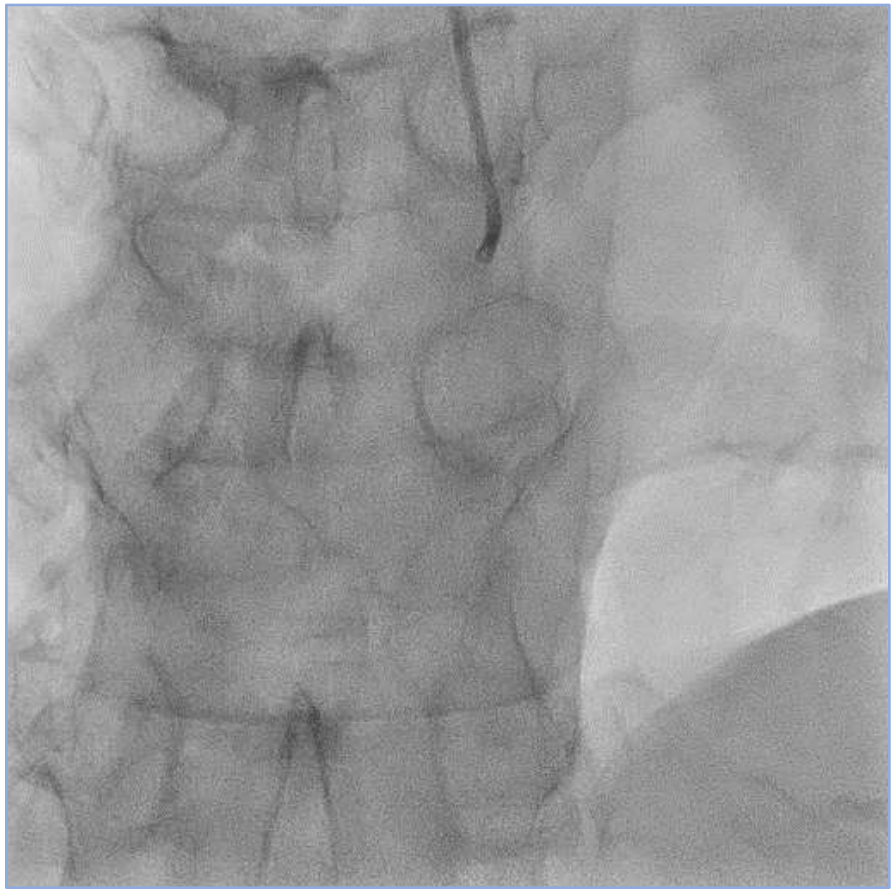


Case 5 : Acute on chronic HF due to severe 3VD

With 3 CTO and very impaired LV function (EF: 23.1 %)

RCA prox-mid: Diffuse lesions , RCA distal: CTO (grade II collateral from LCx distal)

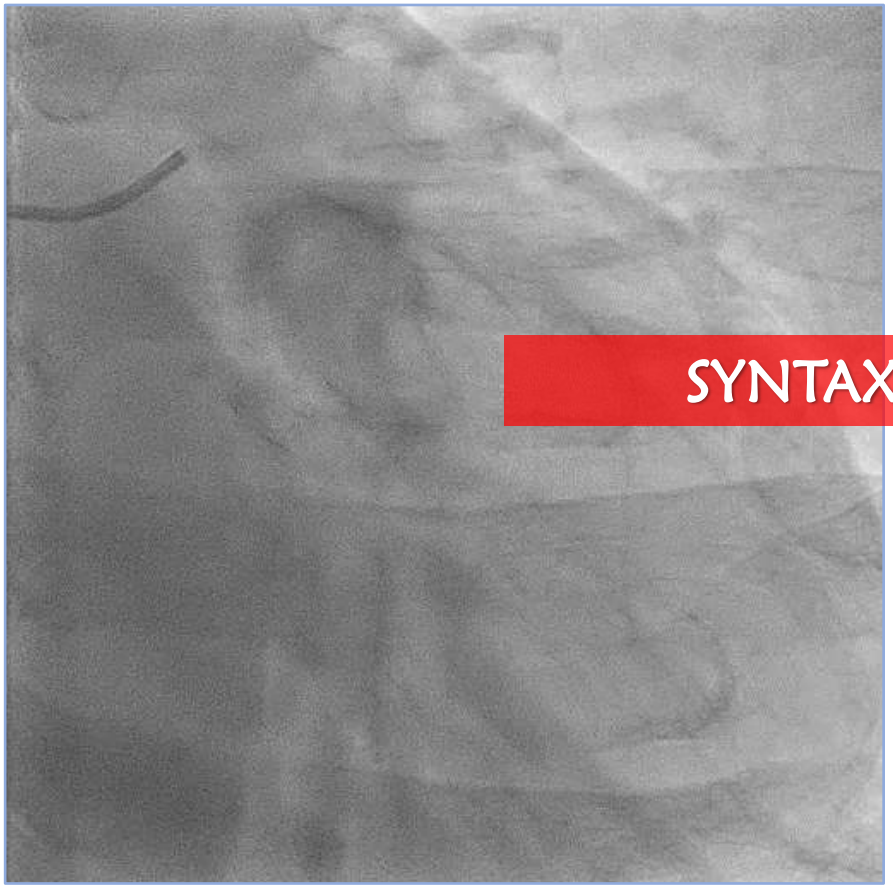




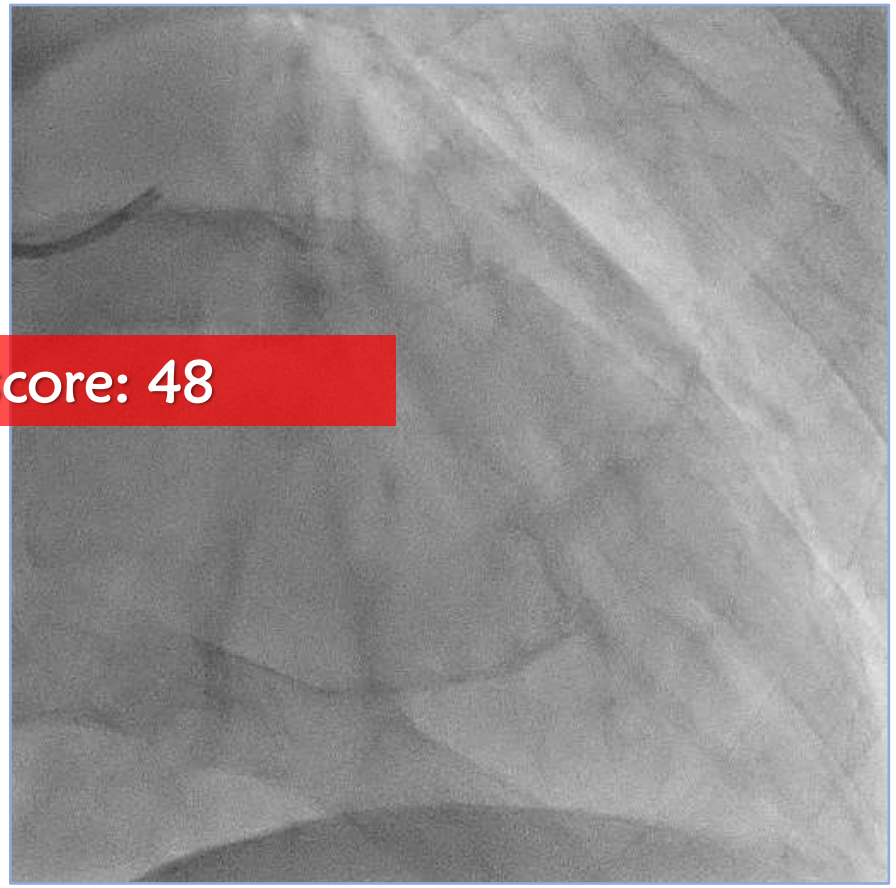
Case 5 : Acute on chronic HF due to severe 3VD

With 3 CTO and very impaired LV function (EF: 23.1 %)

LCx : significant stenosis and Distal CTO



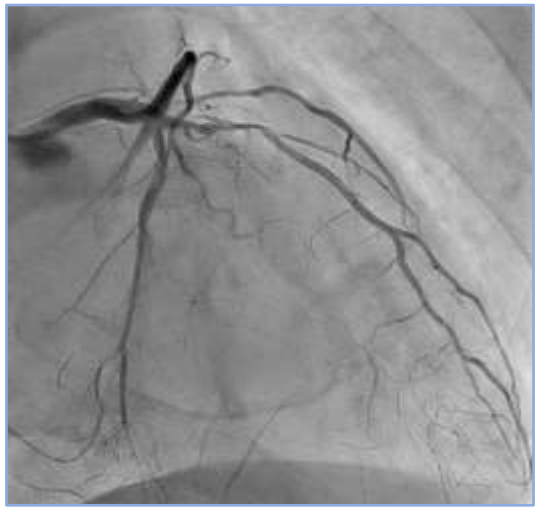
LAD prox: CTO (tinny antegrade flow)



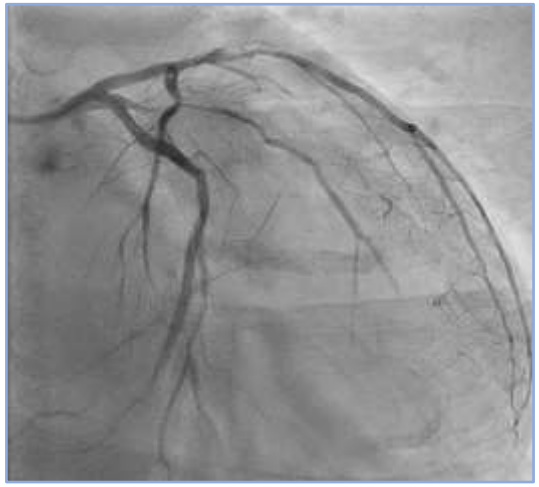
SYNTAX score: 48

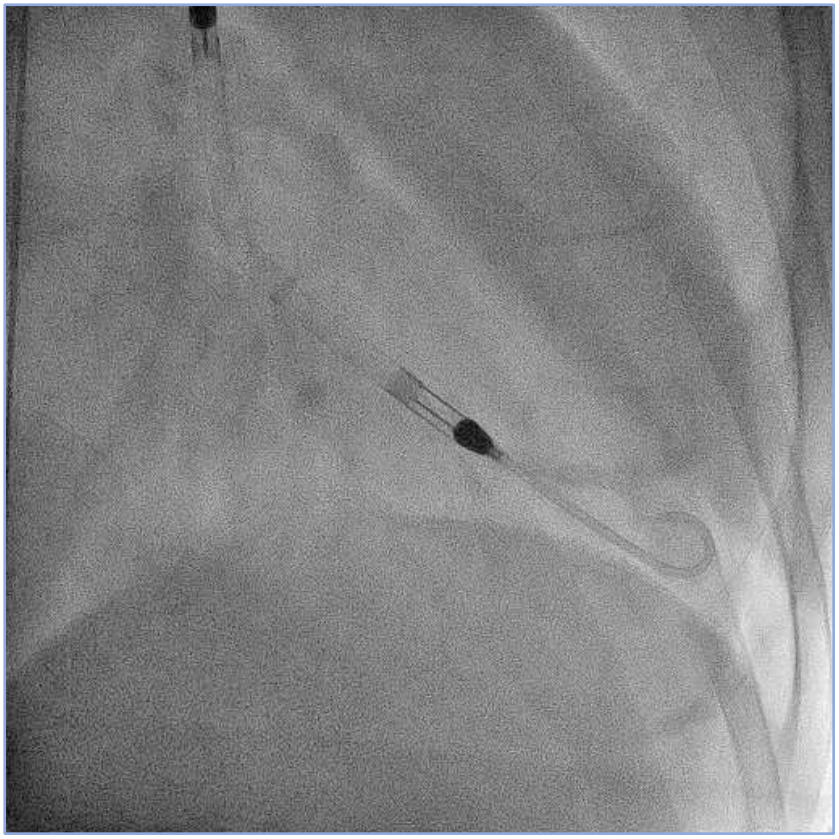
Case 5 : Acute on chronic HF due to severe 3VD

With 3 CTO and very impaired LV function (EF: 23.1 %)



Severely impaired LVEF





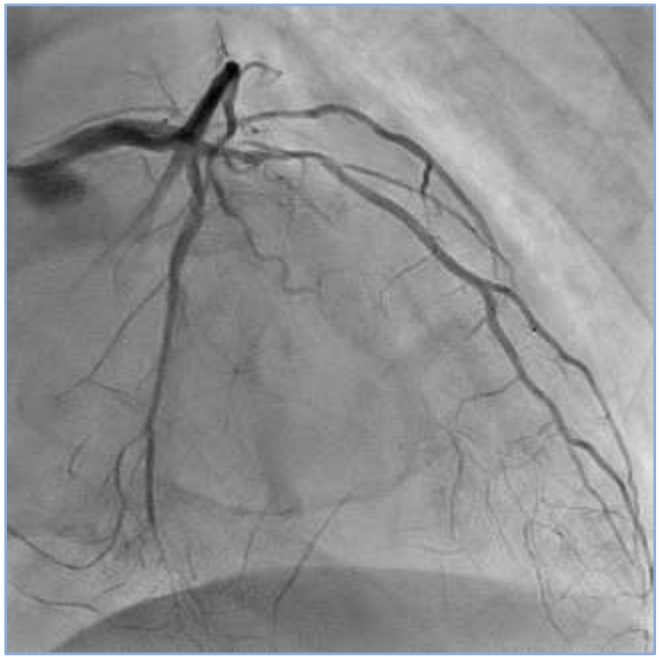
Peri-operative cardiac support

➡ Impella CP (P4-6)

Case 5 : Acute on chronic HF due to severe 3VD

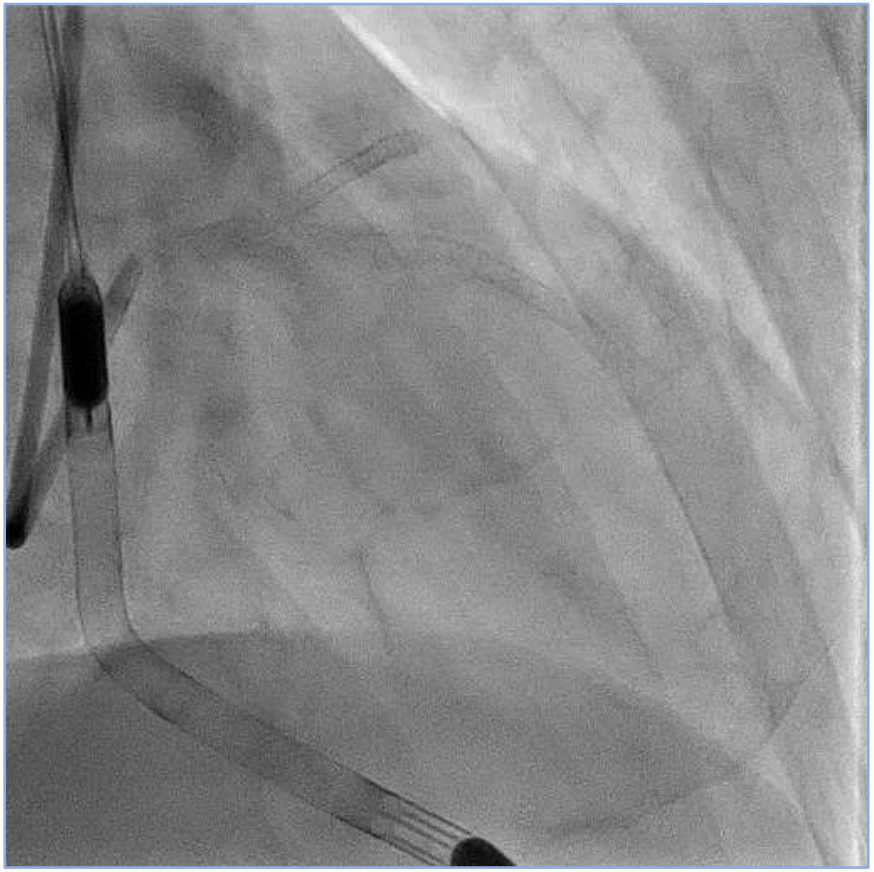
With 3 CTO and very impaired LV function (EF: 23.1 %)

PCI for LAD CTO



Antegrade approach

Stent: Xience sierra 2.5/48mm

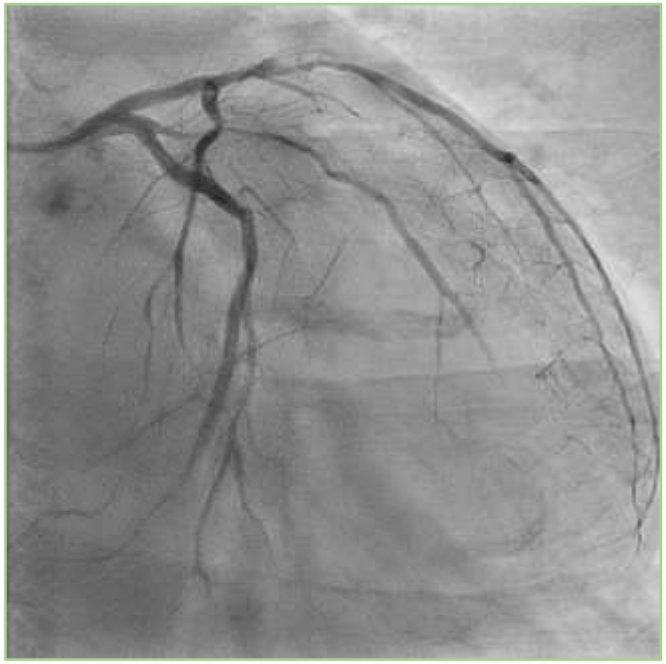


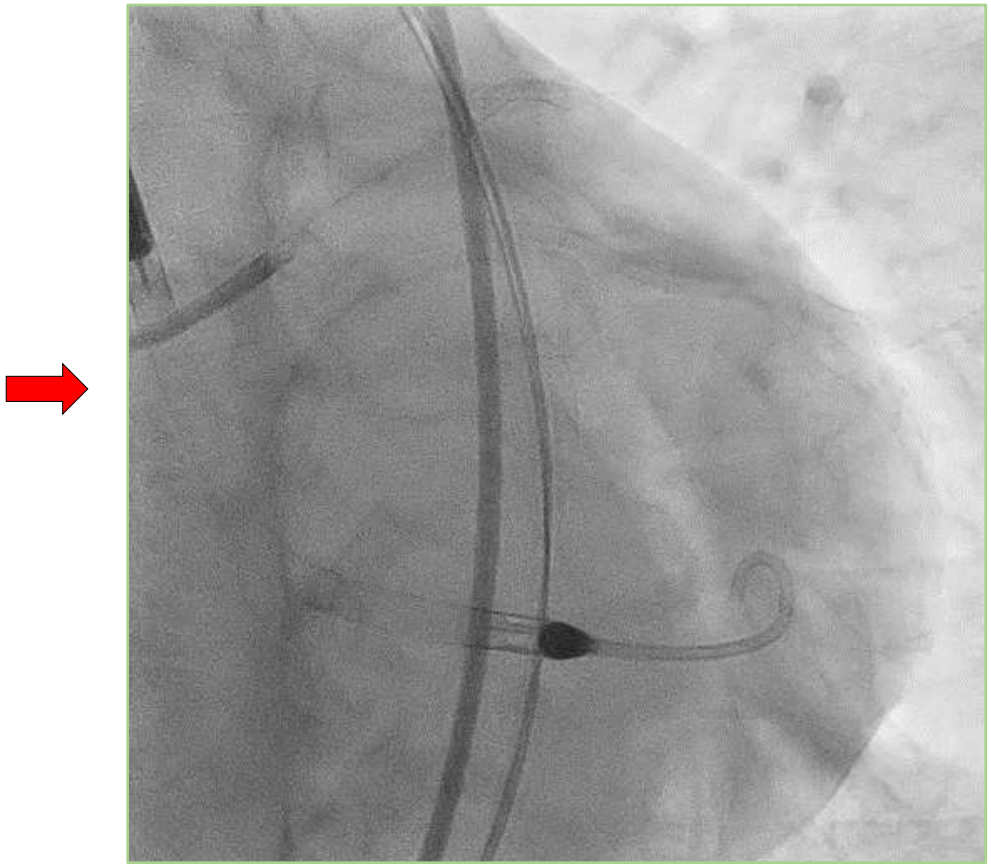
Opened LAD

Case 5 : Acute on chronic HF due to severe 3VD

With 3 CTO and very impaired LV function (EF: 23.1 %)

PCI for LCX/ HL





Stent: Xience sierra 2.5/18mm(LCx)

Xience sierra 2.25/38mm(HL)

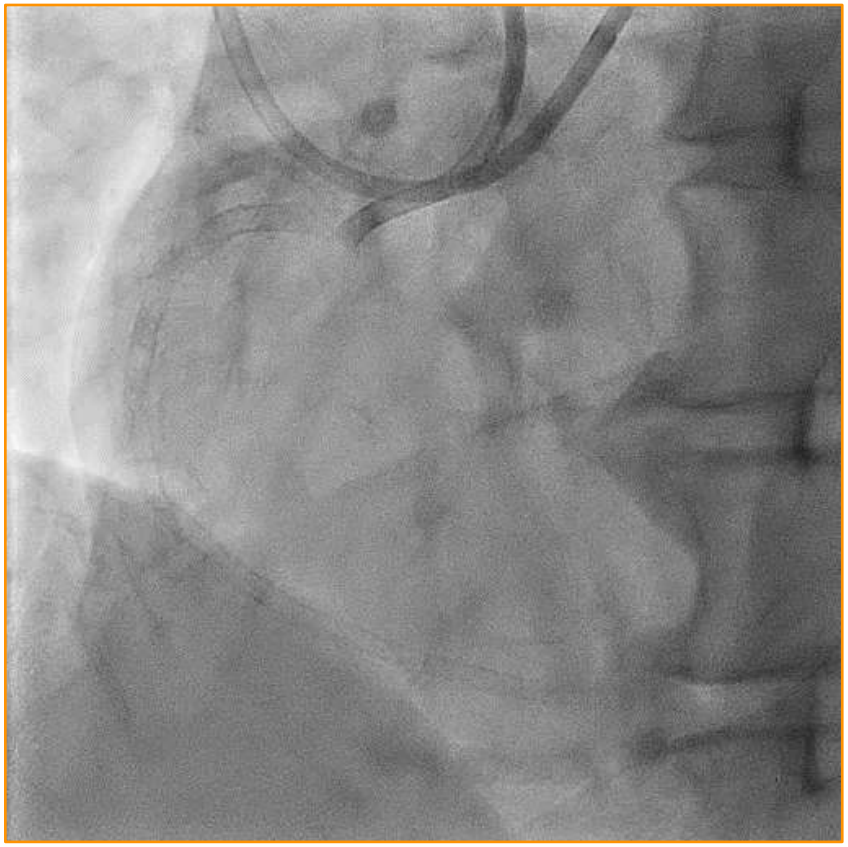
Case 5 : Acute on chronic HF due to severe 3VD

With 3 CTO and very impaired LV function (EF: 23.1 %)

PCI for LAD CTO

Stent: Xience sierra 2.25/38mm,

Same stent 2.5/30mm, 3.0/28mm



Opened RCA, All stented

Pt. condition : Pre and 1 week after PCI

Pre

Cre 1.39mg/dl (eGFR 42), BNP 514.3pg/ml

2 Mo. after PCI

Cre 1.21mg/dl (eGFR 52), BNP 70.2pg/ml

After all procedures, we checked in our OPD and there were no episodes of repeat admission due to CHF and recurrent anginal symptoms.

What is the Key Elements ???

For prediction, For preventing as security against accidents

Should be focus on the vessel preparation as much as you can !!

Should be smart enough to select appropriate device

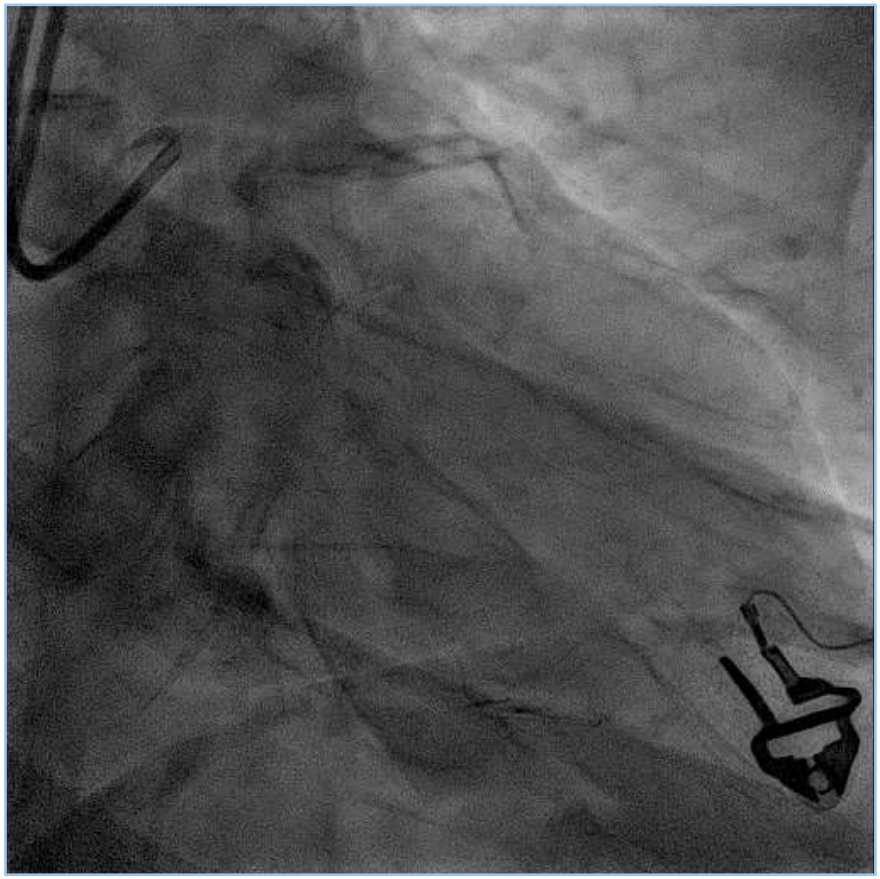
Case 6. Severely calcified LMT, LAD and LCx lesions

CASE : by ANTONIO COLOMBO with Satoru Mitomo

Case 6. Severely calcified LMT, LAD and LCx lesions

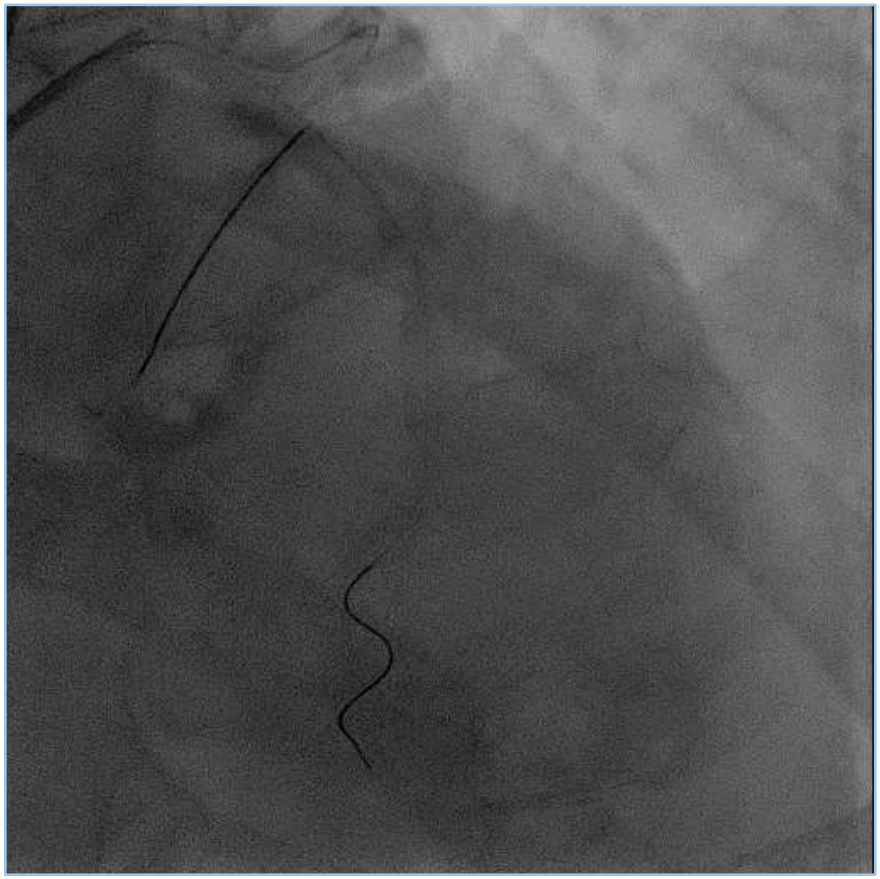
77 year-old, male Stable angina

Coronary risk factors: hypertension, dyslipidemia



Proximal to mid LCx:

diffusely and severely calcified lesions



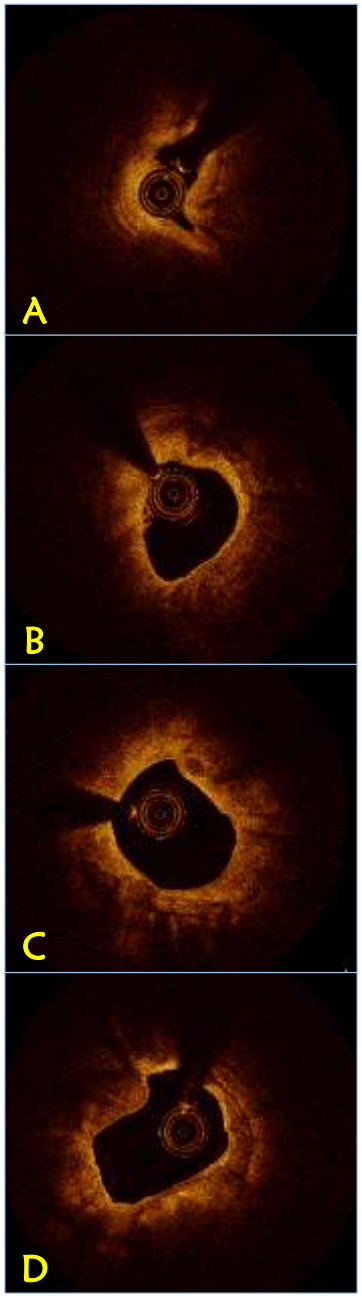
Proximal to mid LAD:

diffusely and severely calcified lesions

Baseline OCT findings LCX

After pre-dilatation with 2.0 NC balloon

➡ baseline OCT

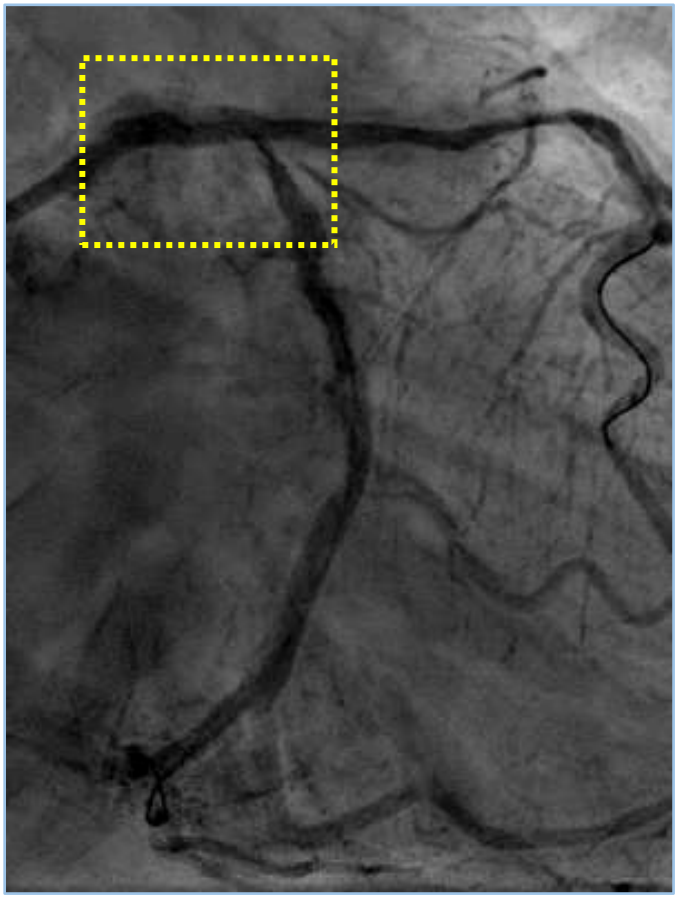


Diffusely and severely calcified LCx

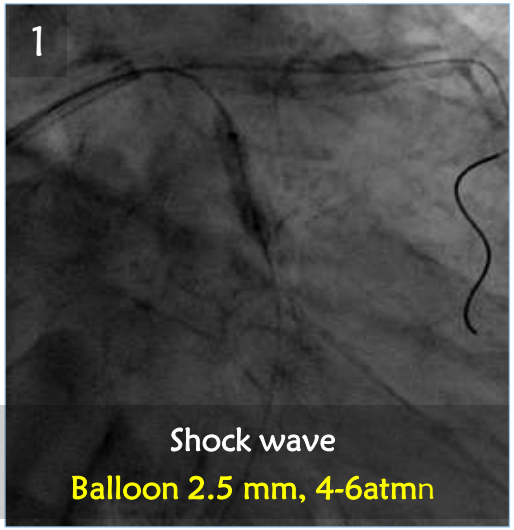
Large arc (>270° degrees)

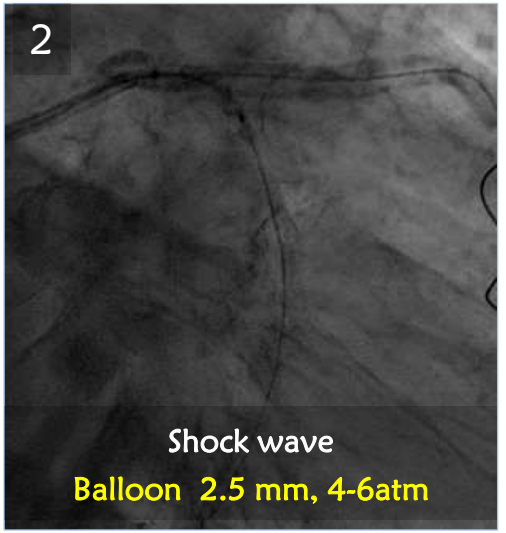
Thick calcification

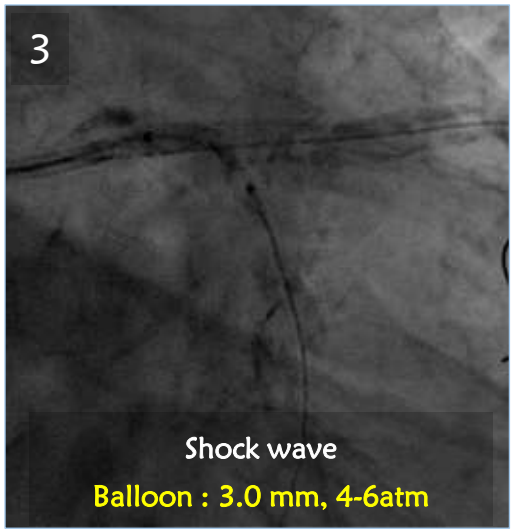
Shock wave for the LCX mid to LMT

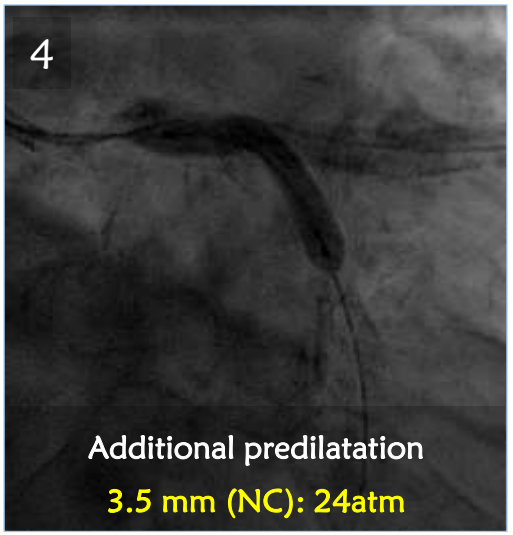


Additional shock wave
for the proximal LCx to LMT
Balloon size up: 2.5 ➡ 3.0 mm

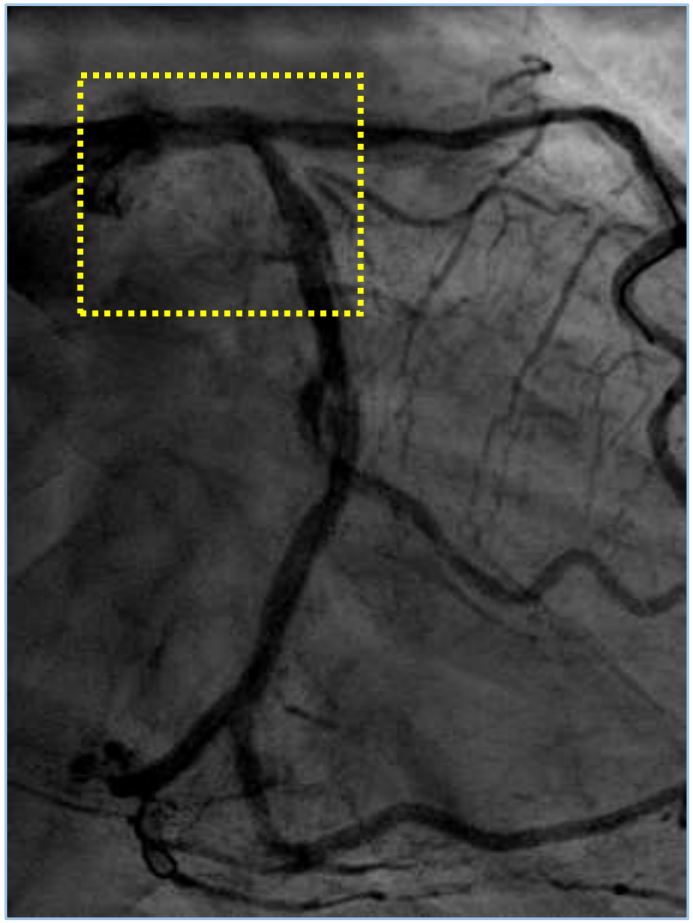






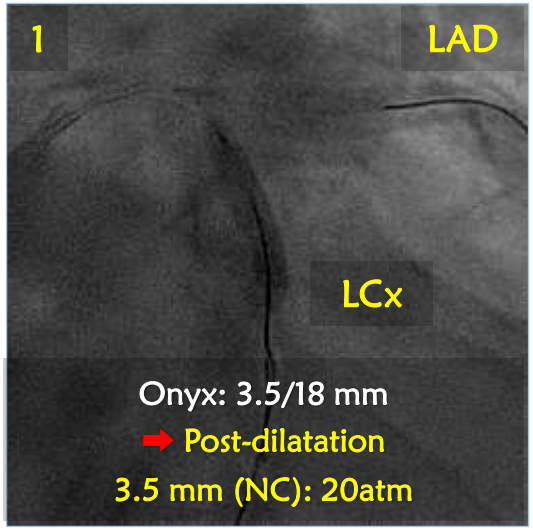


DES implantation for the LMT to the proximal LCx

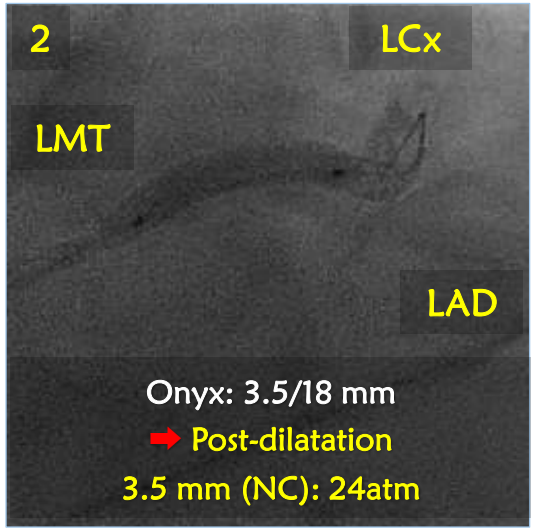


LMT true bifurcation lesion (1.1.1)

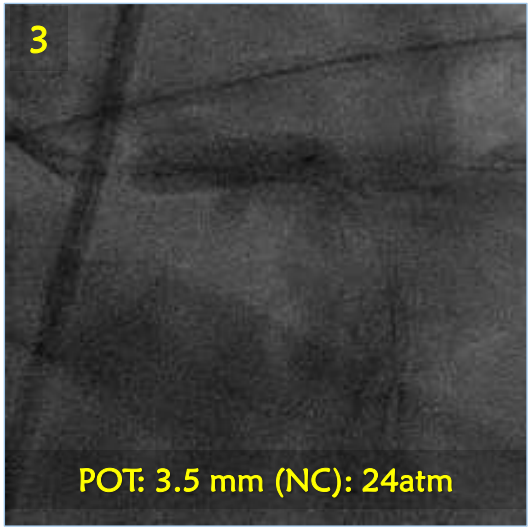
➡ Systemic double stenting



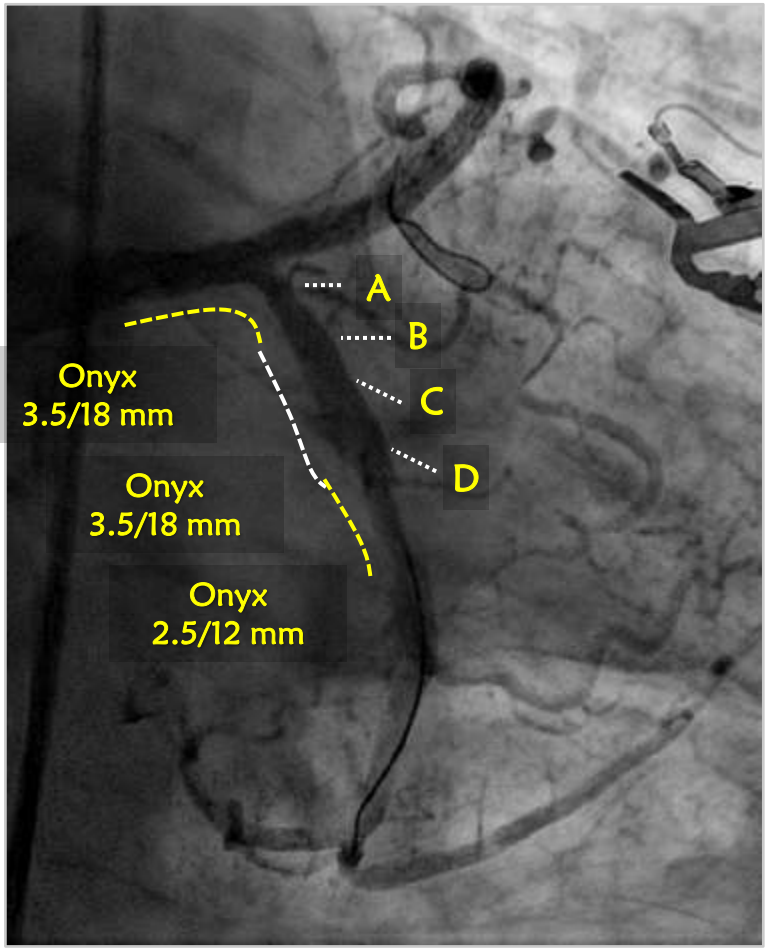
Proximal LCx

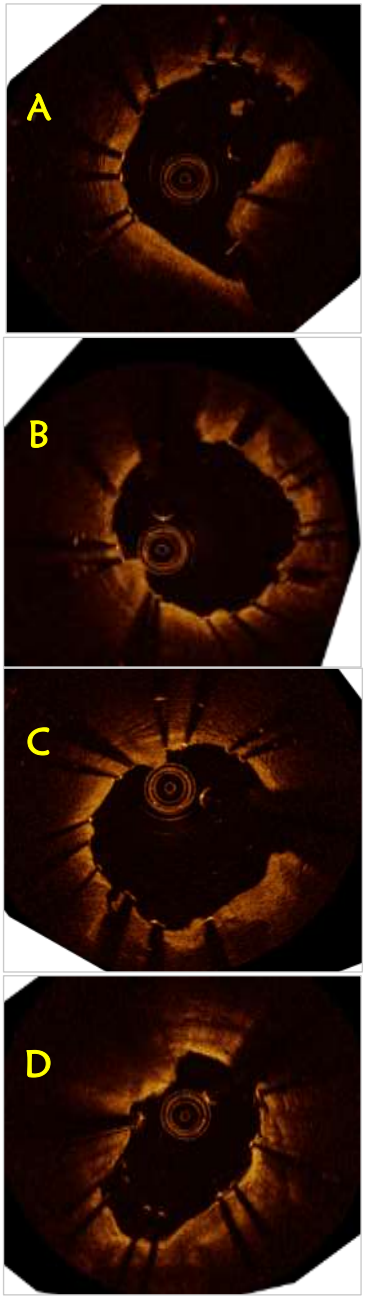


Proximal LCx to LMT



OCT findings:
mid LCx to LMT





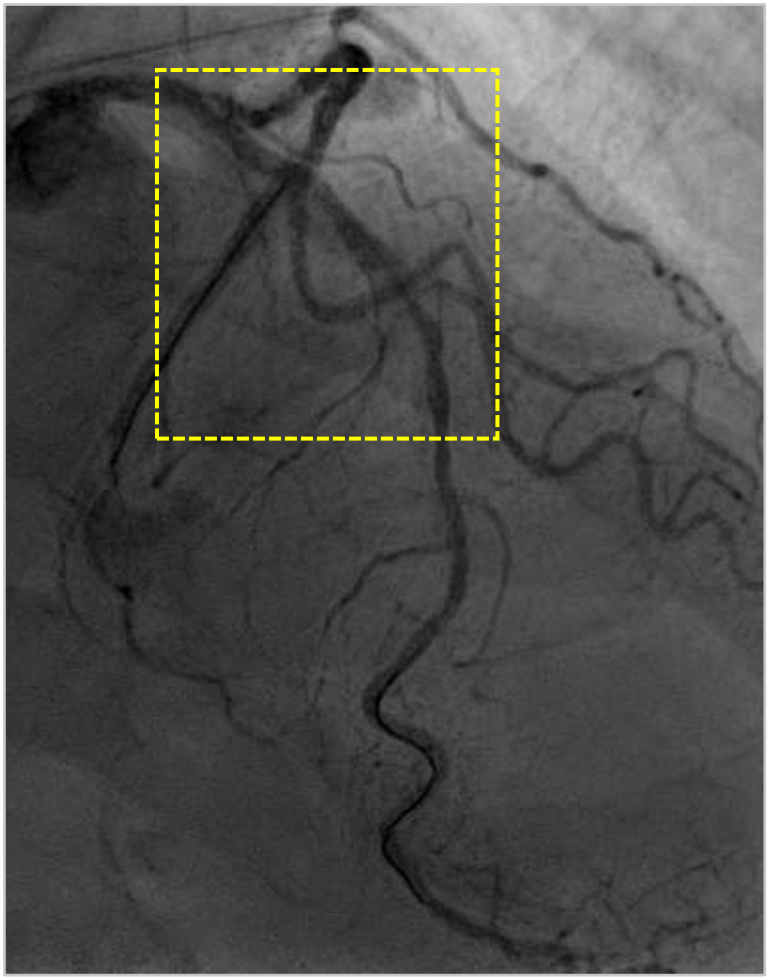
Diffusely and severely calcified LCx

Optimal stent expansion
Optimal stent apposition

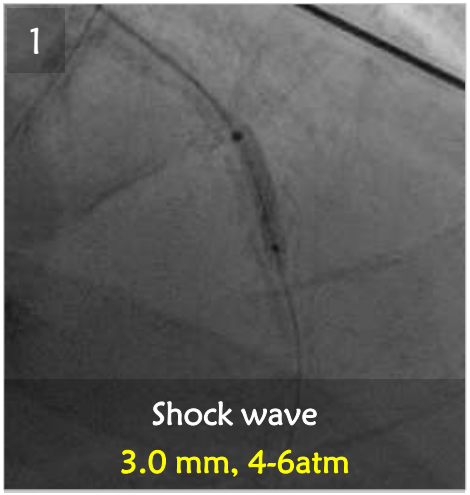
MSA: 4.26 mm²
(Segment treated with 2.5mm DES)

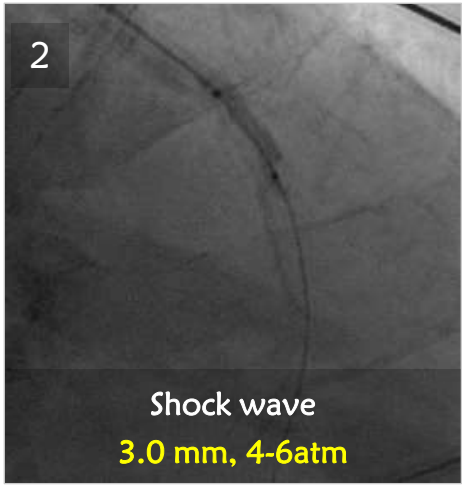
After bailout stenting
➡ No residual dissection extended distally

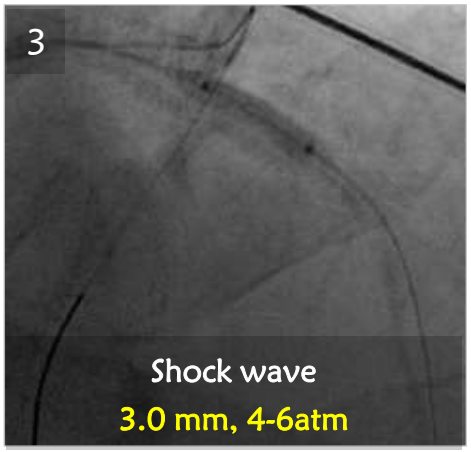
Lesion preparation with shock wave: LAD

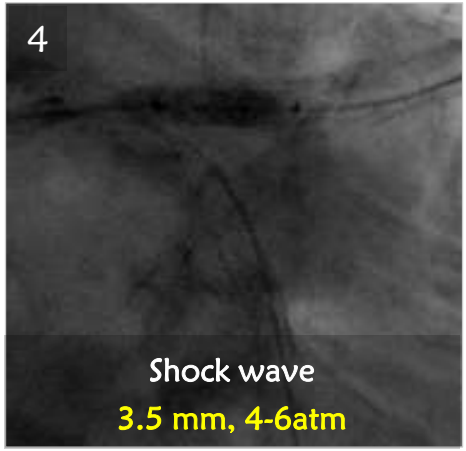


Lesion preparation with shock wave

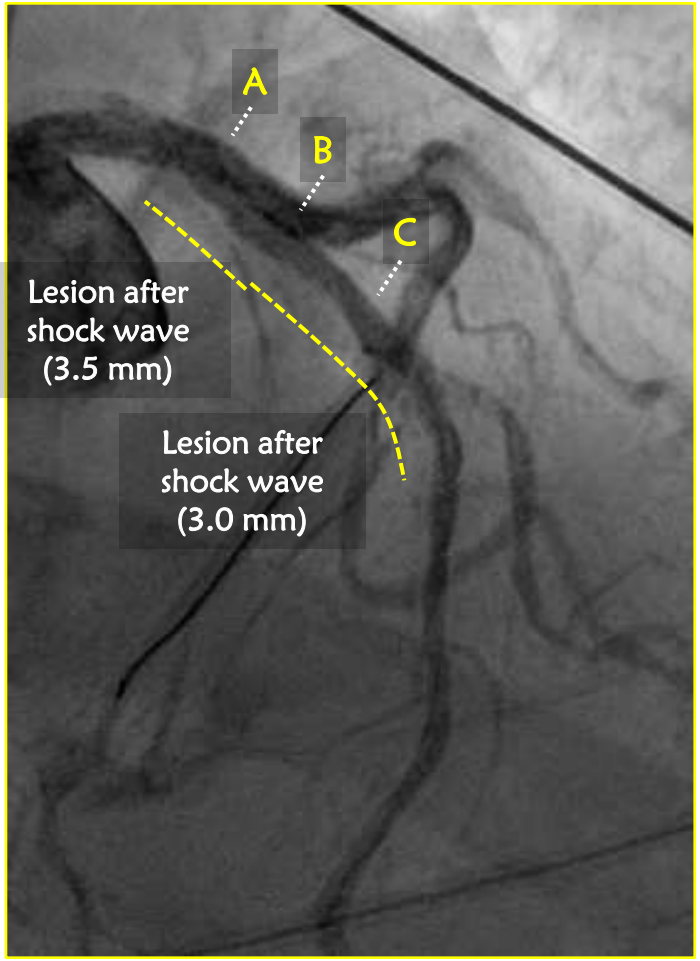


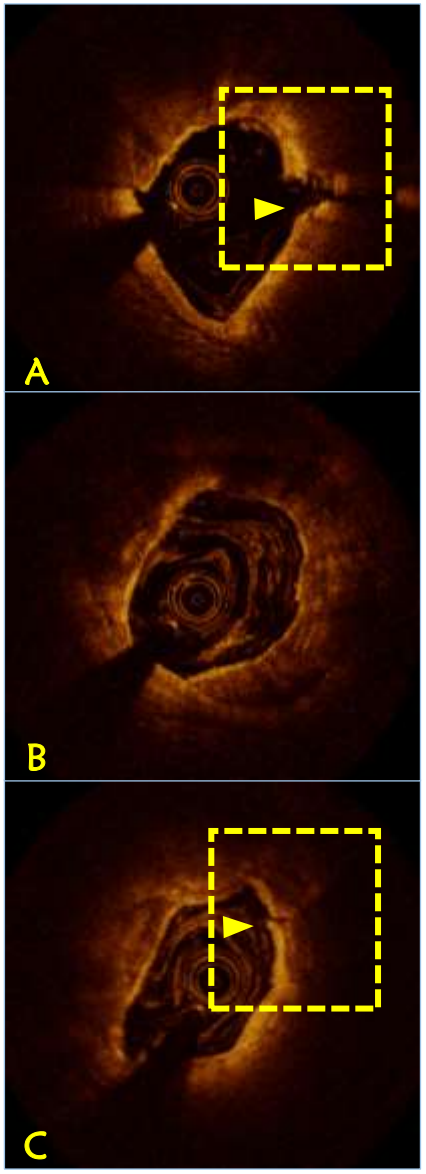


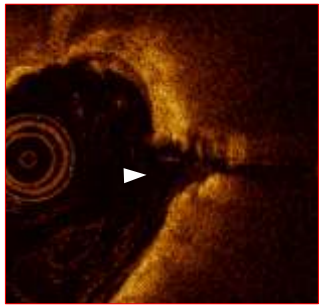




OCT findings after lesion preparation with shock wave

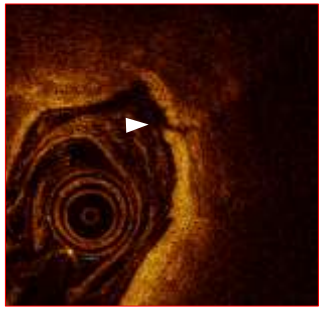






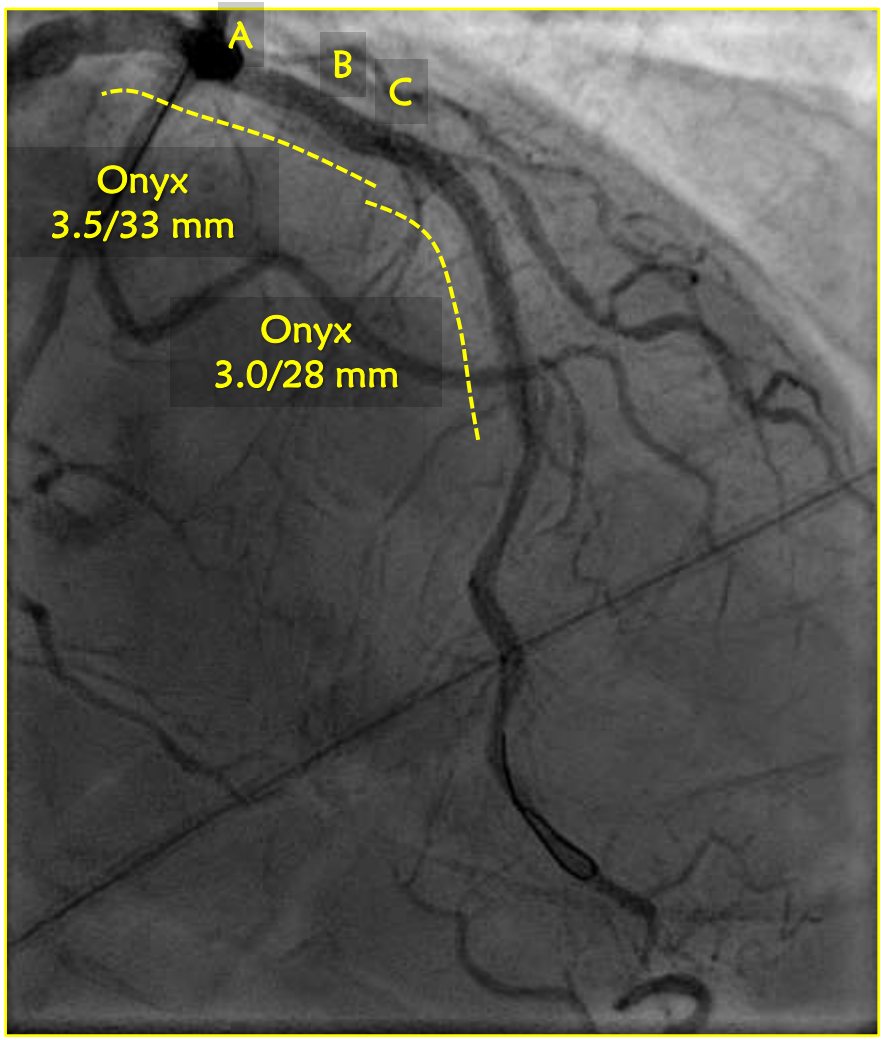
Crack of thick calcification

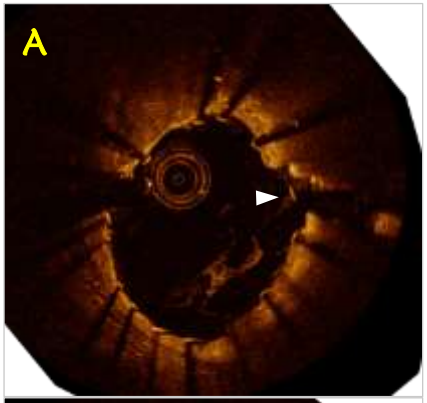
Lesion was expanded; however cracks of calcification were not obviously observed.

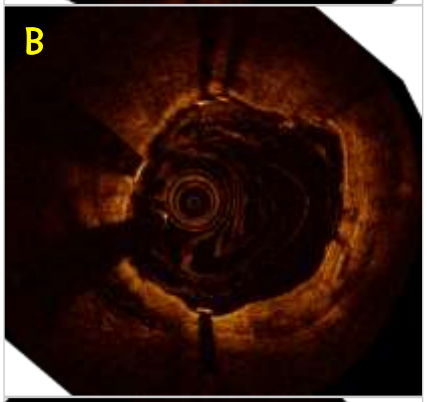


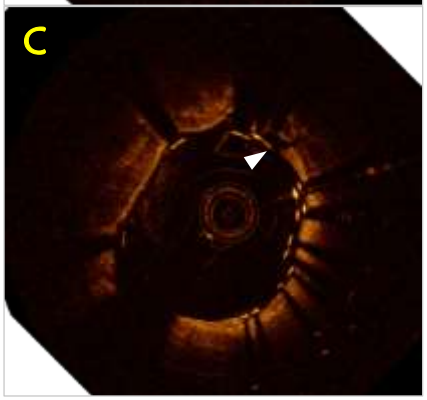
Crack of thick calcification

OCT findings: mid to proximal LAD









Diffusely and severely calcified LAD

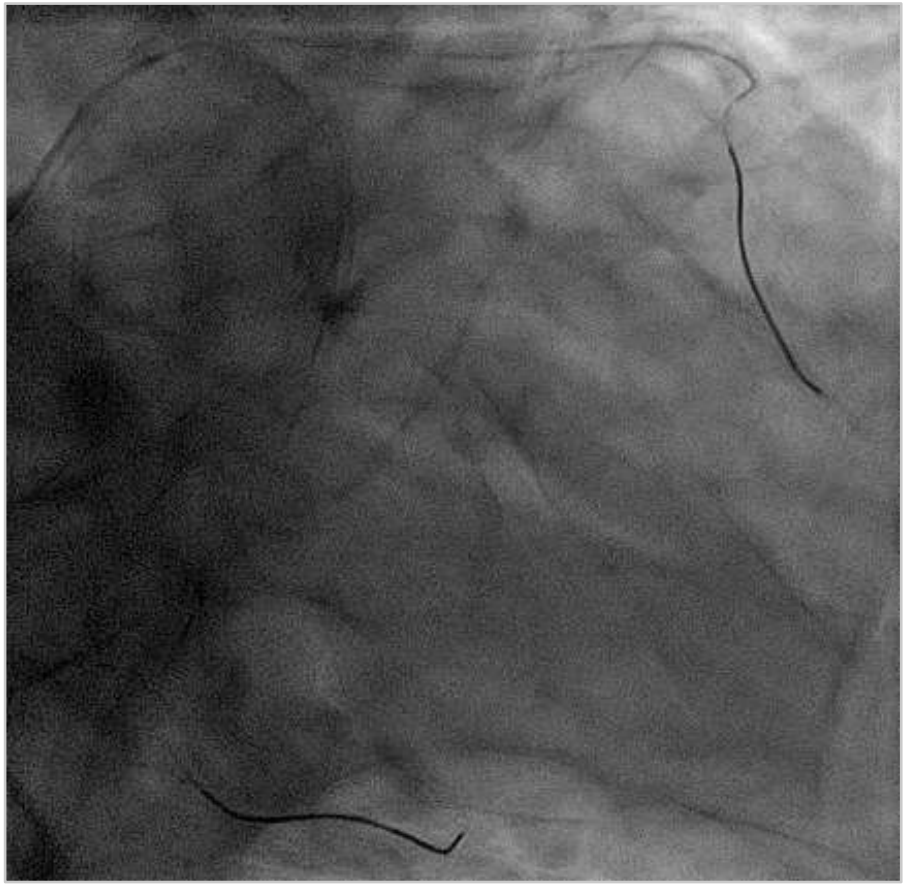
Optimal stent expansion
Optimal stent apposition

MSA: 5.39 mm^2
(Segment treated with 3.0mm DES)

No dissection extended distally

DES implantation for the severely calcified lesion

after lesion preparation with shock wave



Final angiography