# Usefulness of Directional Atherectomy for LMT Bifurcation Followed by DCB


## Sunao Nakamura MD PhD

FACC, FESC, FAHA, FSCAI

Shotaro Nakamura MD, Naoyuki Kurita MD, Hisaaki Ishiguro MD, Satoko Tahara MD
Masaaki Okutsu MD, Tomohiko Sato MD, Toru Naganuma MD, Satoru Mitomo M.D.
Hiroyoshi Kawamoto MD, Kentaro Tanaka MD, Satoshi Matsuoka MD, Tatsuya Amano MD,
Hiroaki Nakajima MD, Hirokazu Onishi MD, Kenjiro Tani MD, Yusuke Watanabe MD,
Koji Hozawa M.D., Toru Ohuti M.D., Hiroto Yabushita MD,

The New Tokyo Hospital ; Japan Tokyo

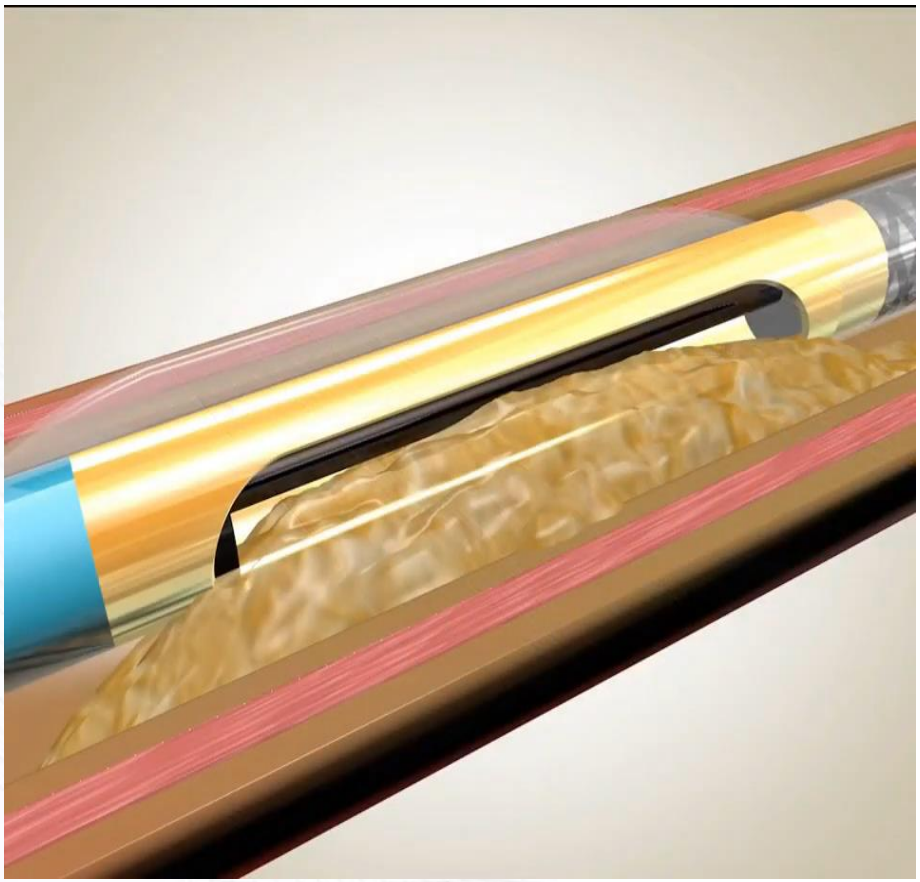

Nintendo Super TV game

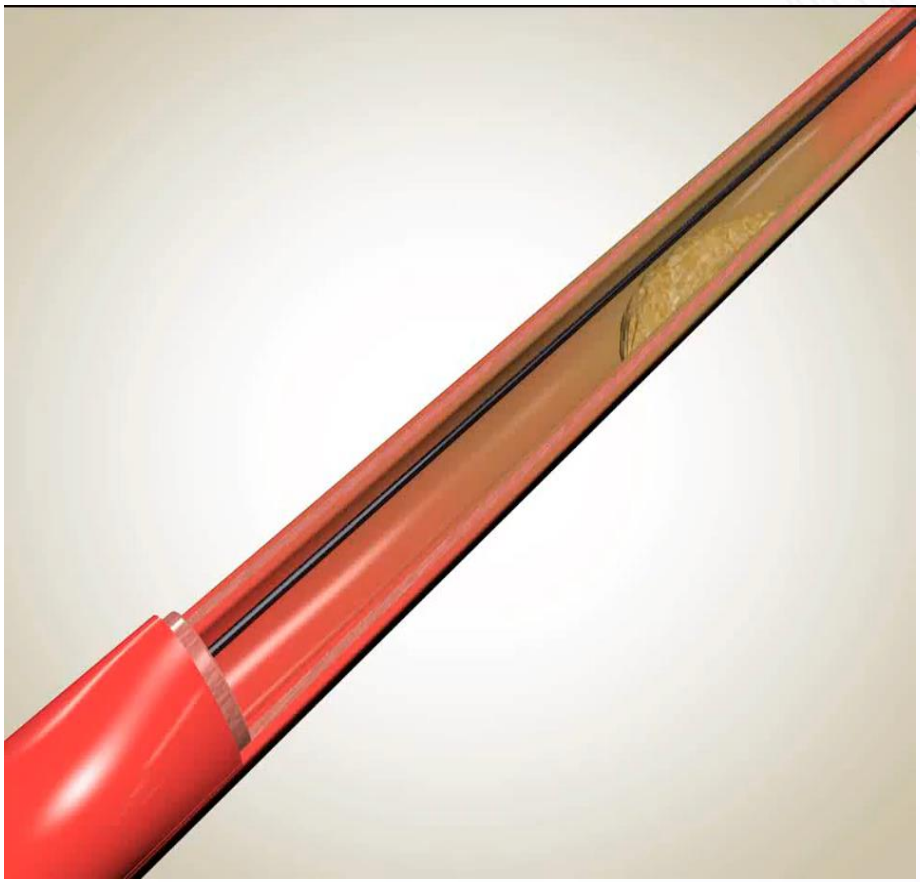


Early 1990

# Directional Coronary Atherectomy ( DCA )

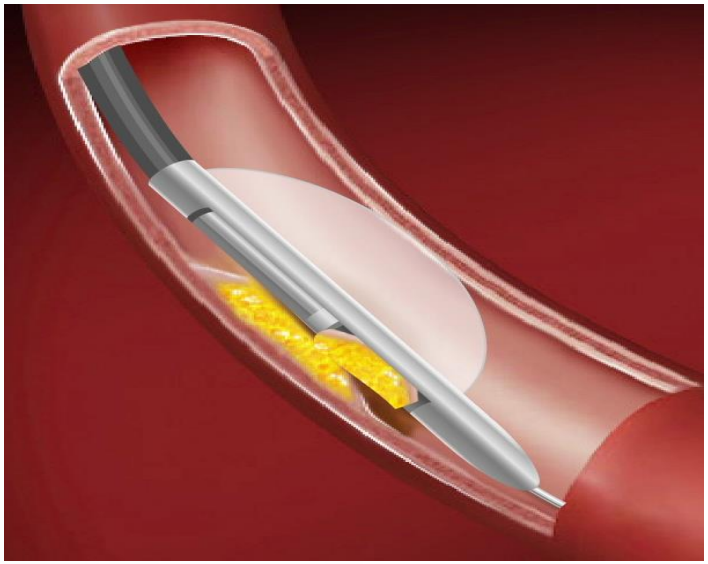
- He come to the stage just before the STENT-

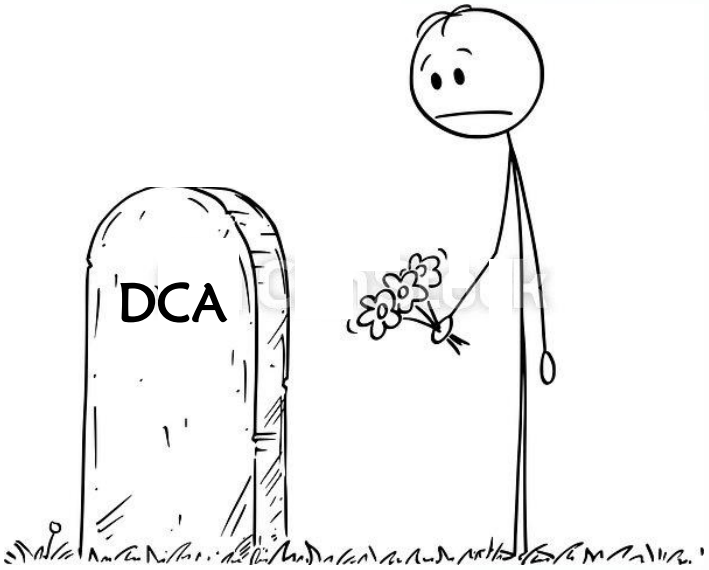




# DCA (Directional Coronary Atherectomy) Went into Grave

## - Even he would not to like to go -






CABEAT trial ; Topol EJ NEJM 1993

BOAT trial ; Blaim DS Circulation 1998

OARS trial ; Simonton CA Circulation 1998

ABACAS trial ; SUZUKI TAKAHIKO JACC 1999

# DCB: Body of Evidence : A Certainly Growing : ISR

**TABLE 2** Randomized Controlled Trials of DCBs in ISR

| Study Name (Ref. #) | Comparators to PCB | n | Follow-Up Duration | Angiographic Follow-Up | p Value | MACE (%) | p Value | TLR (%) | p Value |
|---|---|---|---|---|---|---|---|---|---|
| BMS ISR | | | | | | | | | |
| PACOCATH ISR I and II (14) | POBA | 108 | 6 months (angio)<br>12 months (clinical) | LLL 0.03 ± 0.48 mm vs. 0.74 ± 0.86 mm | 0.0002 | 4 vs. 31 | 0.01 | 0 vs. 23 | 0.02 |
| | | | 5 yrs (clinical) | | | 27.8 vs. 59.3 | 0.009 | 9.3 vs. 38.9 | 0.004 |
| PEPCAD II (97) | PES | 131 | 6 months (angio)<br>12 months (clinical) | LLL 0.17 ± 0.42 mm vs. 0.38 ± 0.61 mm | 0.03 | 9 vs. 22 | 0.08 | 6 vs. 15 | 0.15 |
| | | | 3 yrs (clinical) | | | 34.8 vs. 41.5 | | | |
| RIBS V (98) | EES | 189 | 6–9 months (angio)<br>12 months (clinical) | LLL 0.14 ± 0.5 mm vs. 0.04 ± 0.5 mm, | 0.14<br>0.22 | 8 vs. 6 | 0.60 | 6 vs. 1 | 0.09 |
| | | | 3 yrs (clinical) | binary restenosis 9.5% vs. 4.7% | | 12 vs. 10 | 0.64 | 8 vs. 2 | 0.04 |
| SEDUCE (99) | EES | 50 | 9 months (angio)<br>12 months (clinical) | LLL 0.28 mm vs. 0.07 mm, proportion uncovered struts (OCT) 1.4% vs. 3.1% | 0.1<br>0.025 | | | 4.2 vs. 8 | 0.576 |
| TIS (100) | EES | 136 | 12 months | LLL 0.02 mm vs. 0.19 mm | 0.0004 | 10.3 vs. 19.1 | 0.213 | 7.4 vs. 16.2 (TVR) | 0.110 |
| DES ISR | | | | | | | | | |
| PEPCAD-DES (101) | POBA | 110 | 6 months (angio and clinical) | LLL 0.43 ± 0.61 mm vs. 1.03 ± 0.77 mm, | <0.001<br>0.001 | 16.7 vs. 50.0 | <0.001 | 15.3 vs. 36.8 | 0.005 |
| | | | 3 yrs | restenosis 17.2% vs. 58.1% | | 20.8 vs. 52.6 | 0.001 | 19.4 vs. 36.8 | 0.046 |
| PEPCAD CHINA ISR (102) | PES | 220 | 9 months (angio)<br>12 months (clinical) | LLL 0.46 ± 0.51 mm vs. 0.55 ± 0.61 mm | 0.0005* | 16.5 vs. 16 (TLF) | 0.92 | 15.6 vs. 12.3 | 0.48 |
| | | | 2 yrs (clinical) | | | 16.8 vs. 18.6 (TLF) | 0.73 | 15.9 vs. 13.7 | 0.66 |
| ISAR DESIRE III (103) | PES vs. POBA | 402 | 6–8 months (angio)<br>12 months (clinical) | Diameter stenosis 38% vs. 37.4% | 0.007* | 23·5 vs. 19·3 vs. 46·2 | 0.5 (PCB vs. PES) | 22·1 vs. 13·5 vs. 43·5 | 0.09 (PCB vs. PES) |
| | | | 3 yrs (clinical) | | | 38.0 vs. 37.7 vs. 55.7 | 0.91 (PCB vs. PES) | 33.3 vs. 24.2 vs. 50.8 | 0.11 (PCB vs. PES) |
| ISAR DESIRE IV (29) | Scoring and PCB | 252 | 6–8 months (angio)<br>12 months (clinical) | LLL 0.31 ± 59 mm vs. 0.41 ± 0.74 mm | 0.27 | 18.4 vs. 23.3 | 0.35 | 16.2 vs. 21.8 | 0.26 |
| RIBS IV (104) | EES | 309 | 6–9 months (angio)<br>12 months (clinical) | Binary restenosis 19% vs. 11% | 0.06 | 18 vs. 10 | 0.04 | 16 vs. 8 | 0.035 |
| RESTORE (105) | EES | 172 | 9 months (angio)<br>12 months (clinical) | LLL 0.15 ± 0.49 mm vs. 0.19 ± 0.41 mm | 0.54 | 7.0 vs. 4.7 | 0.51 | 5.8 vs. 1.2 | 0.10 |
| FIM LIMUS DCB (25) | SCB | 50 | 6 months (angio) | LLL 0.21 ± 0.54 mm vs. 0.17 ± 0.55 mm | 0.794 | 16 vs. 12 | >0.99 | 16 vs. 12 | >0.99 |
| Mixed ISR | | | | | | | | | |
| BIOLUX (106) | SES | 229 | 6 months (angio)<br>12 months (clinical) | LLL 0.03 ± 0.40 mm vs. 0.20 ± 0.70 mm | 0.40 | 16.9 vs. 14.2 (TLF) | 0.65 | 12.5 vs. 10.1 | 0.82 |
| DARE (107) | EES | 278 | 6 months (angio)<br>12 months (clinical) | MLD 1.71 ± 0.51 mm vs. 1.74 ± 0.61 mm | <0.0001* | 10.9 vs. 9.2 | 0.66 | 7.1 vs. 8.8 (TVR) | 0.65 |

# DCB: Body of Evidence : A Further Take a Step: SMALL CORONARY

**TABLE 3** Randomized Controlled Trials of DCB Only in De Novo Lesions of Small Coronary Vessels

| Study Name (Ref. #) | Comparators | n | Follow-Up Duration | Angiographic Follow-Up | p Value | MACE (%) | p Value | TLR (%) | p Value |
|---|---|---|---|---|---|---|---|---|---|
| PICCOLETO (58) | Dior PCB vs. TAXUS Liberté PES | 57 | 6 months (angio)<br>9 months (clinical) | MLD 1.11 ± 0.65 mm vs. 1.94 ± 0.72 mm | 0.0002 | 35.7 vs. 13.8 | 0.054 | 32.1 vs. 10.3 | 0.15 |
| BELLO (59,66) | IN.PACT Falcon PCB vs. TAXUS Liberté PES | 182 | 6 months (angio)<br>12 months (clinical)<br>3 yrs (clinical) | LLL 0.08 ± 0.38 mm vs. 0.29 ± 0.44 mm | 0.001 | 10 vs. 16.3<br>14.4 vs. 30.4 | 0.21<br>0.015 | 4.4 vs. 7.6 | 0.37 |
| RESTORE SVD (61) | Restore PCB vs. Resolute Integrity ZES | 230 | 9-12 months (angio)<br>12 months (clinical) | LLL 0.26 ± 0.42 mm vs. 0.30 ± 0.35 mm, diameter stenosis 29.6 ± 2.0% vs. 24.1 ± 2.0% | 0.41, <0.001 | 9.6 vs. 9.6 | 1.0 | 4.4 vs. 2.6 | 0.72 |
| BASKET-SMALL 2 (60) | Sequent Please PCB vs. TAXUS Element PES and Xience EES | 758 | 6 months (angio)*<br>12 months (clinical) | LLL 0.13 mm (−0.14 to 0.57 mm) vs. 0.10 mm (−0.16 to 0.34 mm) | 0.72 | 8 vs. 8 | 0.918, 0.0152† | 3.4 vs. 4.5 | 0.438 |

Only randomized controlled trials in patients with lesions in native coronary vessels ≤2.75 or 3.0 mm are included. *Only clinically indicated

ZES = zotarolimus-eluting stent; other abbreviations as in Tables 1 and 2.

# DCB: Body of Evidence : More Further : LARGE CORONARY

**TABLE 4** DCB Only in De Novo Lesions of Large Coronary Vessels

| Study Name/ First Author et al. (Ref. #) | DCB | n | ≥2.75-mm DCB (%) | ≥3.0-mm DCB (%) | Bailout Stent (%) | MACE (%) | TLR (%) |
|---|---|---|---|---|---|---|---|
| DELUX (70) | Pantera Lux | 105 | | 23 | 22 | 9.4 (12 months) | 3.1 (12 months) (TVR) |
| FALCON (69) | In.Pact Falcon | 326 | 25 | | 4.8 | 8.0 (12 months) | 4.9 (12 months) |
| Venetsanos et al. (53) | SeQuent Please, In.Pact Falcon, Pantera Lux | 985 | | 6 | 8 | | 3 (12 months) |
| Rosenberg et al. (54) | Sequent Please | 731 | 21 | | 6 | 5.6 (9 months) | 2.3 (9 months) |
| Uskela et al. (68) | Sequent Please | 463 | 79 | 60 | 12 | 6.1 (stable CAD, 12 months) | 1.4 (stable CAD, 12 months) |
| Yu et al.(108) | Sequent Please | 595 | 36 | | 0.5 | 0 (10 months) | 0 (10 months) |
| DEBUT (57) | Sequent Please vs. BMS (RCT) | 103 | 76 | 64 | 2 | 1.9 (9 months) | 0 (9 months) |
| PEPCAD-NSTEMI (62) | Sequent Please vs. BMS and DES (RCT) | 104 | | | 17.4 | 3.8 (9 months) | 1.0 (9 months) |

Only studies including de novo lesion treatment in 100 patients or more and reporting device diameter are included.

CAD = coronary artery disease; RCT = randomized controlled trial; other abbreviations as in Tables 1 and 2.

# DCA : Forgotten ? Hidden?





Dauntless DCA lovers
can hear this screams


They dig up the GRAVE of DCA

# DCA : Resurrection with new plat form

The First Clinical Experience with a Novel Directional Coronary Atherectomy Catheter: Preliminary Japanese Multicenter Experience

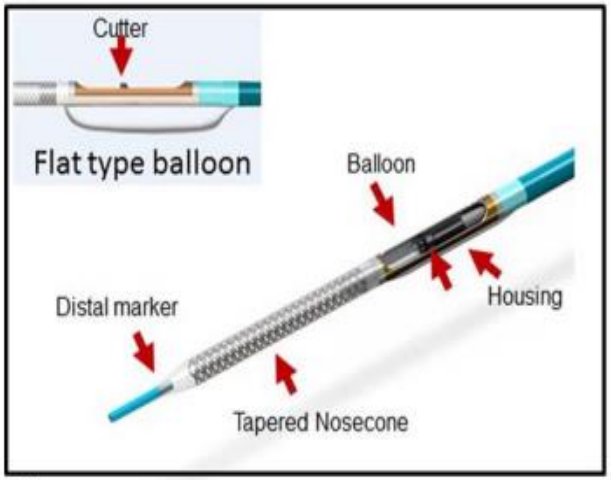
Maoto Habar, Etsuo Tsuchikane, Takahiko Suzuki et al　CCI 2016

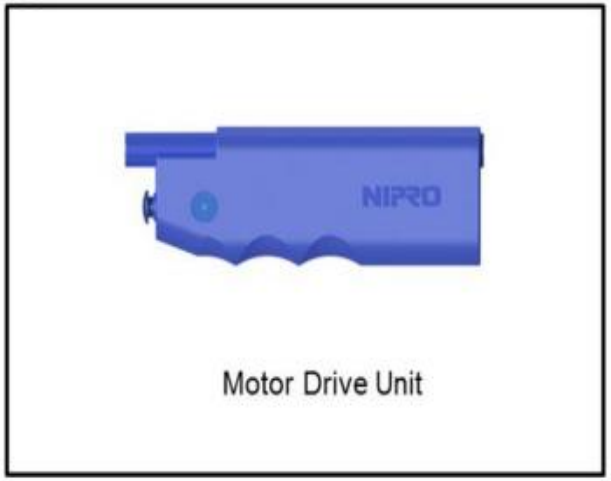
The Role of Revived Directional Coronary Atherectomy

Michihiro Kijima　J Jpn Coron Assoc 2016

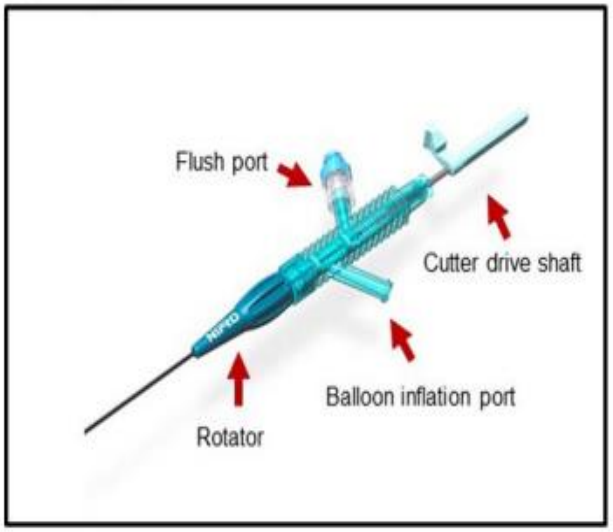
# DCA : Resurrection with new plat form

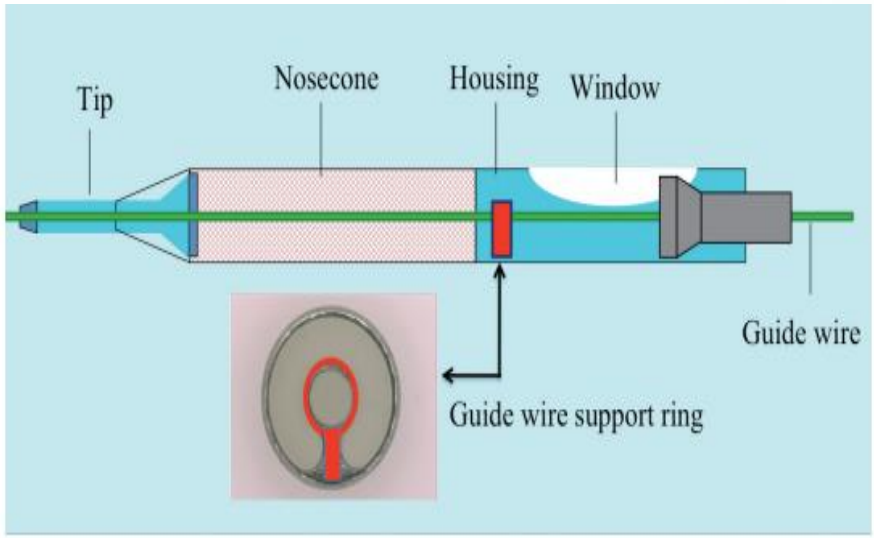
- Capacity Expansion by New Plat Form -




B



# DCA : Resurrection with new plat form

| | ATHEROCUT® (a novel catheter) Short cutter | FLEXI-CUT® (previous catheter) Long cutter |
|---|---|---|
| Cutter | DLC; diamond like carbon coating (Vickers hardness : 900) | Titan coating (Vickers hardness : 550) |
| Outer diameter | 1.95 mm (0.077 in.) | 2.10 mm (0.083 in.) |
| Housing length | 6 mm/9 mm (2 type) | 9 mm |
| Target vessel diameter | 3.0–4.4 mm (3 size) | 2.5–4.0 mm (3 size) |
| Nose cone | Tapered nose cone with tip (0.032 mL) | 0.030 mL |
| Guiding catheter compatibility | ≧7 Fr | ≧ 8 Fr |
| MDU; rotational speed | 6,000 rpm | 3,500 rpm |
| Balloon | Flat type | Circular type |

Very Sharp Cutter, Smaller Catheter, Tapered Nose Cone( more flexible)

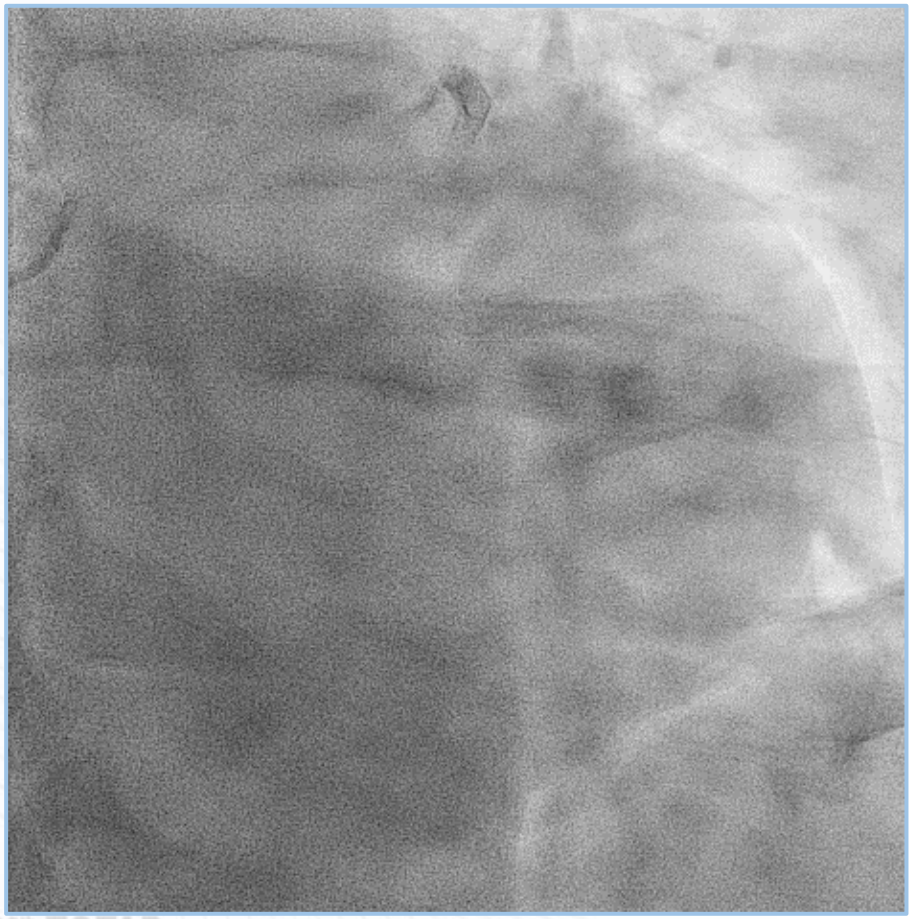
Smaller compatible catheter (7Fr), High MDU: 6000 rpm, Better Balloon

# Advantage

# **Case 1 :** 83yo: M **LMT** true bifurcated Disease

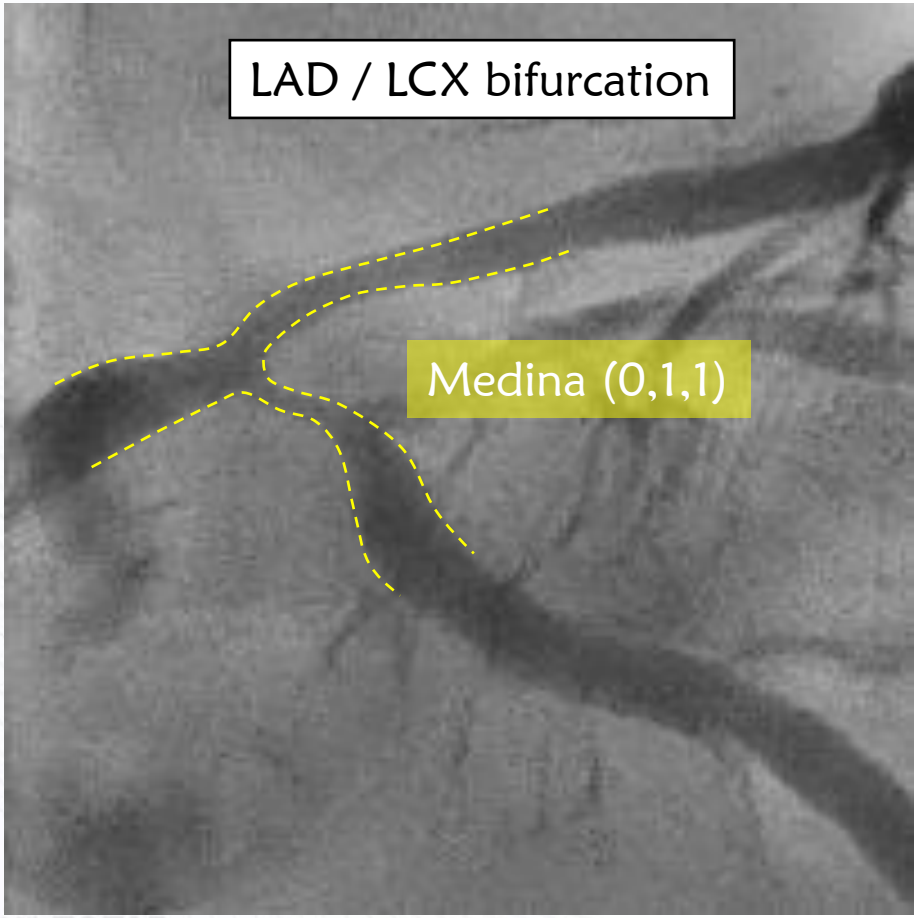
LMT distal true bifurcated Lesion (1.1.1.)

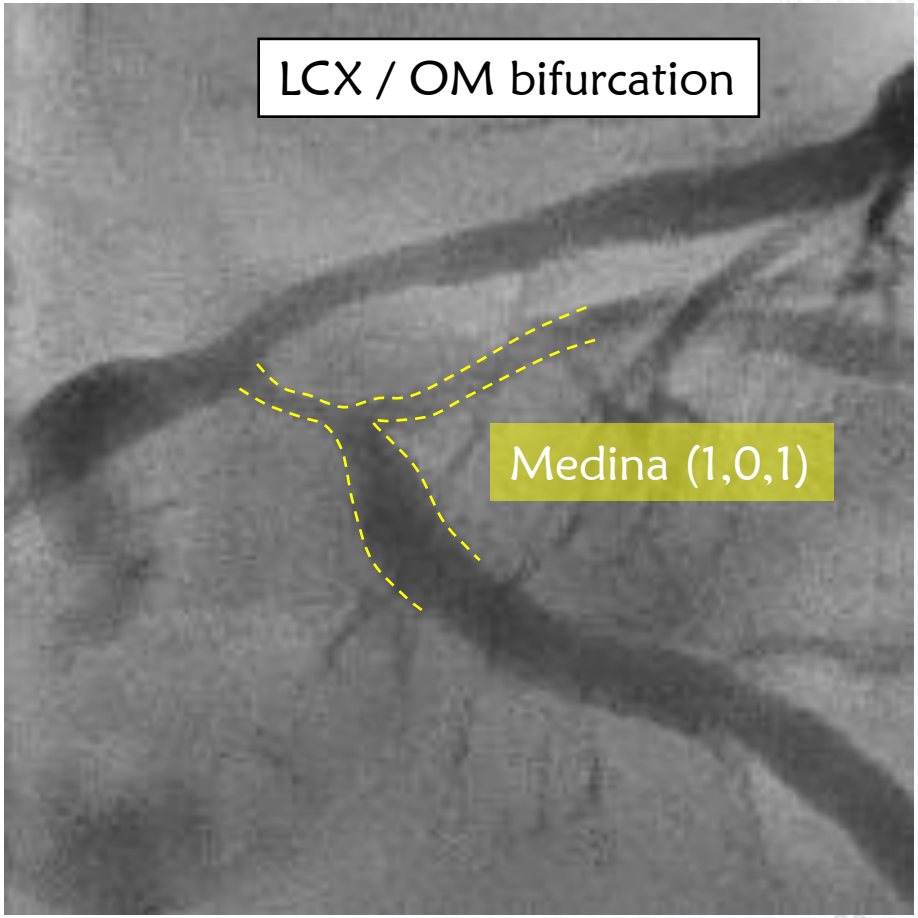
Prox. LCx 90%, Prox.LAD diffuse 80% with Cal.



# **Case 1 :** 83yo: M **LMT** true bifurcated Disease

Double true bifurcated lesion with LAD/LCX and LCX/OM



# How would you treat this lesion?

## 1. Provisional Stenting

Highly probable TAP ???



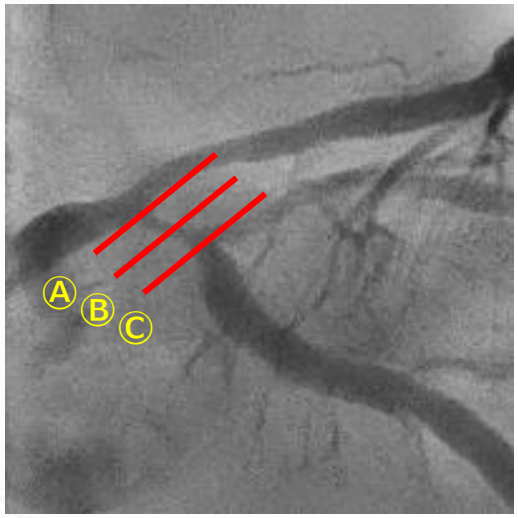


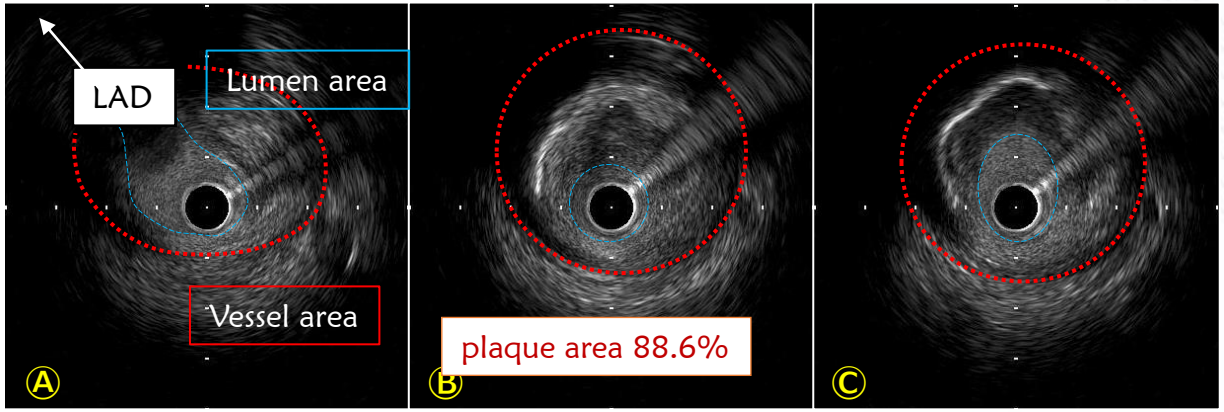
## 2. DK Crush

DK CRUSH 1.2.3.4.5.....


# No Calcification in LCX ost~Prox.

Before IVUS, already-known fact by no contrast coronary CT

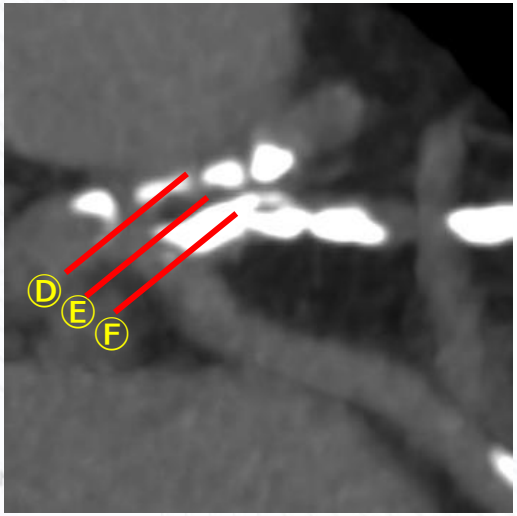


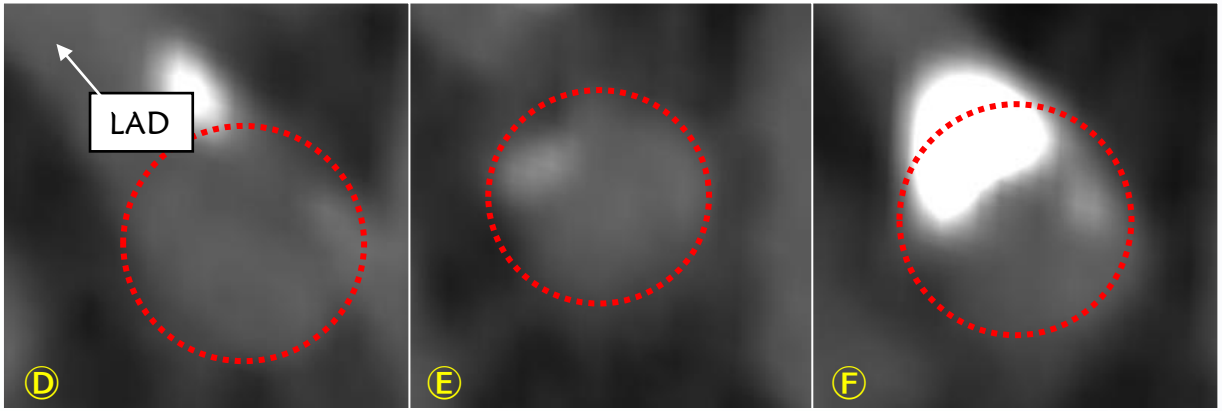




Moderate length lesion

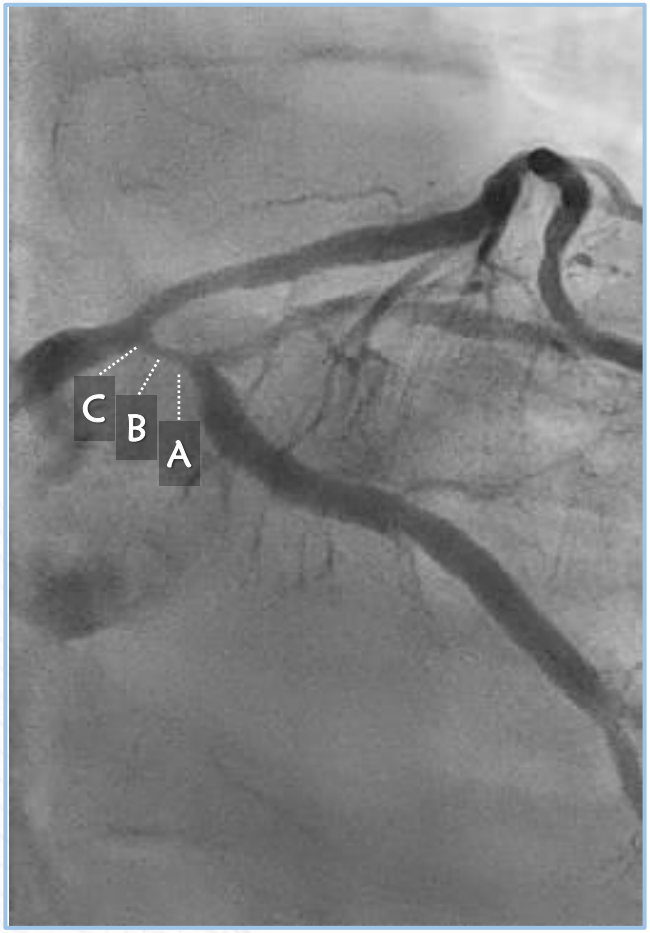
large plaque burden

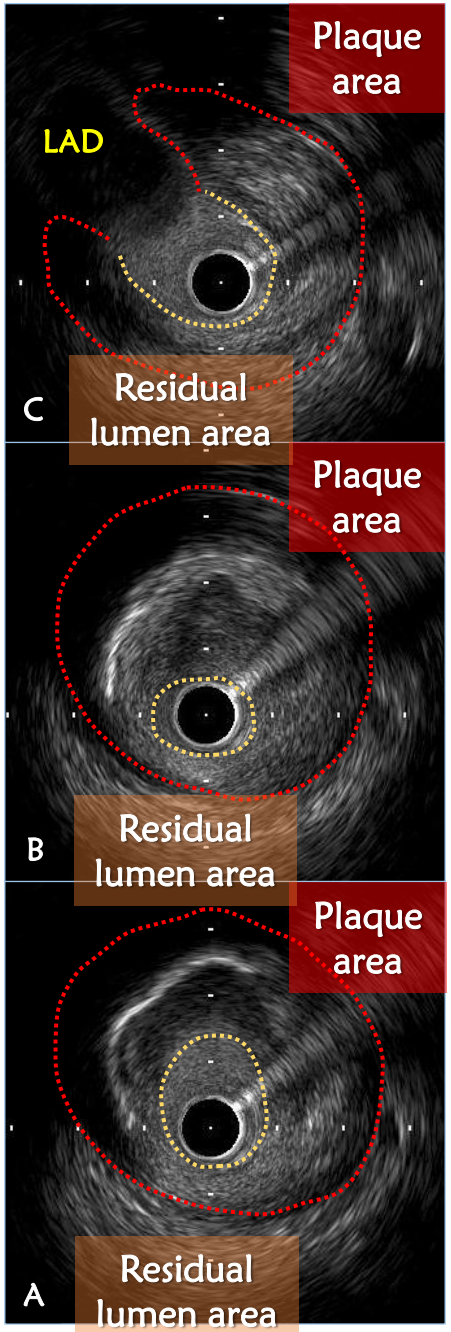
deep calcium mass



# Pre IVUS : Proximal LCx




Ostial LCx

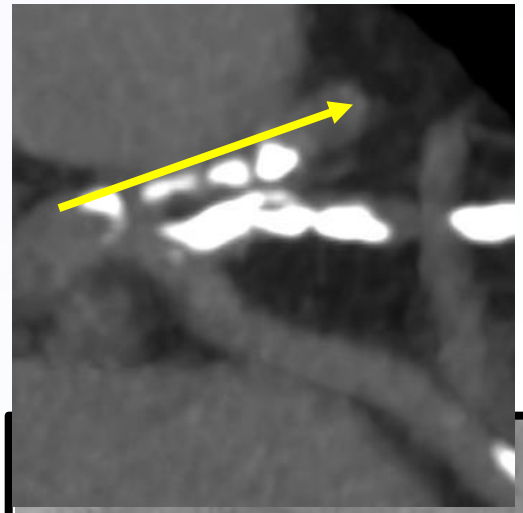
Large plaque burden

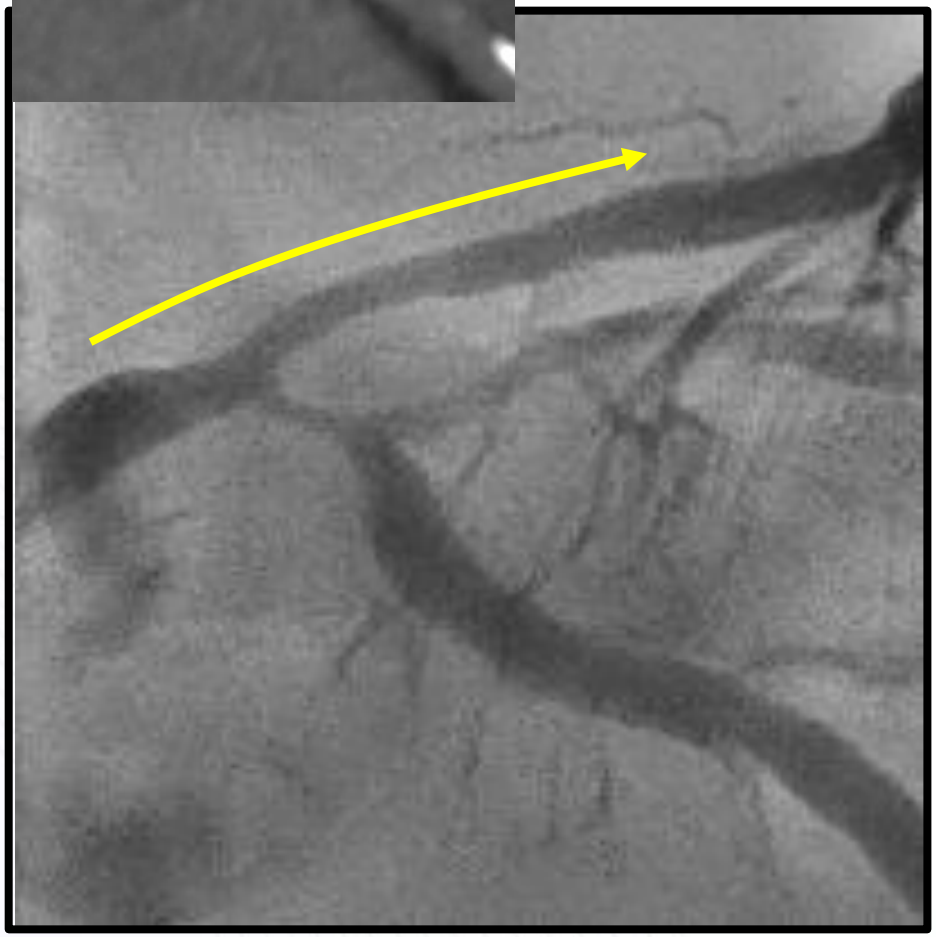
plaque area 88.6%

Proximal LCx

Divide 3 Parts

## 1. LMT- LAD



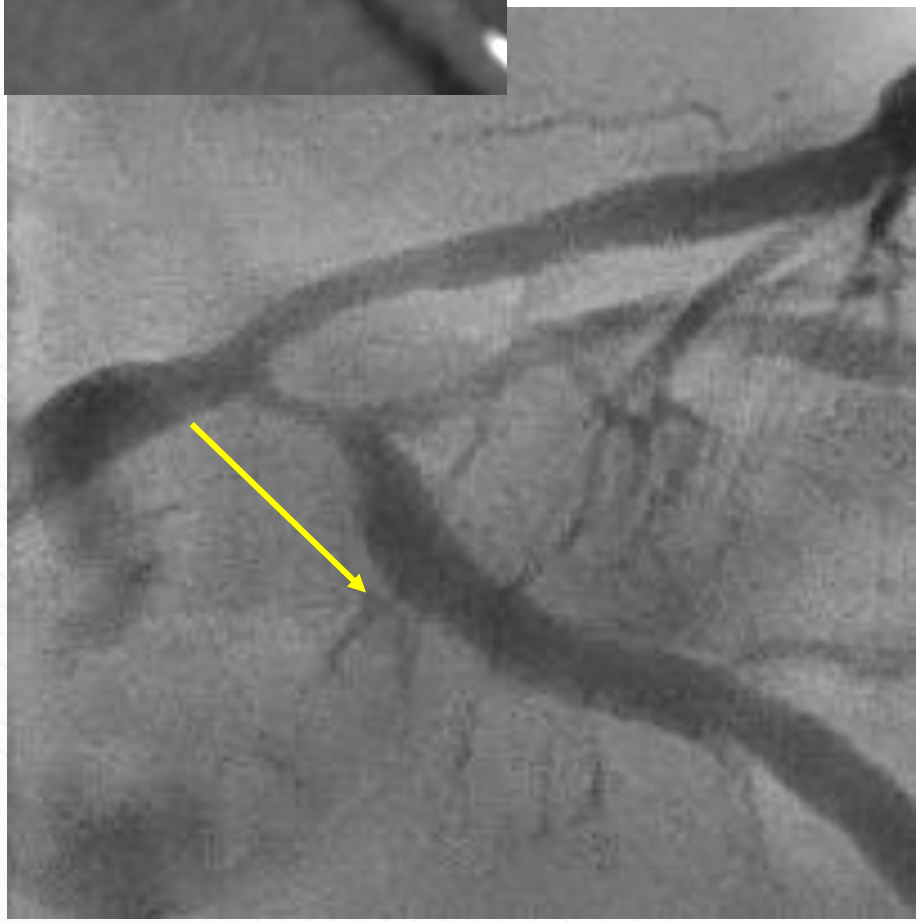


Long, Diffuse lesion
Some superficial calc.
Main Vessel

DES

Divide 3 Parts

## 2. LCX prox.



Long, Diffuse lesion
Some superficial calc.
Main Vessel

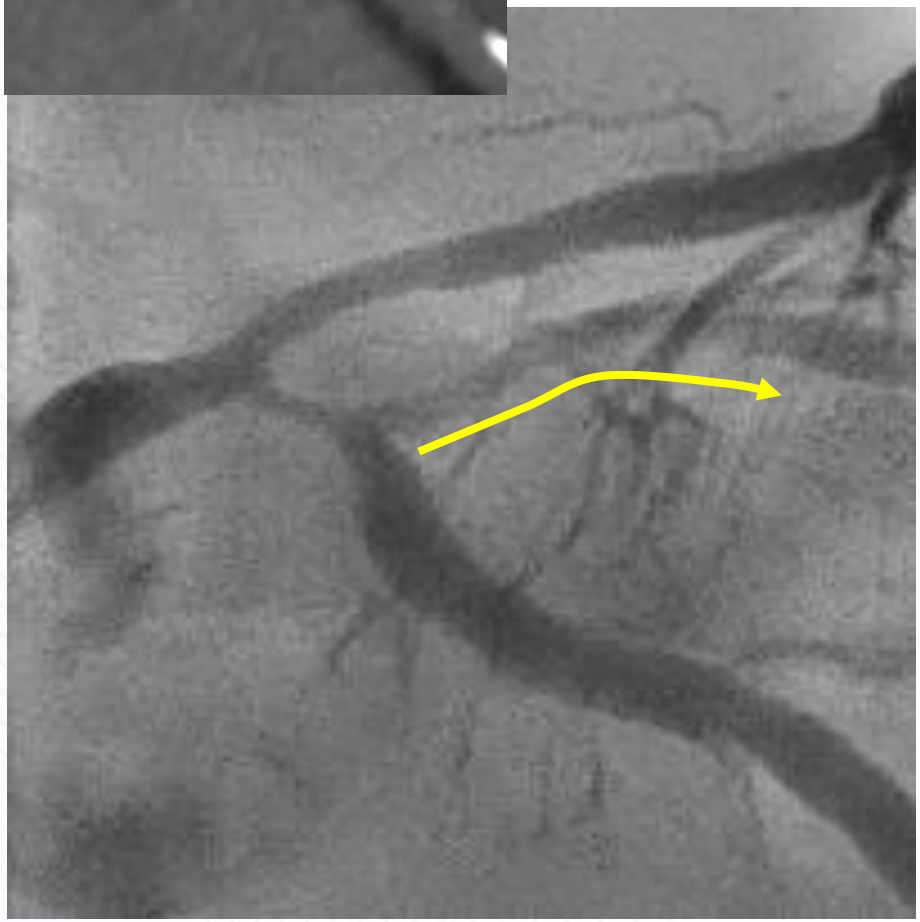
→ DES

Short Lesion
Few calcification
Possible angle for DCA

→ DCAB

Divide 3 Parts

# 3. LCX-OM



Long, Diffuse lesion
Some superficial calc.
Main Vessel

➡ DES

Short Lesion
Few calcification
Possible angle for DCA

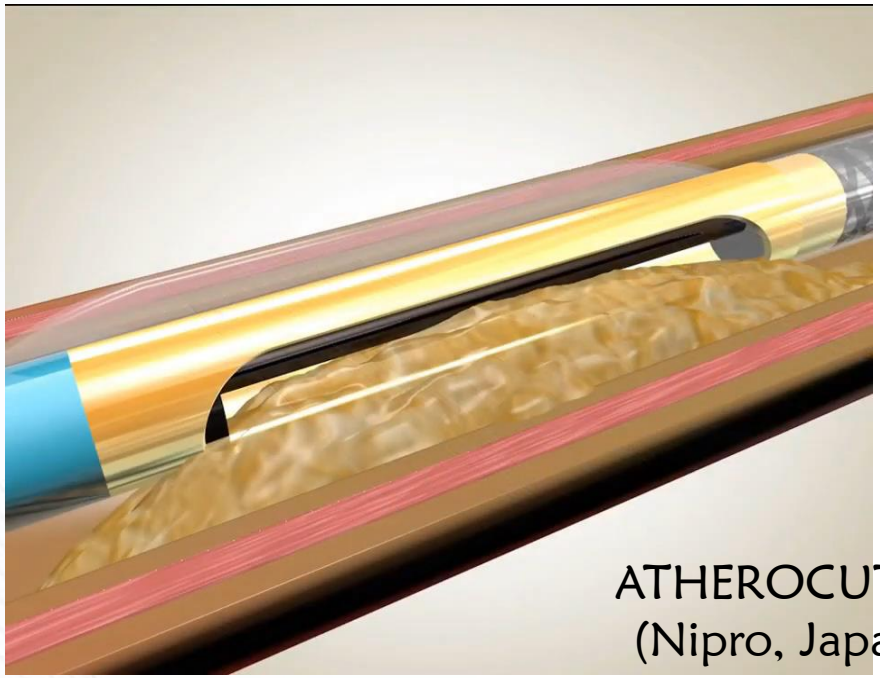
➡ DCAB

Long, diffuse lesion
Some superficial calc.

➡ DES

# DCA

Plaque reducing effect



ATHEROCUT®
(Nipro, Japan)

# DCB

Prevention of neointimal hyperplasia

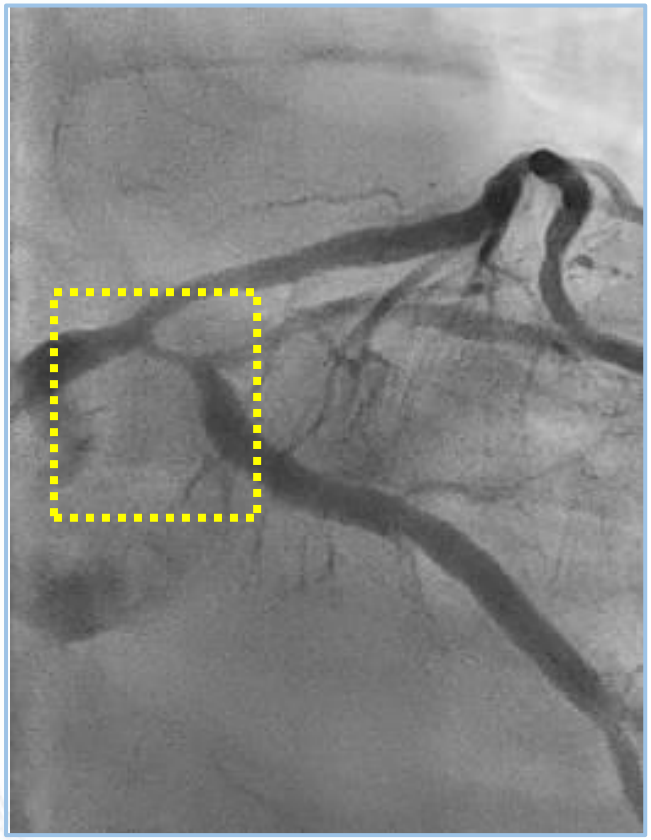
SeQuent Please®
(B Braun, Germany)

**If we combine to use DCA and DCB…**

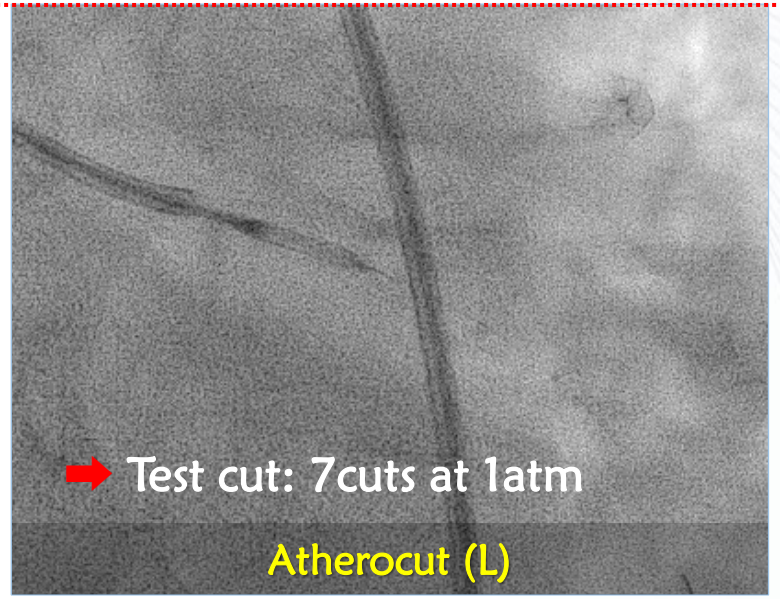
Each of them compensate their drawback by their cross talk

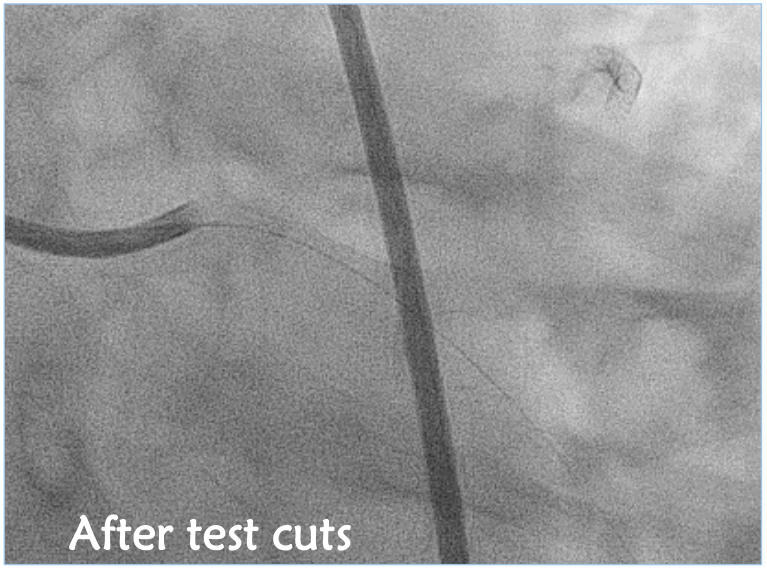
Resulting, New concept would be born !!

# DCA for the proximal LCx : At first "Test-Cut"

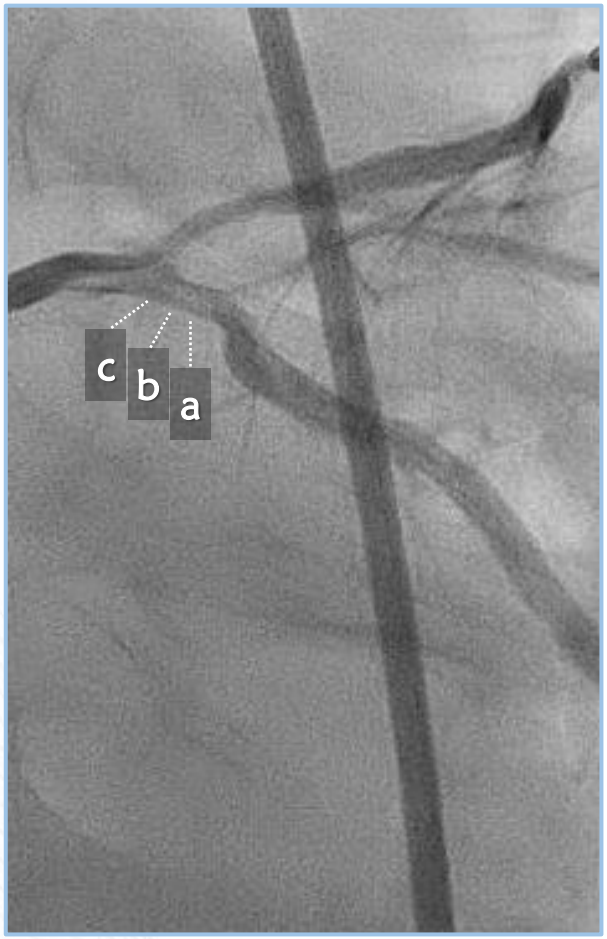


Test Cut for
the proximal LCx

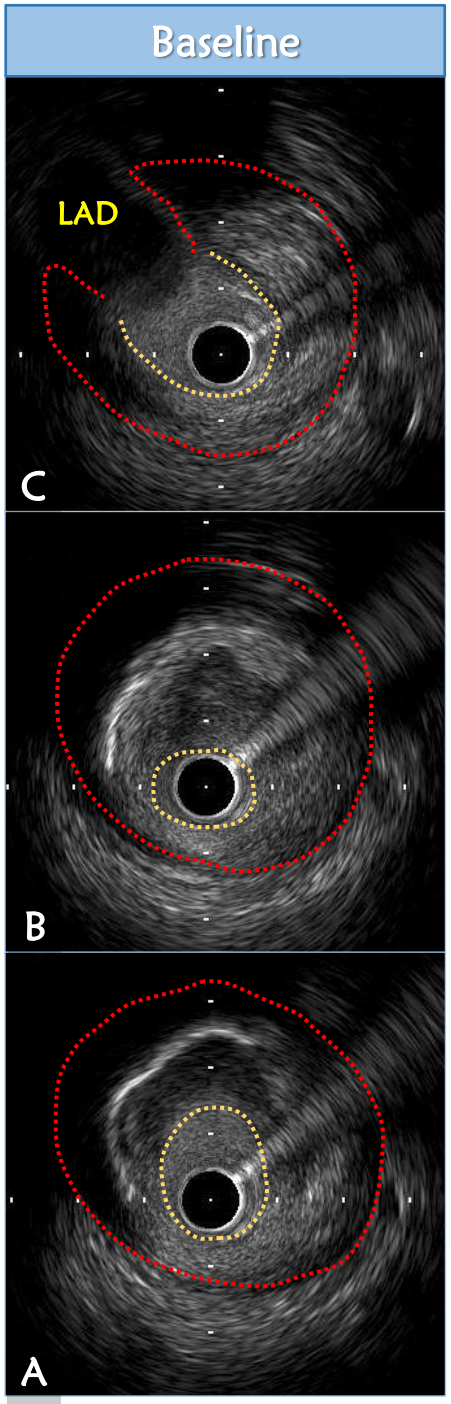


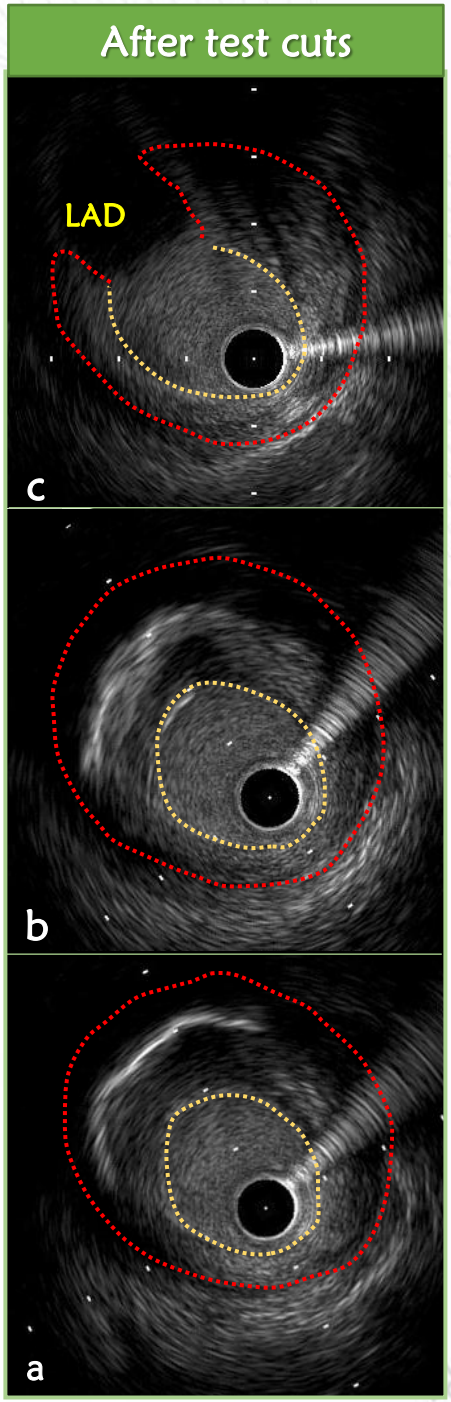



IVUS after test cut
: proximal LCx

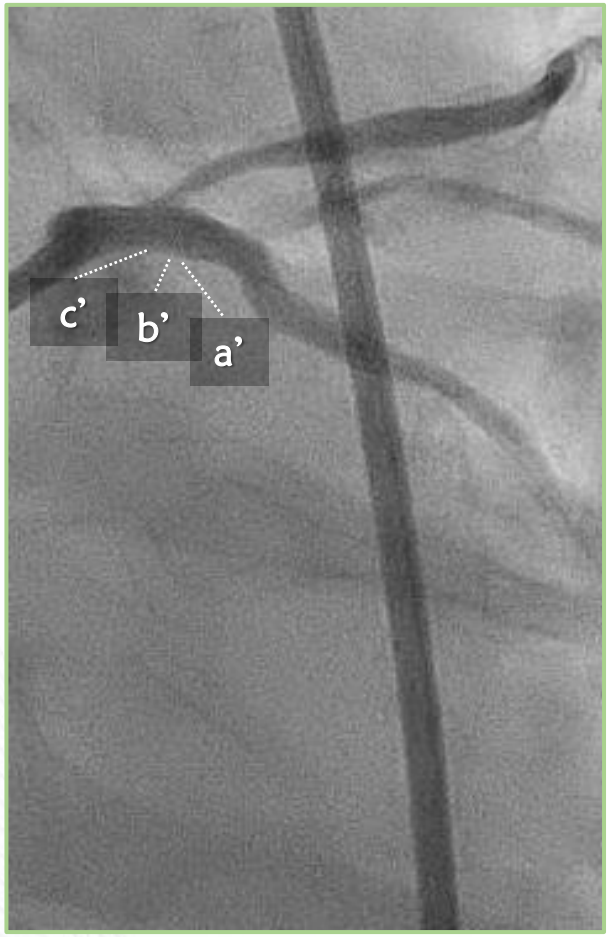



Need to confirm what we have done right or not

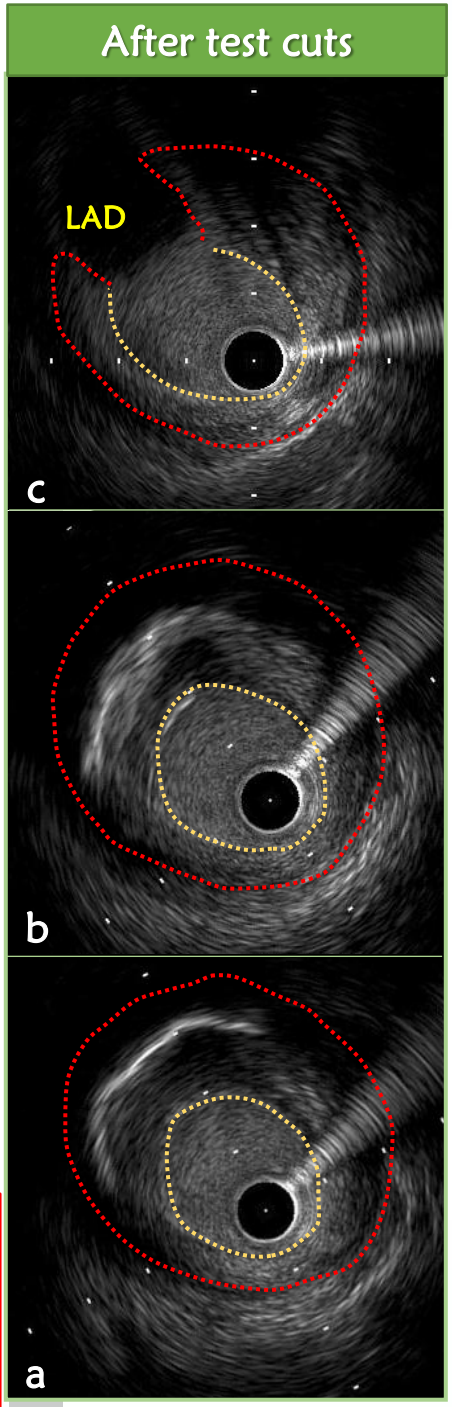


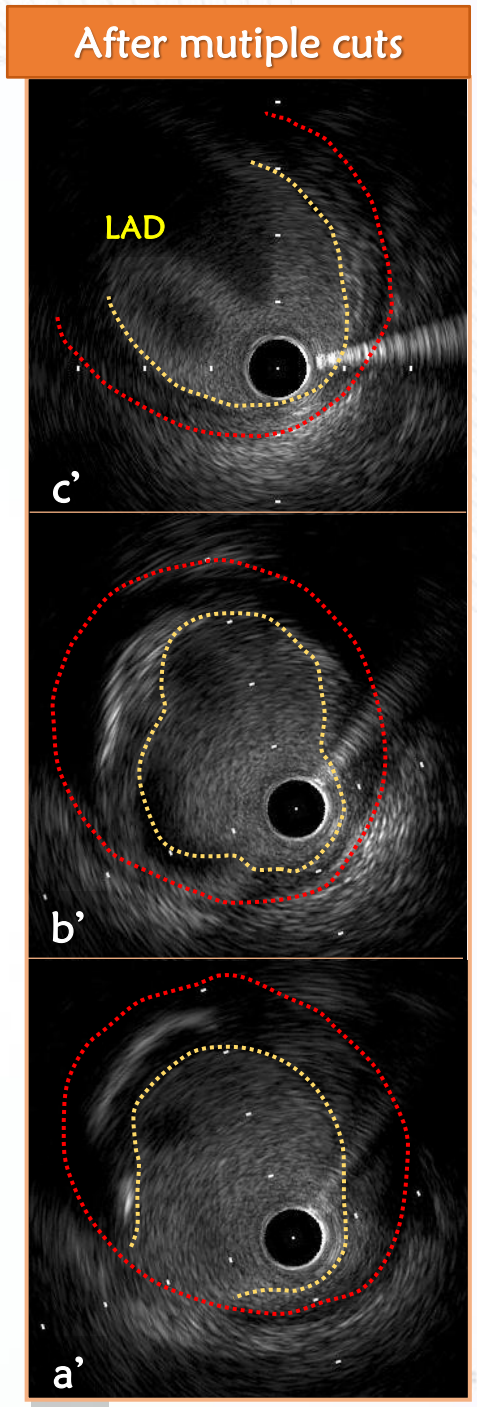



# IVUS after multiple DCA for the prox. LCx



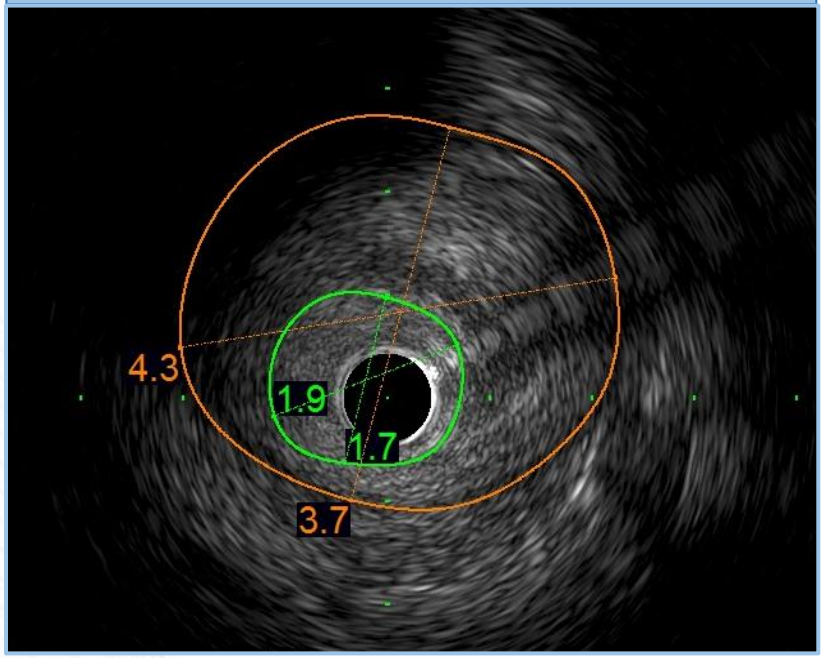

Need to check How much plaque burden already removed And still in safe or not ?



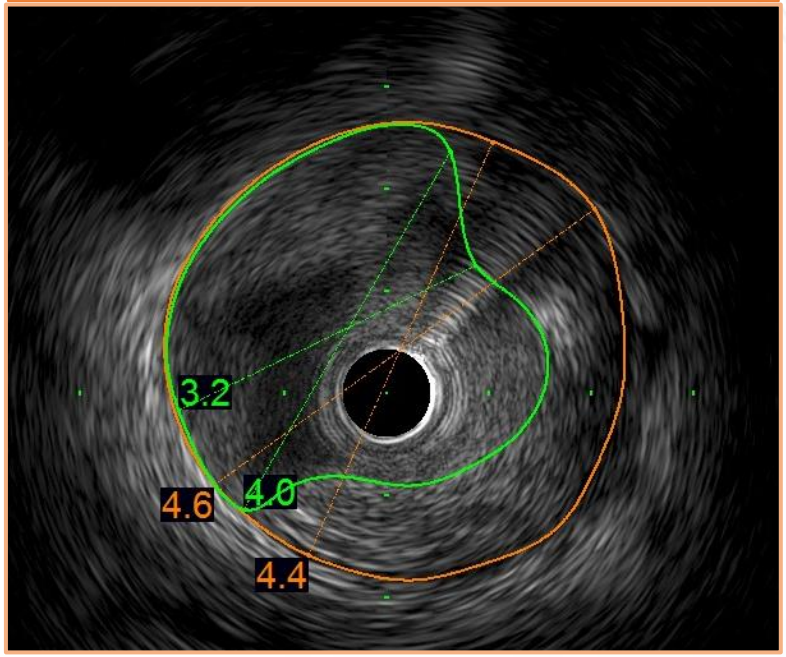



# Watch !! Removed Big Plaque Reduction !! By DCA

Pre: 88.6 %

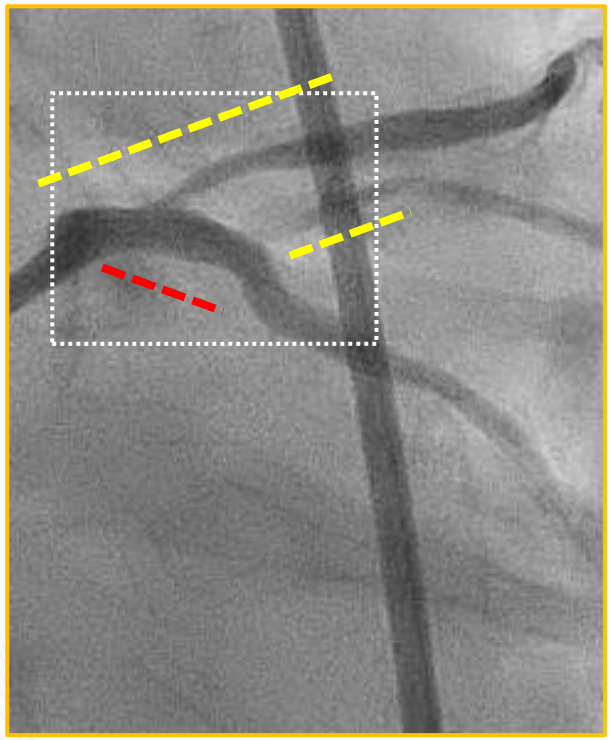



Post: 37.7 %

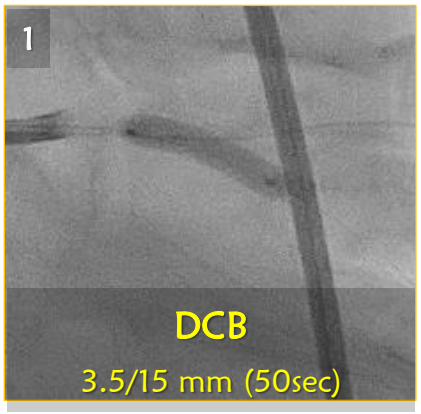


# Stenting in LAD, OM and DCB in LCx:

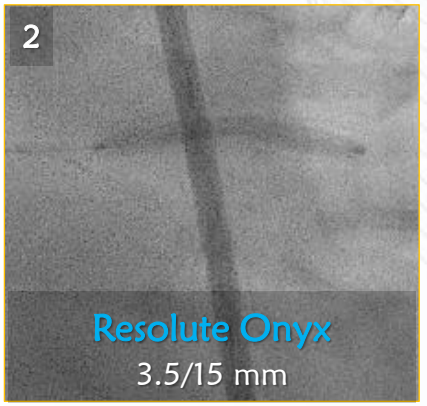
## No Overlapping Stent !!



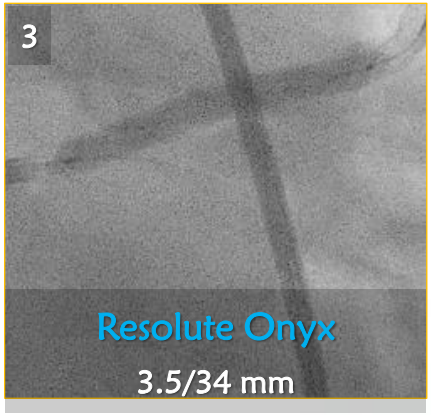
Looks like 0,1,0




Ostial LCx

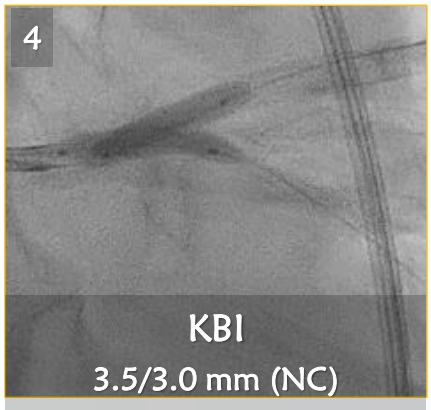



OM branch




LMT-LAD

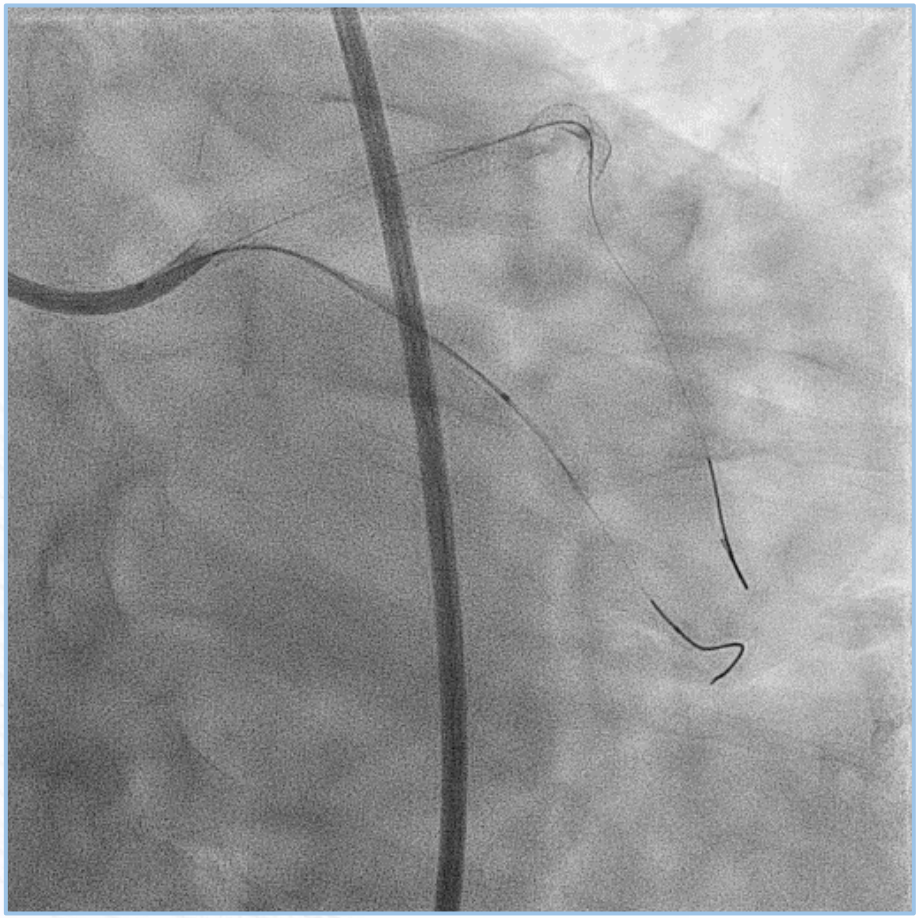
➡ POT: 4.5/8 mm

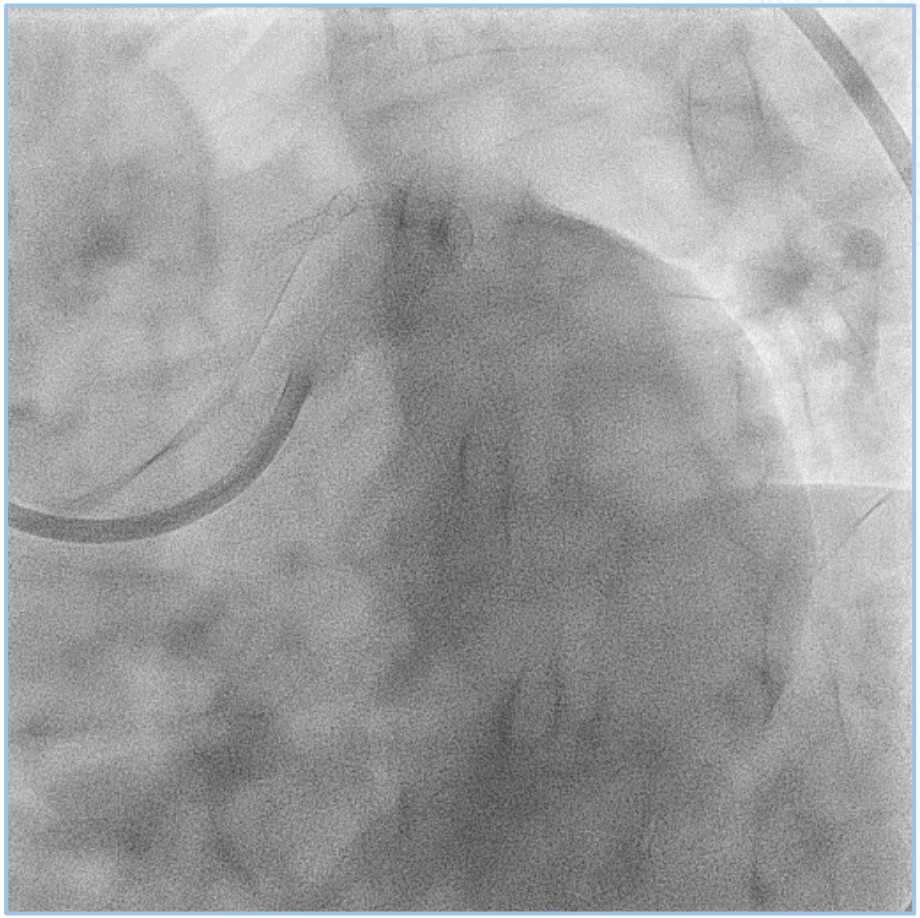



➡ Final POT:4.5/8 mm

# Hybrid Strategy with DCAB and DES

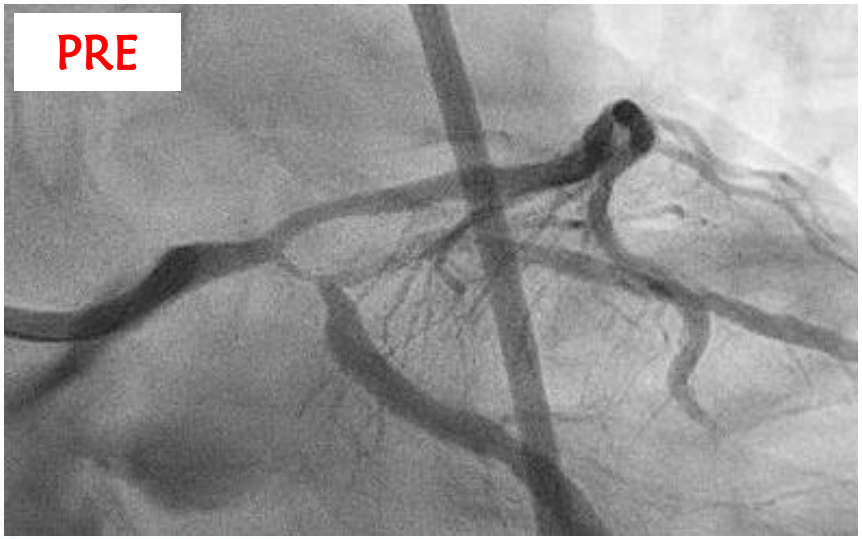
## Then **No Overlapping Stent !!**

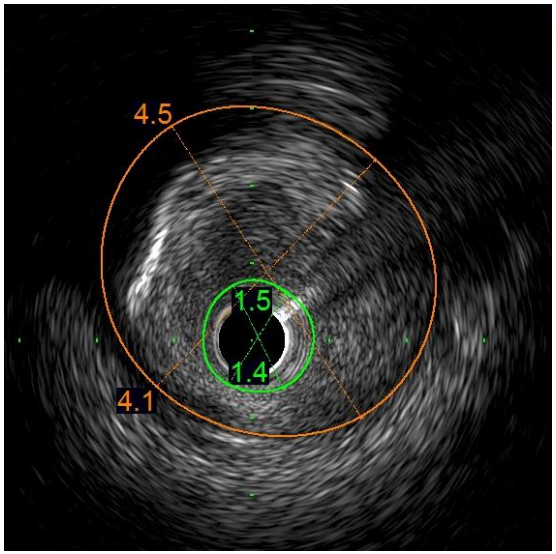




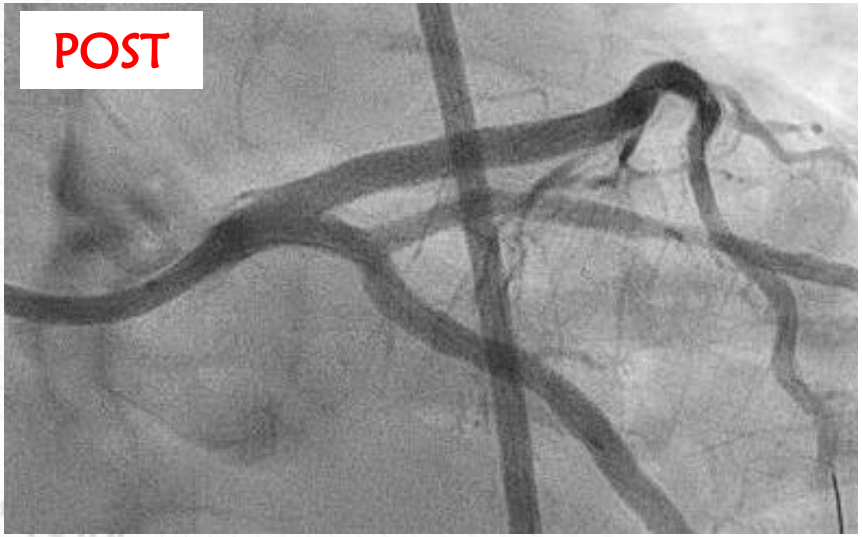
Final angiography

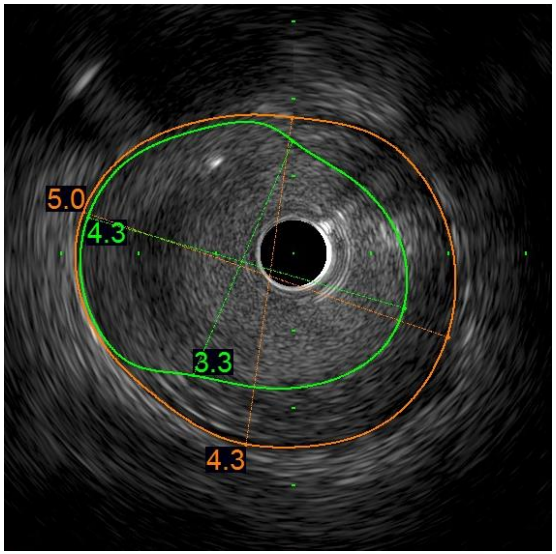
# How do you think ???




Plaque area
88.6%

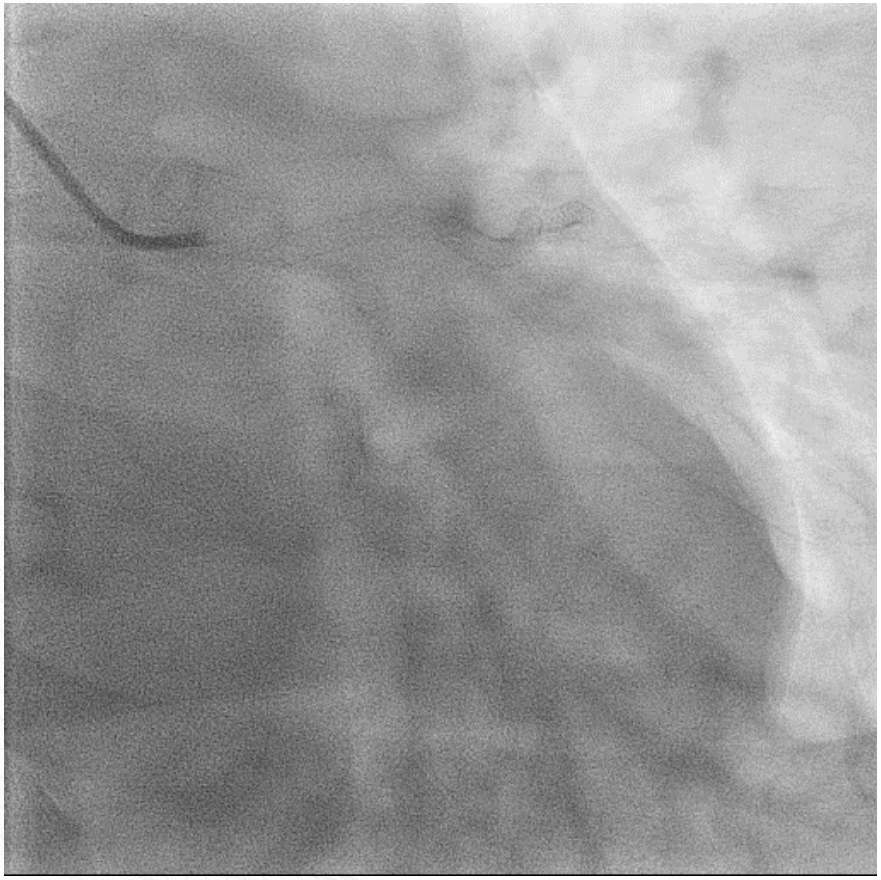


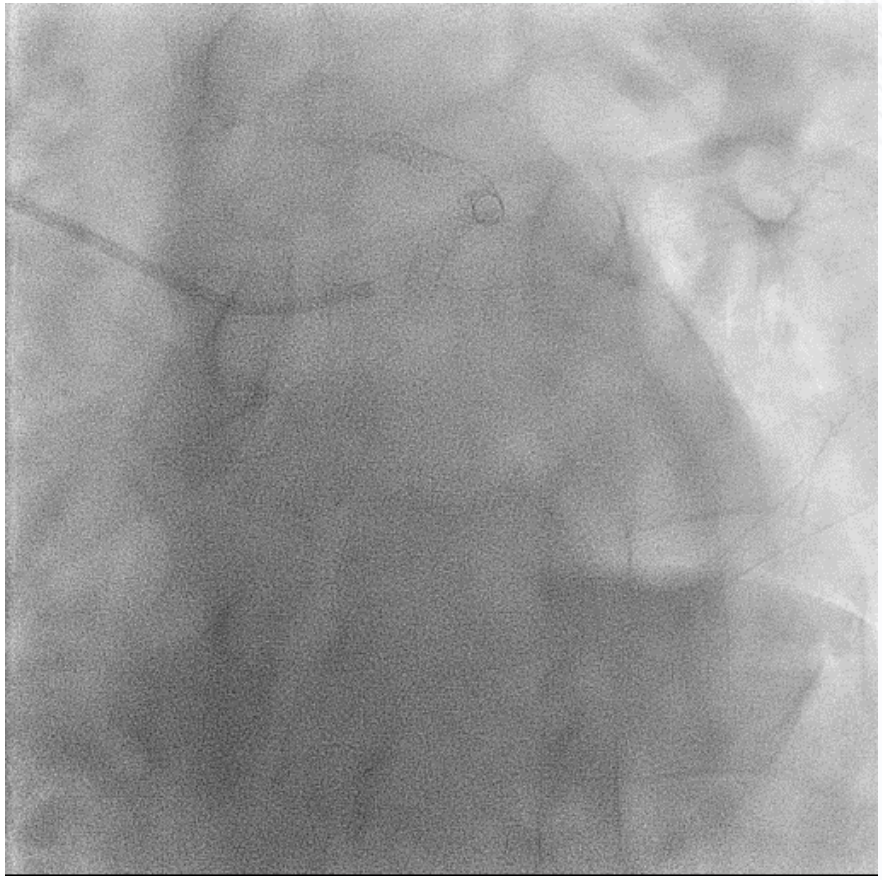




Plaque area
37.7%

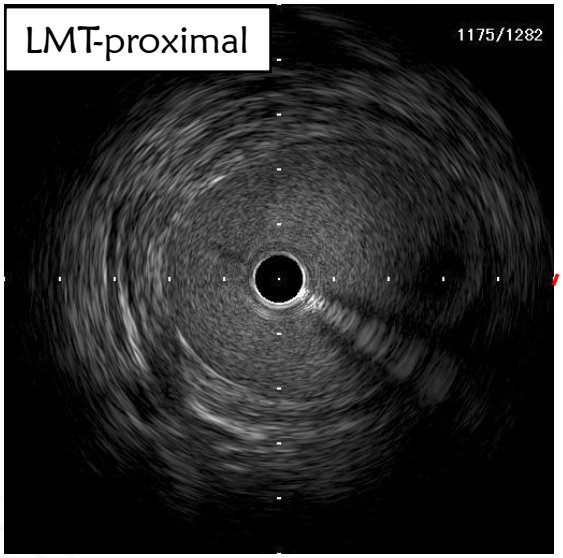
# Case 2 : Severe Restenosis **after V-Stenting** in LAD and LCX

Stenosis in LMT distal just before area of V-stenting in LAD and LCX

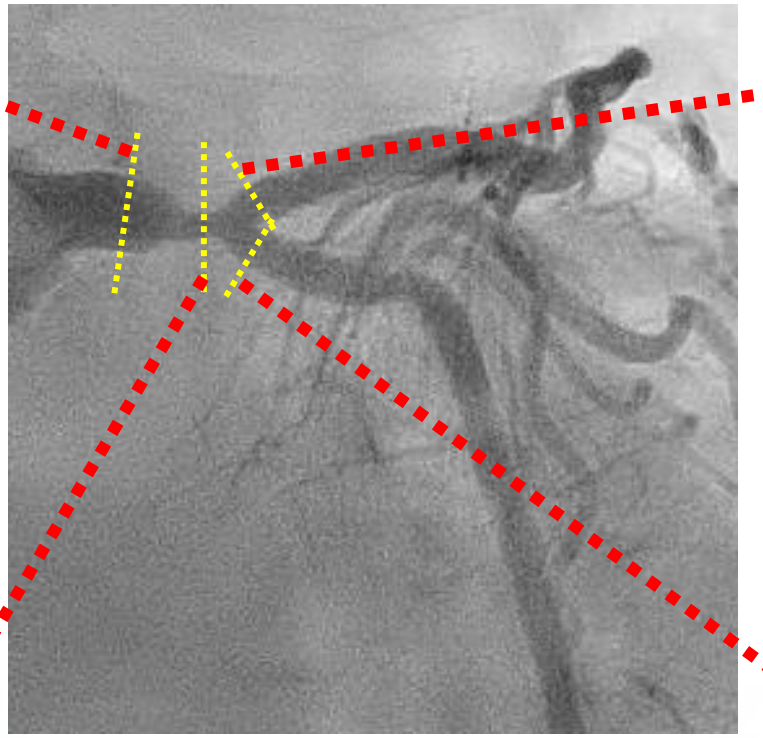


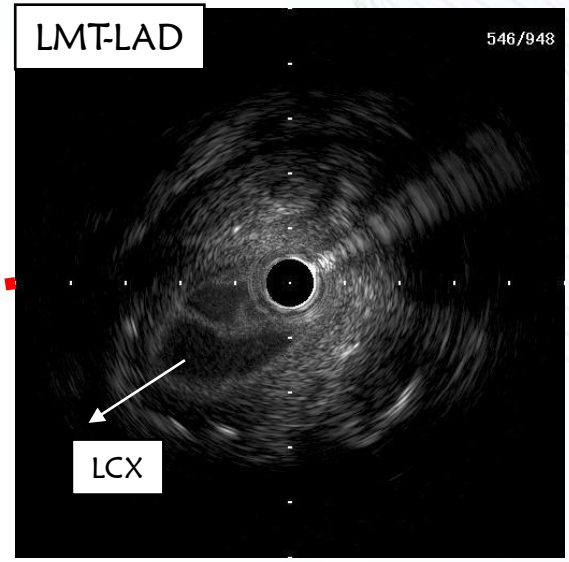


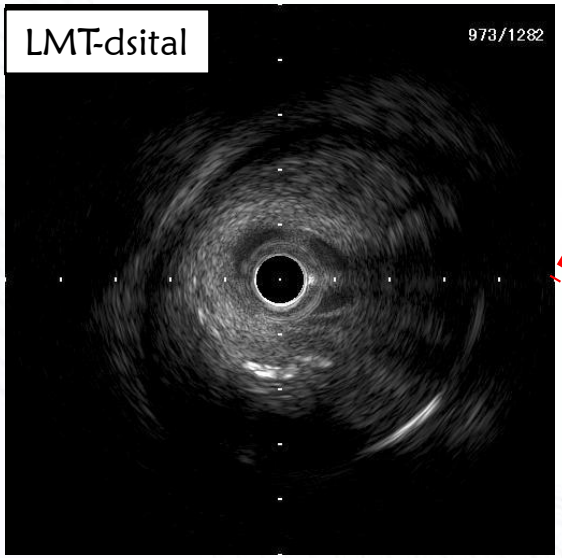
# Case 2 : Severe Restenosis **after V-Stenting** in LAD and LCX

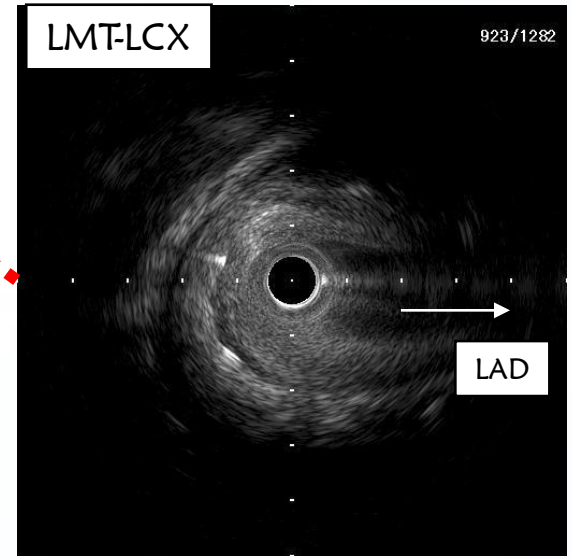



IVUS: Big Plaque burden
w/o obvious calcium

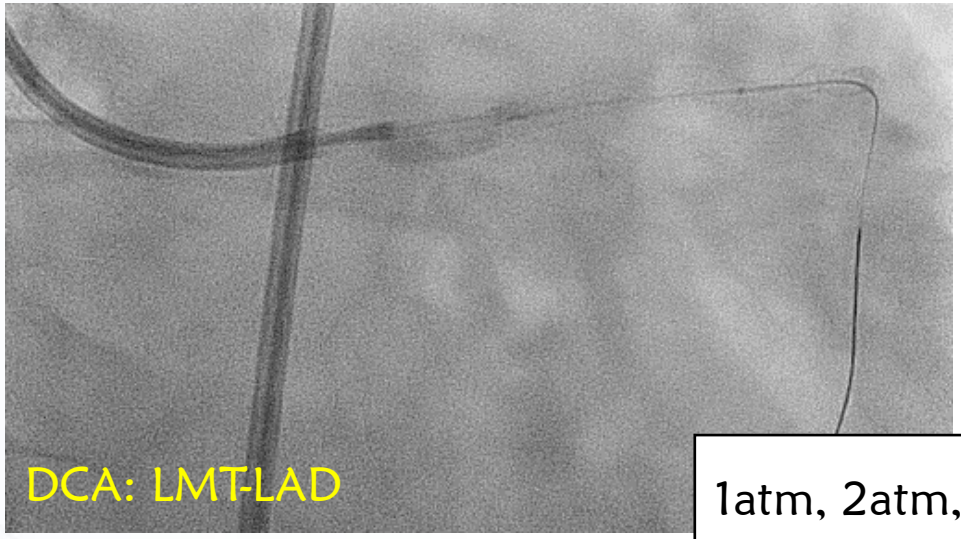


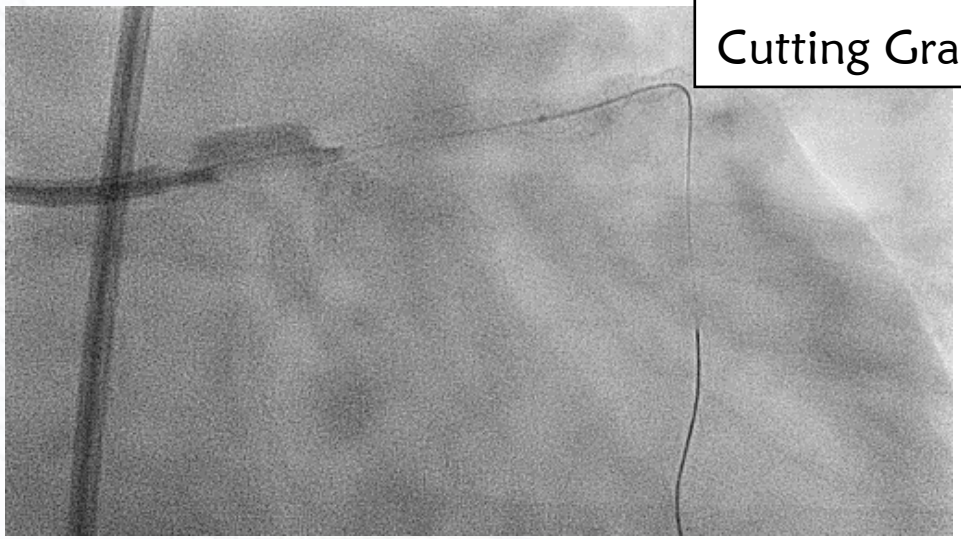


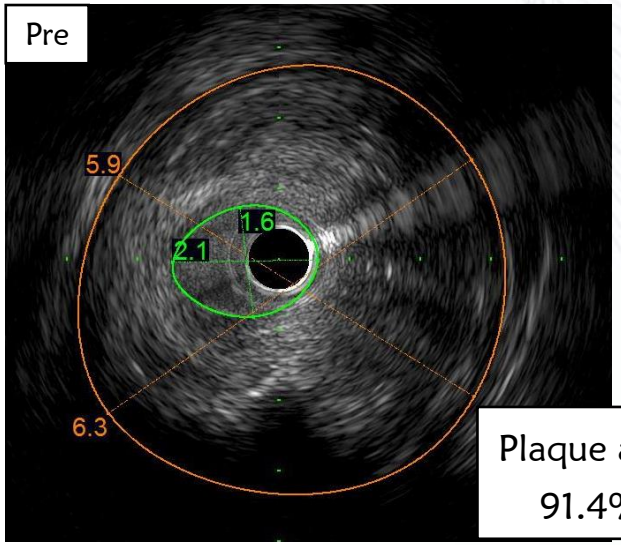
# Case 2 : Severe Restenosis **after V-Stenting** in LAD and LCX

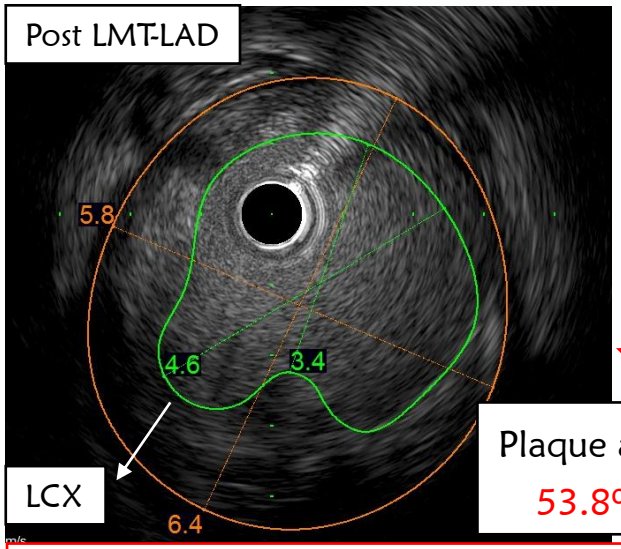


1atm, 2atm,3atm

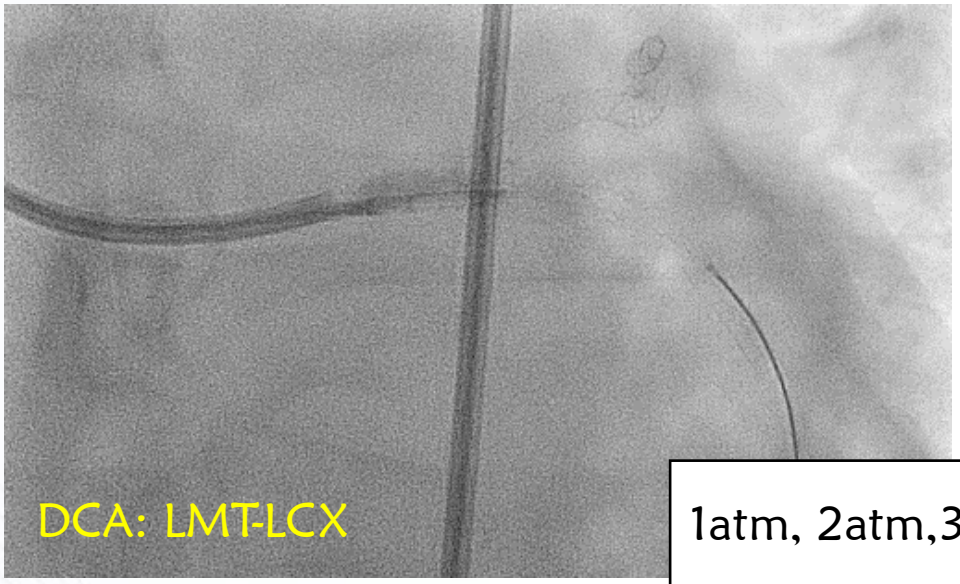
Cutting Gradually



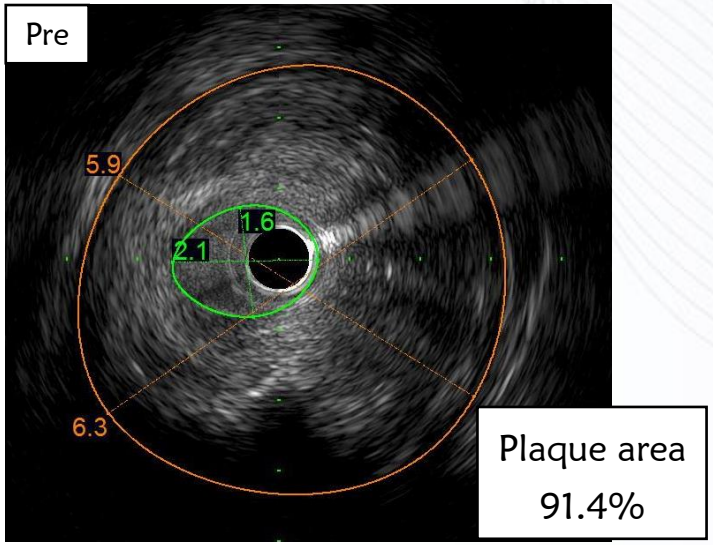

Much residual plaque at LCX side

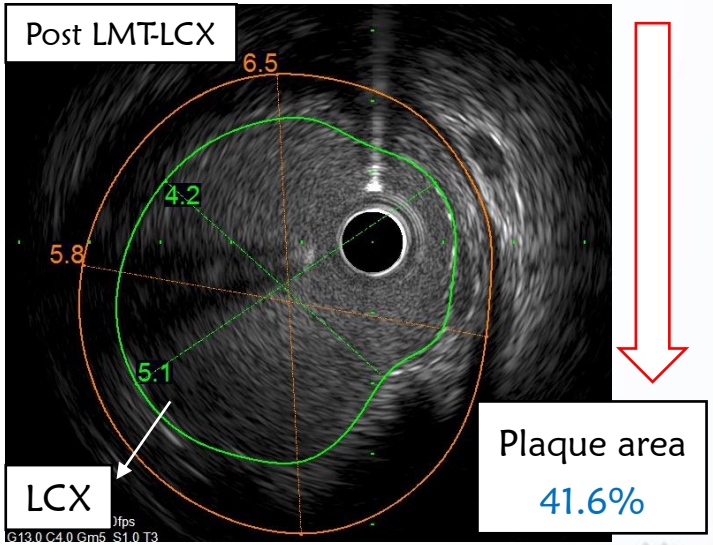
# Case 2 : Severe Restenosis **after V-Stenting** in LAD and LCX




1atm, 2atm,3atm

Cutting Gradually



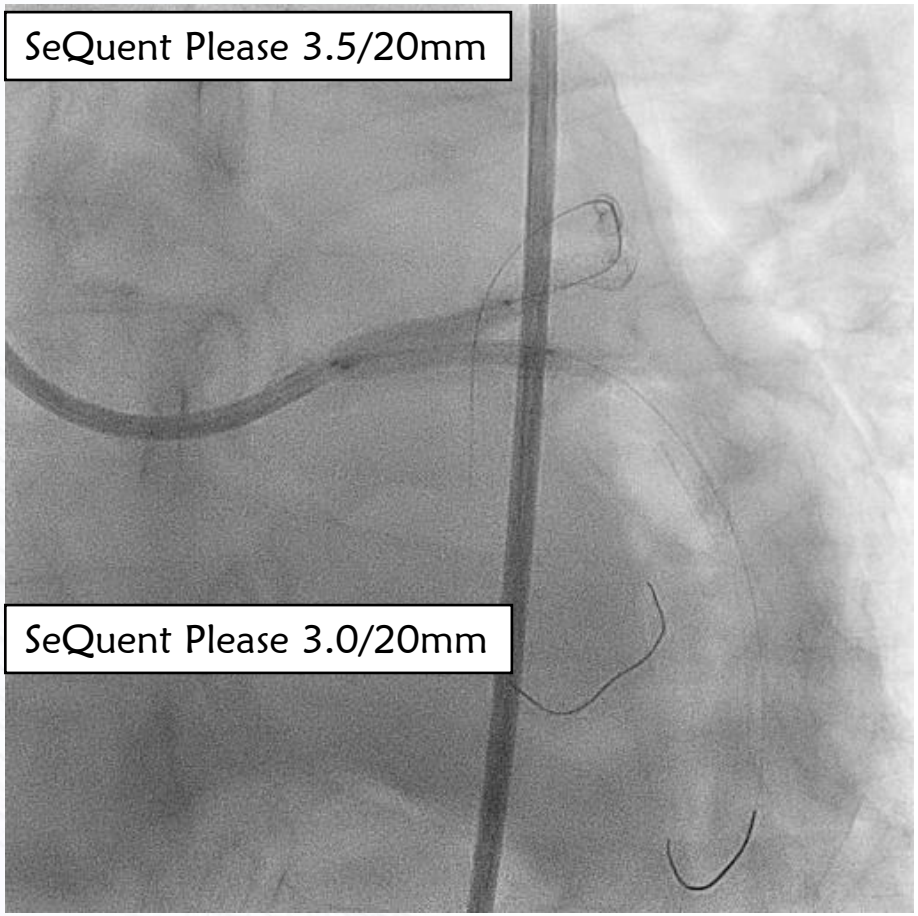

Plaque area
91.4%

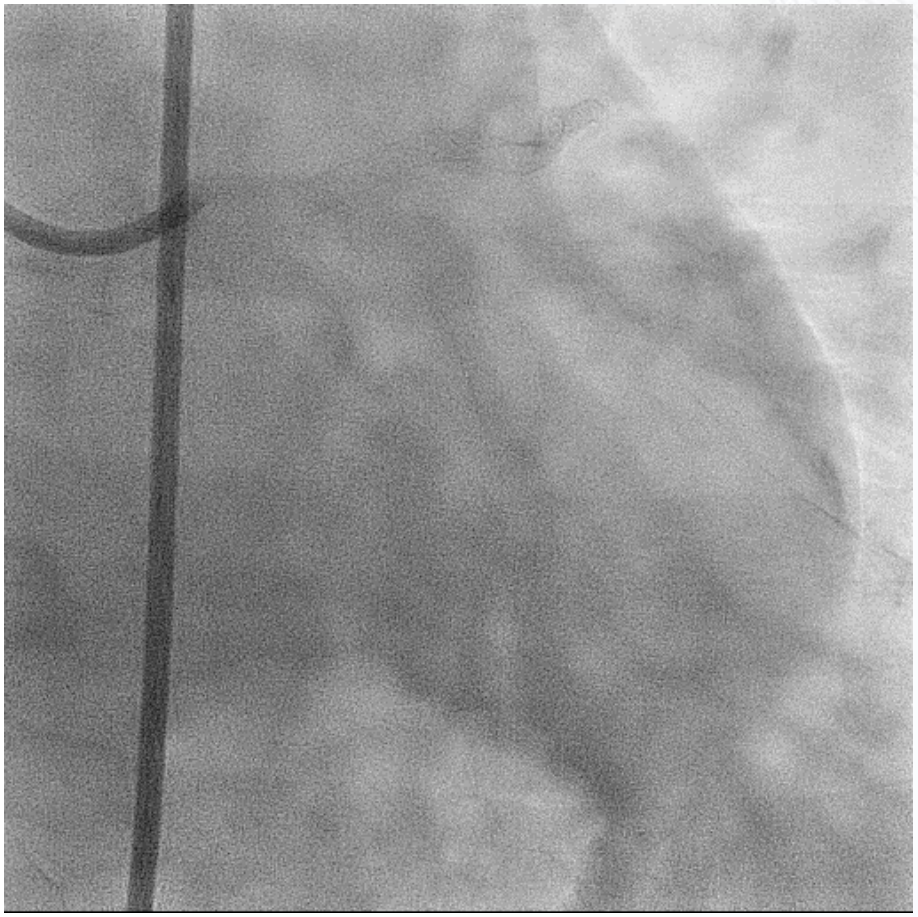
→

Plaque area
41.6%

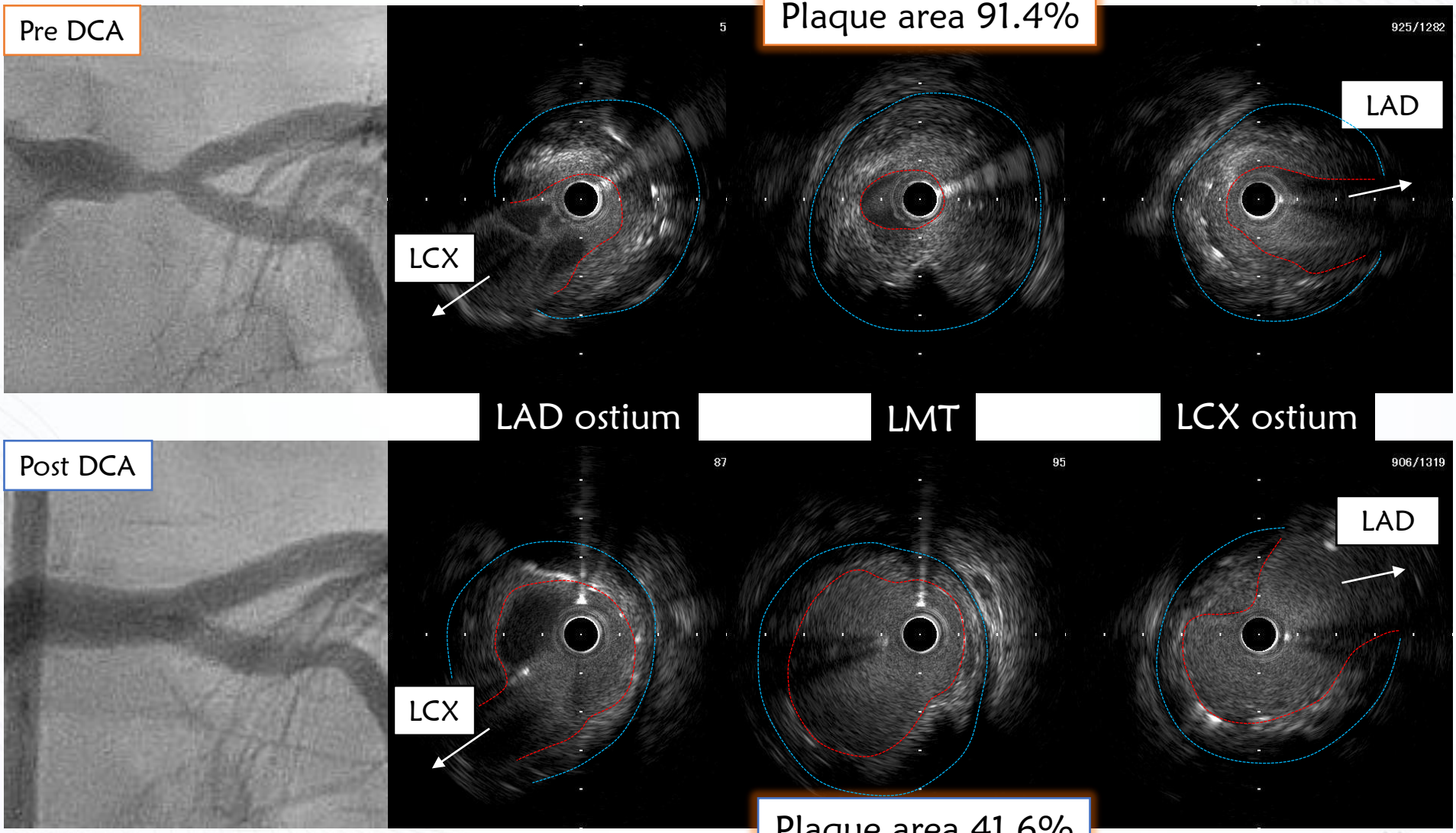
# **Case 2** : Severe Restenosis **after V-Stenting** in LAD and LCX

KBT !! With DCBs



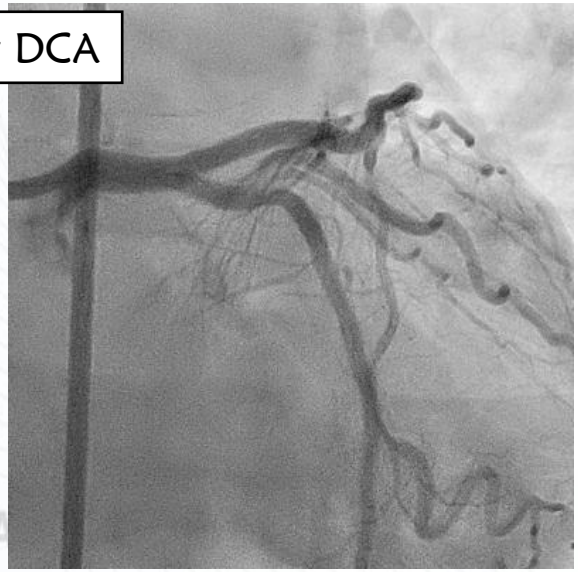
# Case 2 : Severe Restenosis **after V-Stenting** in LAD and LCX



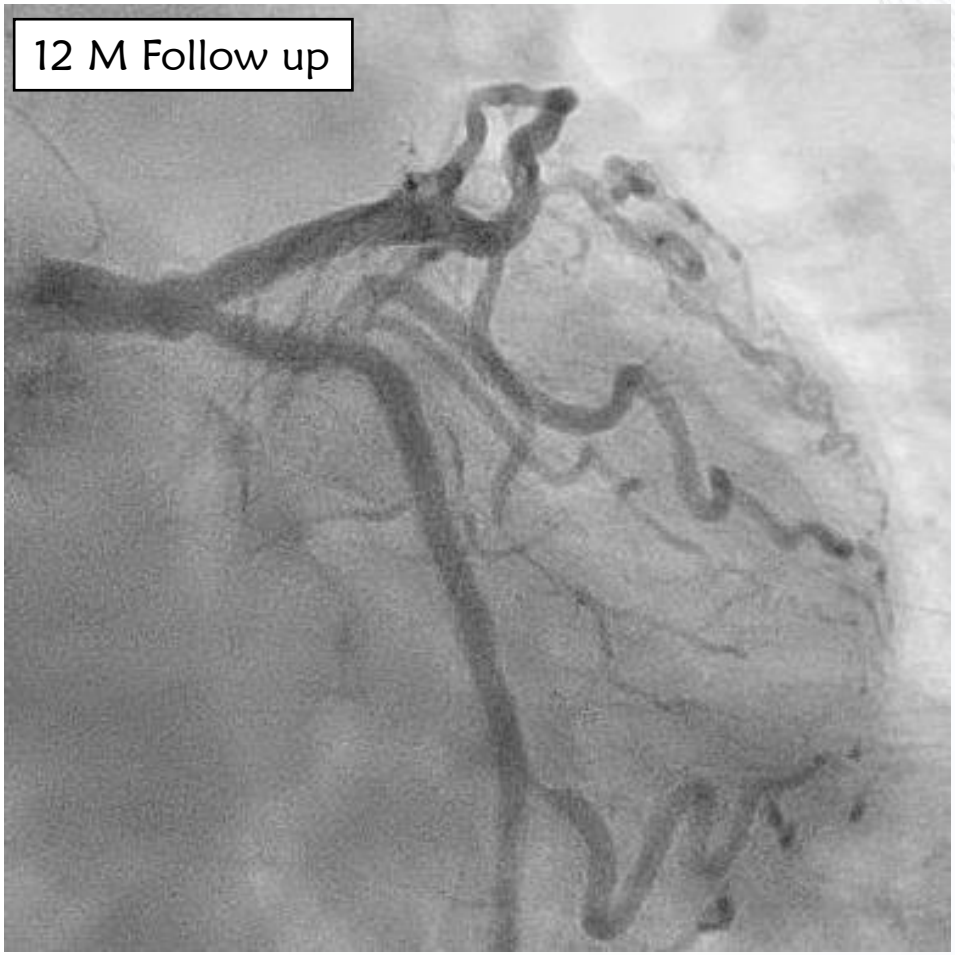
# **Case 2** : Severe Restenosis **after V-Stenting** in LAD and LCX

Pre DCA

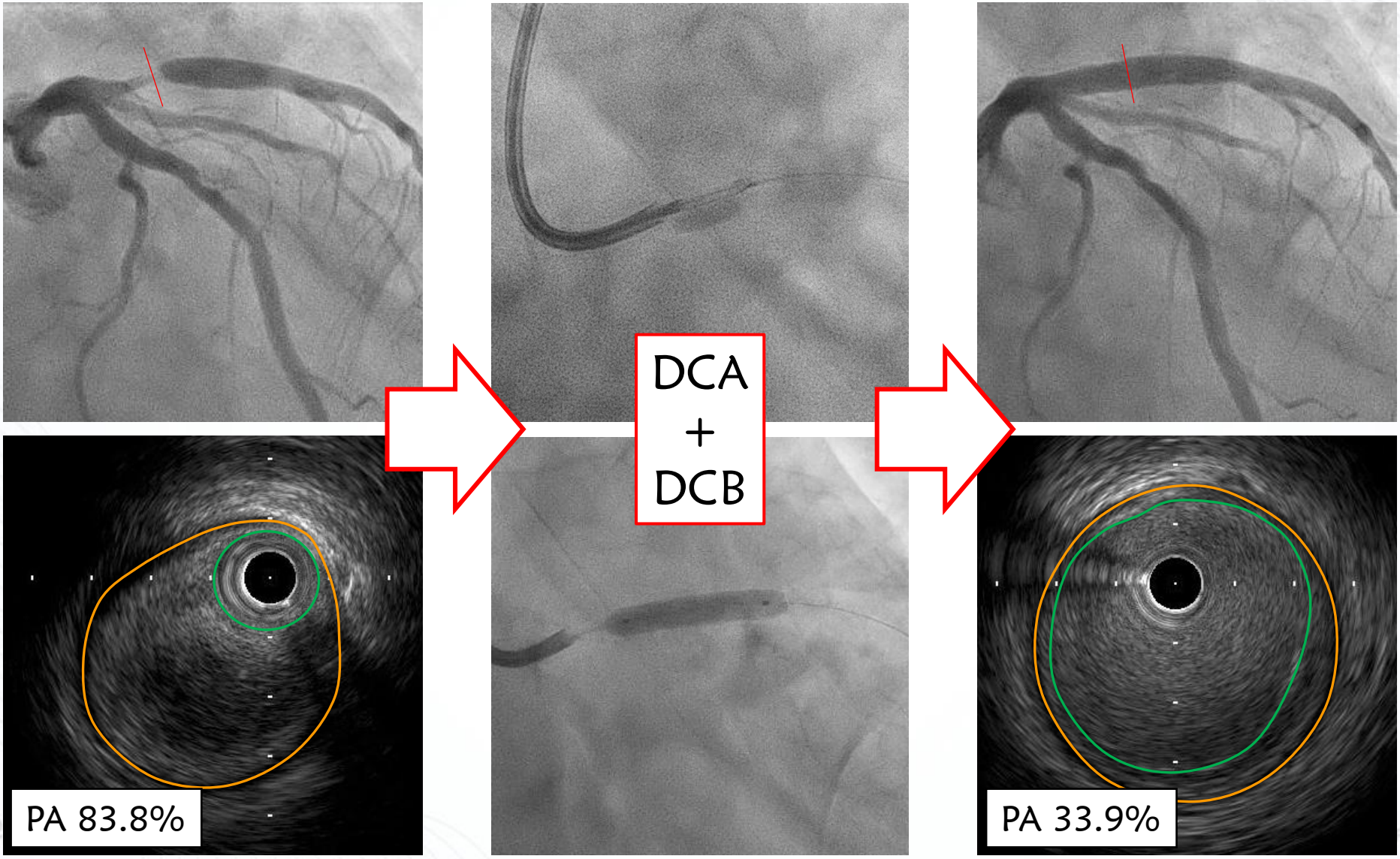
Post DCA



12 M Follow up



# Case 3 : LAD just Prox. DCA case

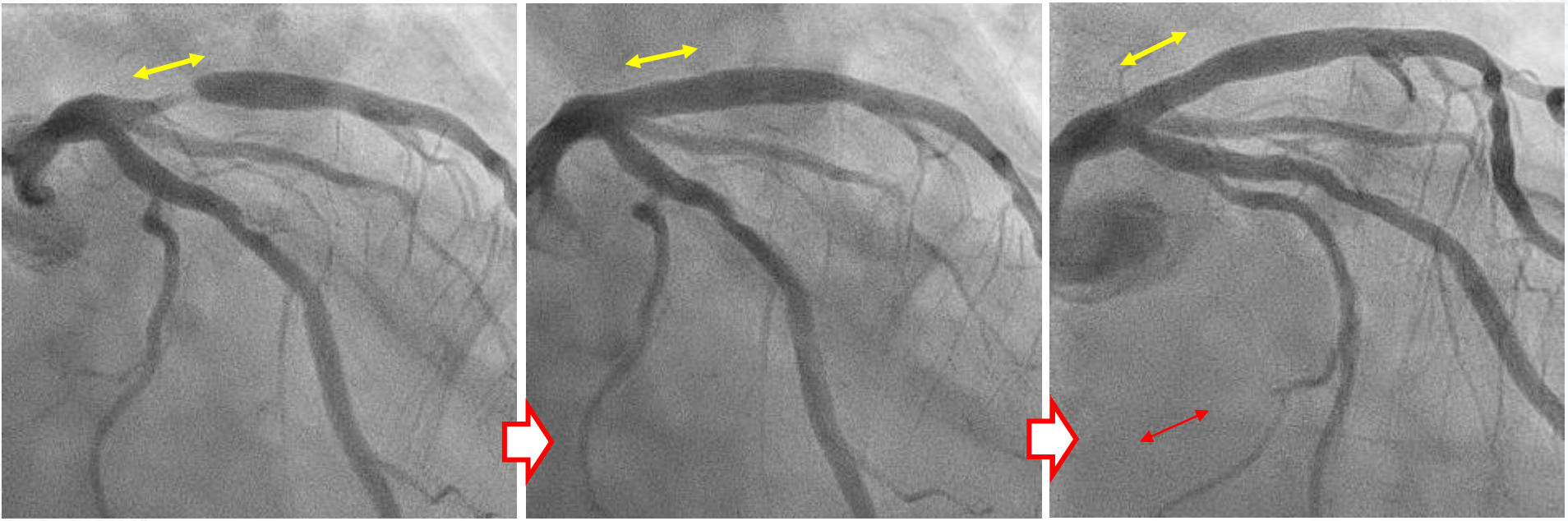


# DCA decrease the number of STENT

Pre

Post DCA+DCB

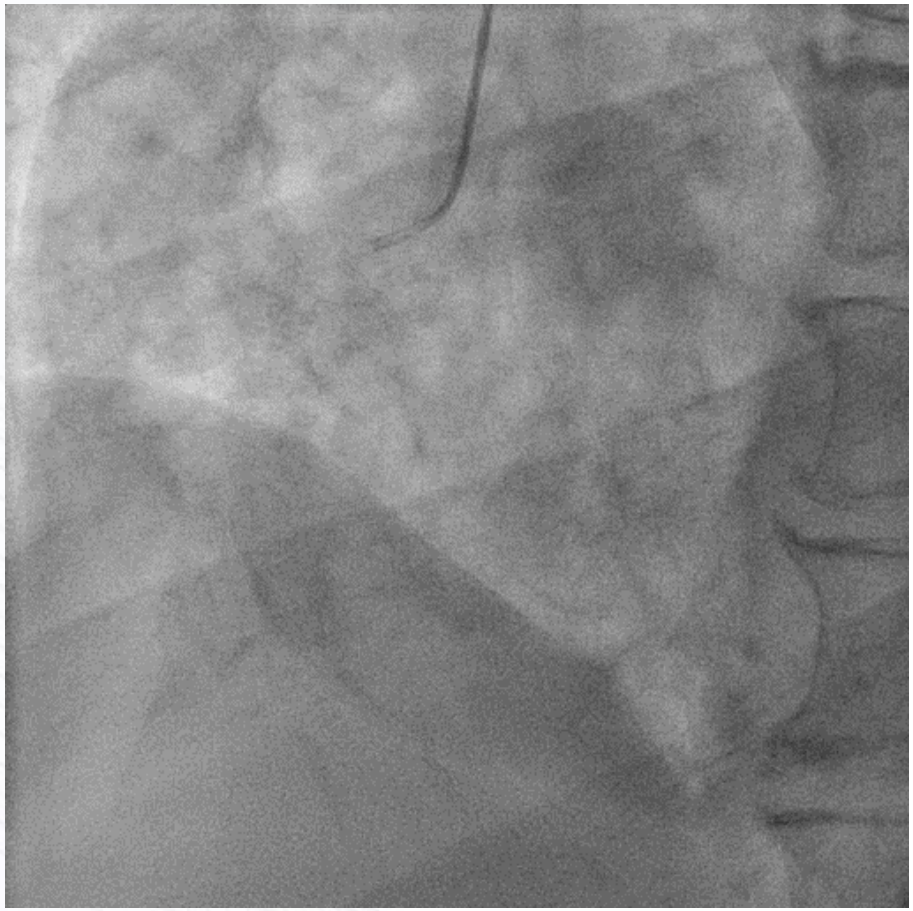
6 months follow up



NO STENT !!

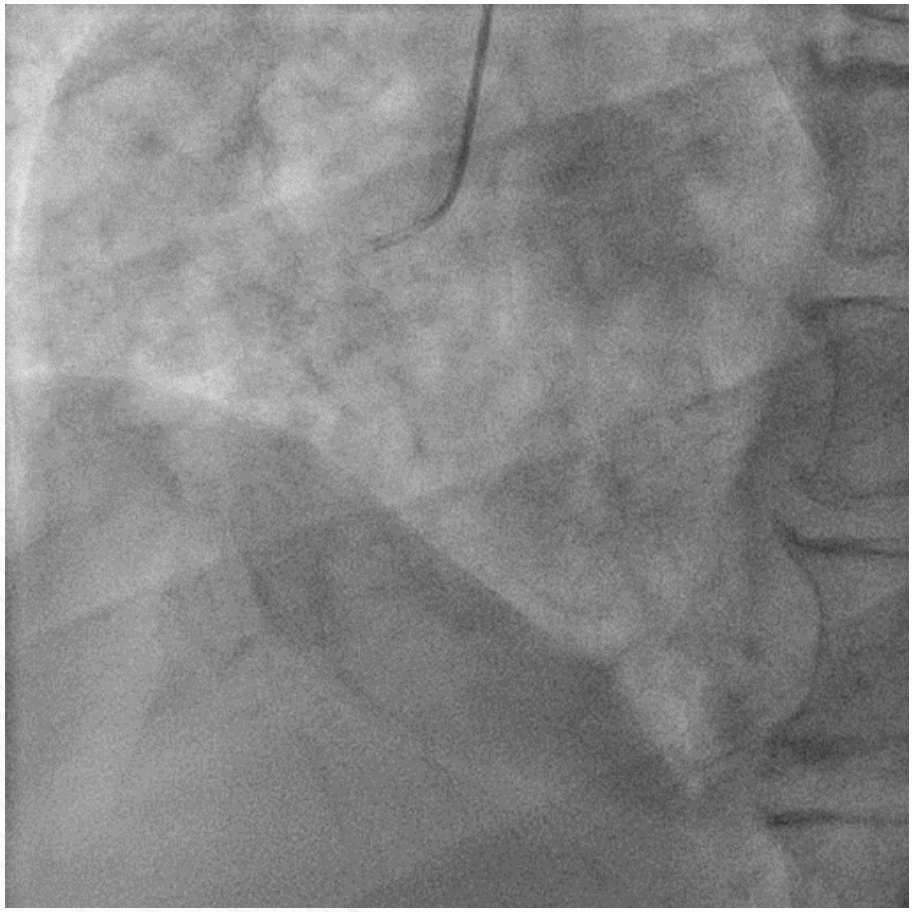
# **Case 4 :** 66yo: M ; **LAD** CTO with trifurcation LMT

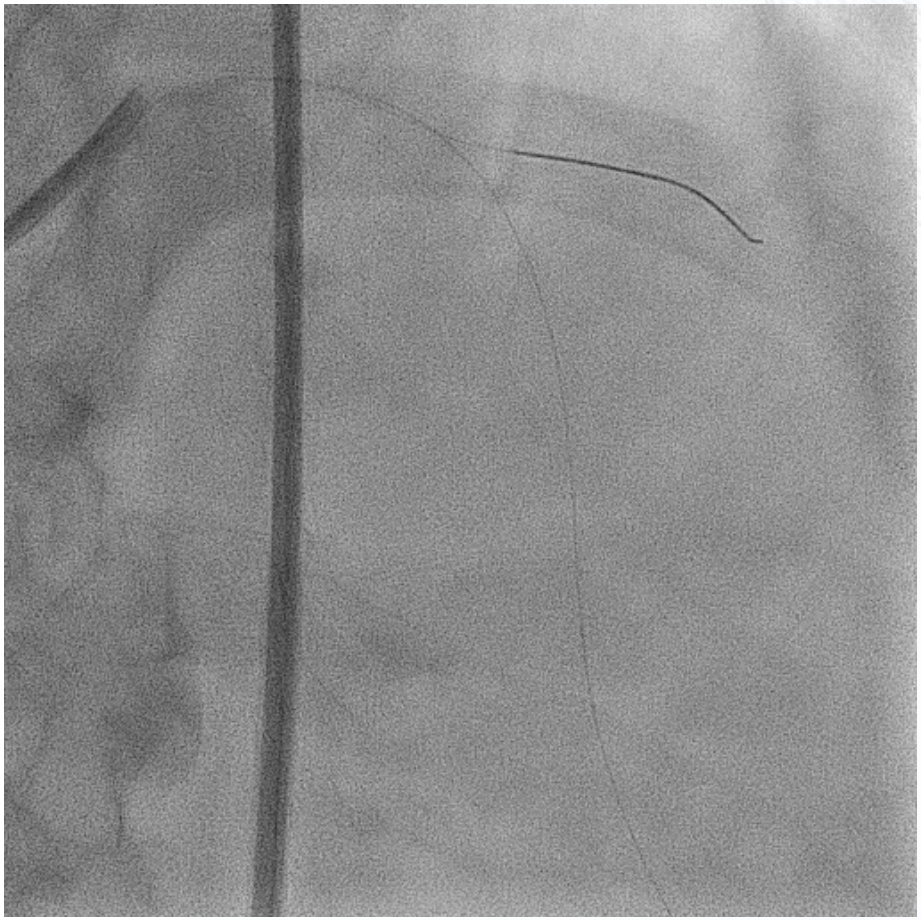
No significant in RCA and good collateral to LAD and LAD subtotal occlusion



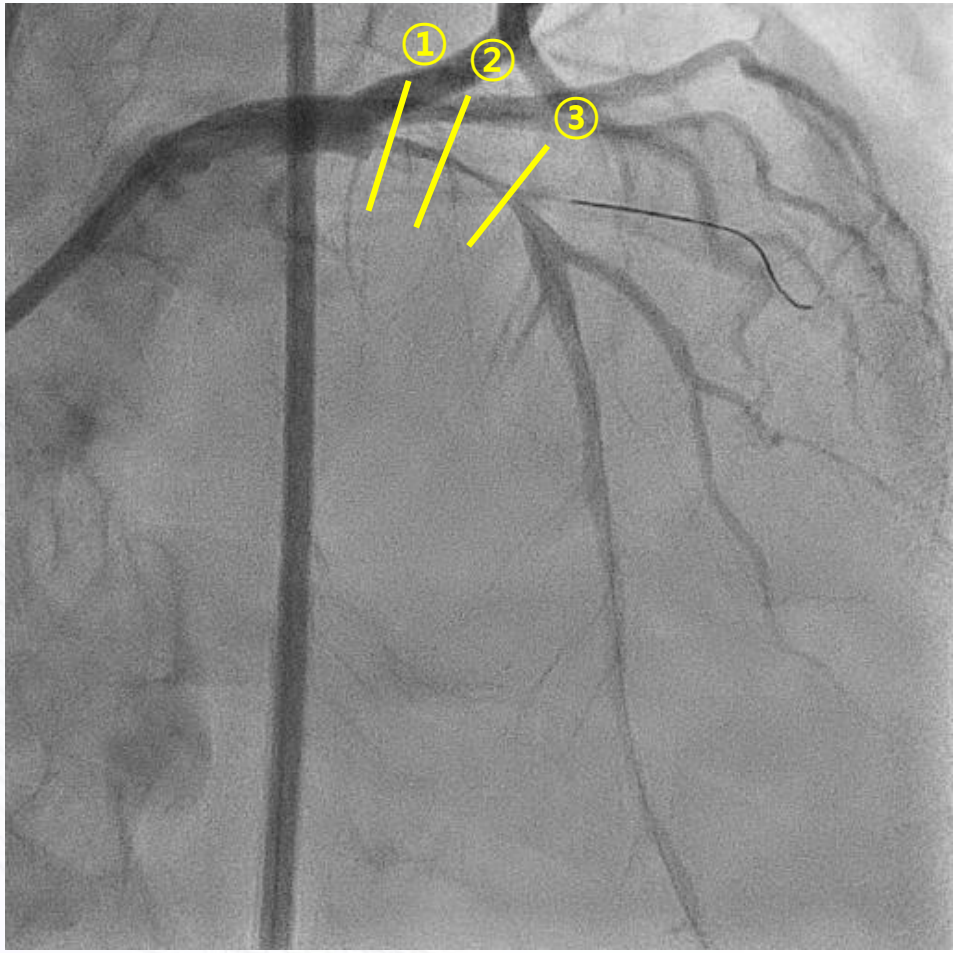
# **Case 4 :** 66yo: M ; **LAD** CTO with trifurcation LMT

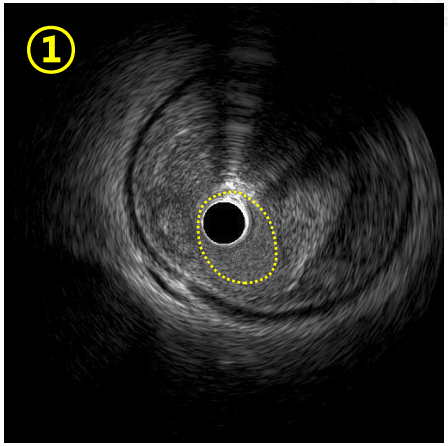
After passing the GWs to LAD and Dx, 1.5 mm ballooning for making space

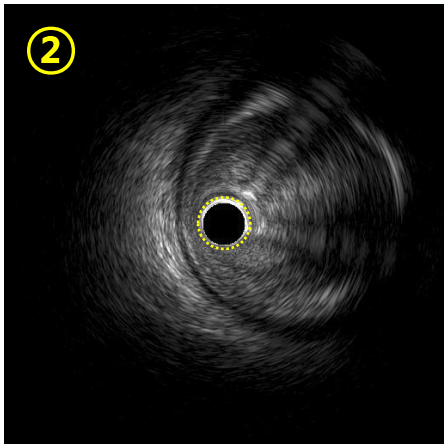


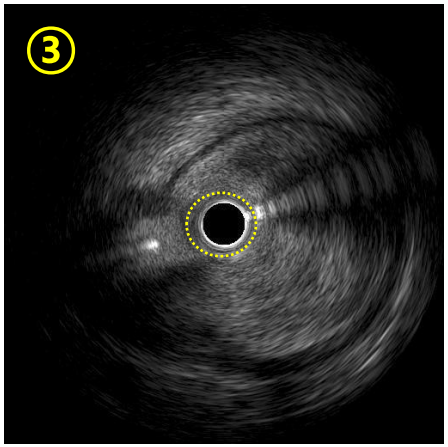


# IVUS run 1



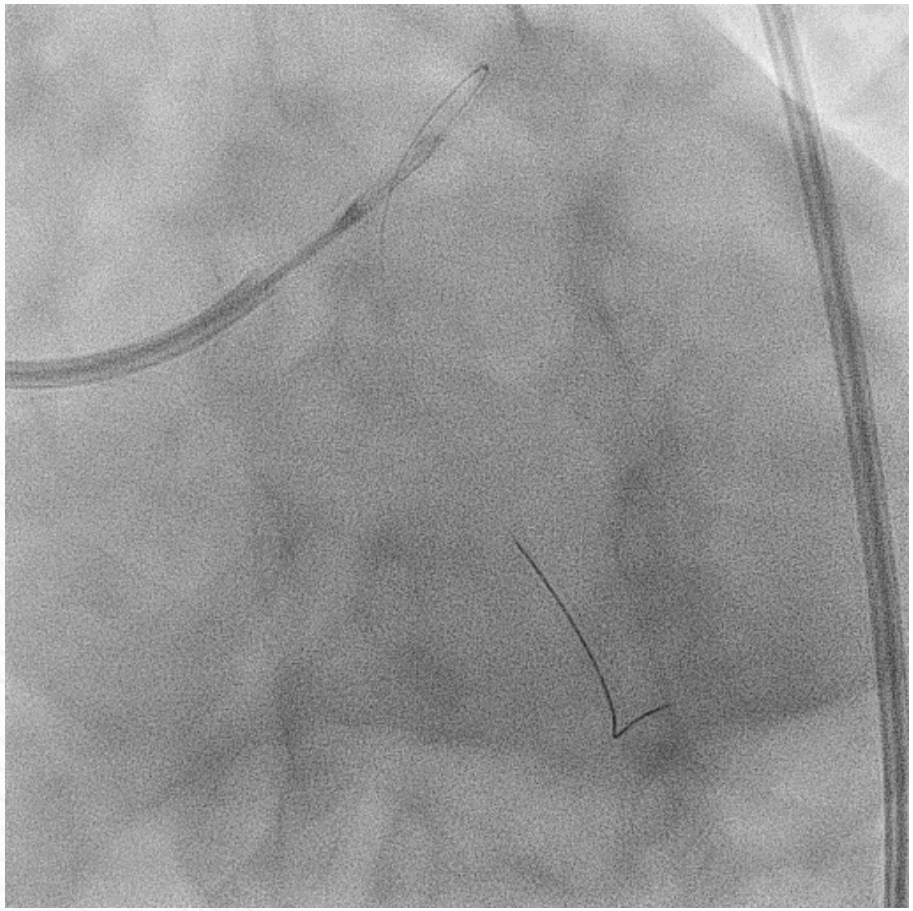



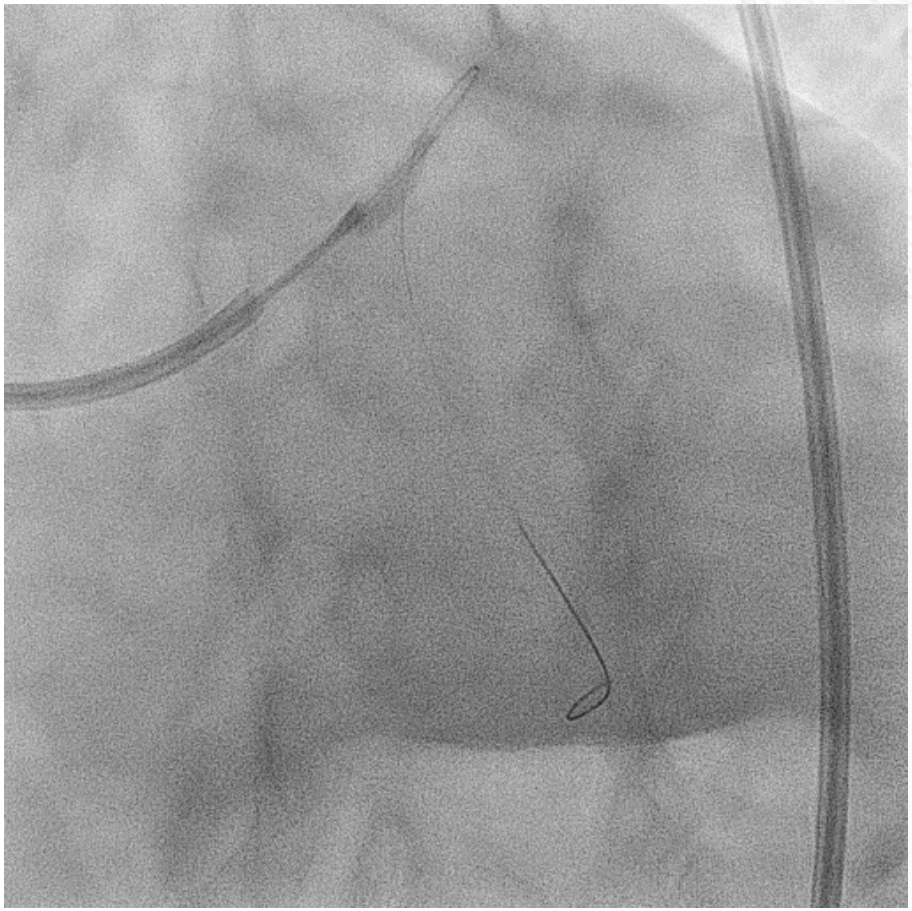




Big
Plaque Burden

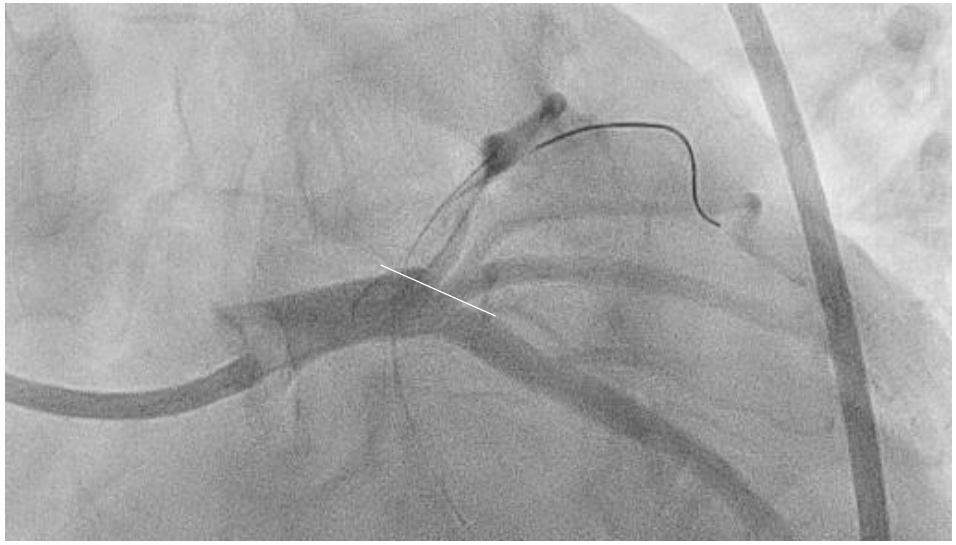
# DCA 1st Session @ 1atm

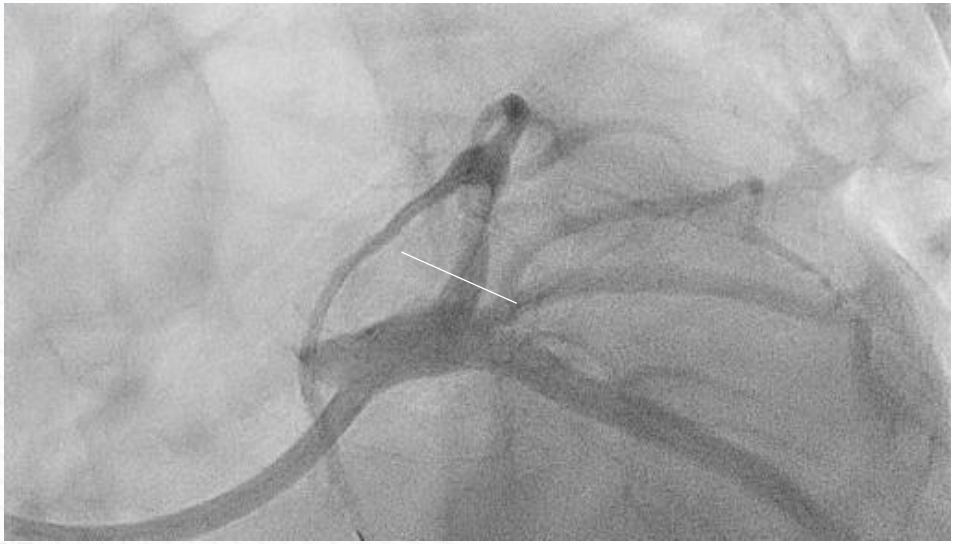


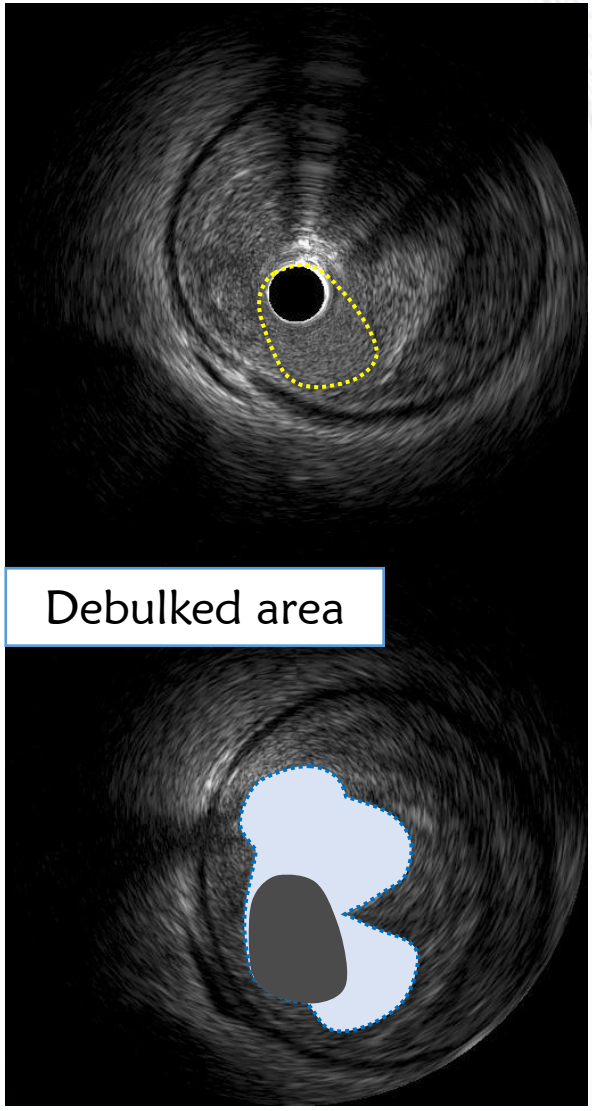


8Fr. Mach1 FCL4.0　DCA: Atherocut (L)

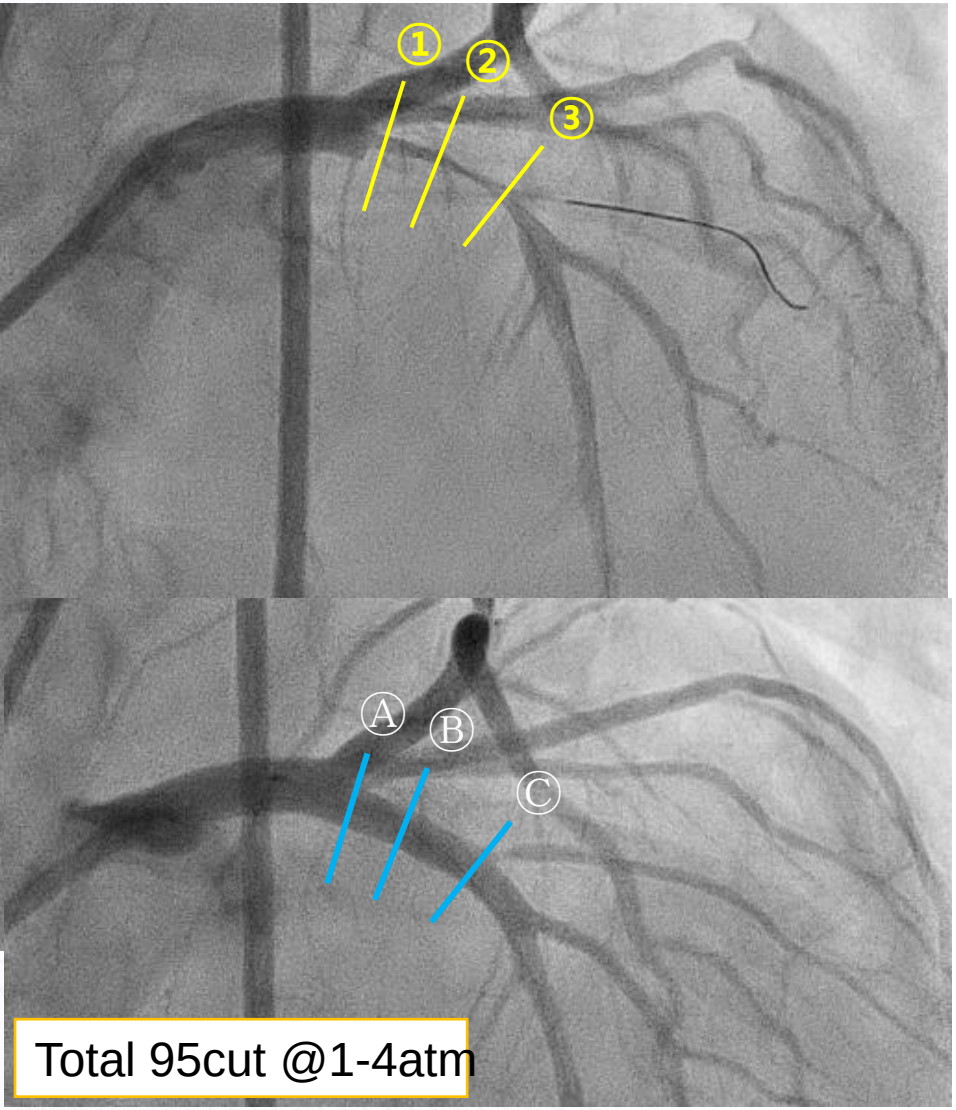
# Post 1st Session @ 1atm







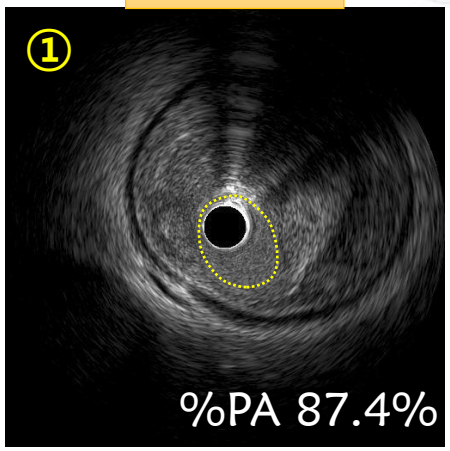
# Pre and Post IVUS

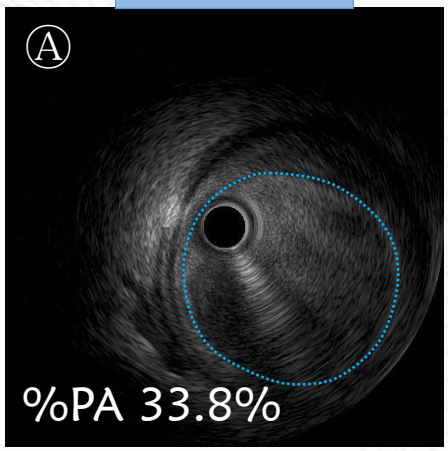


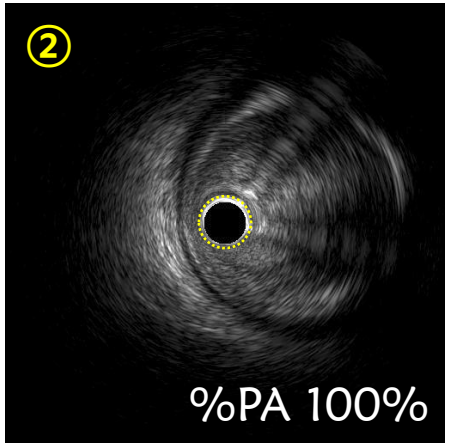

Total 95cut @1-4atm

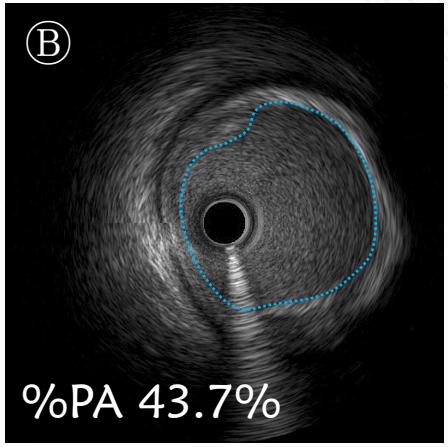
Pre DCA

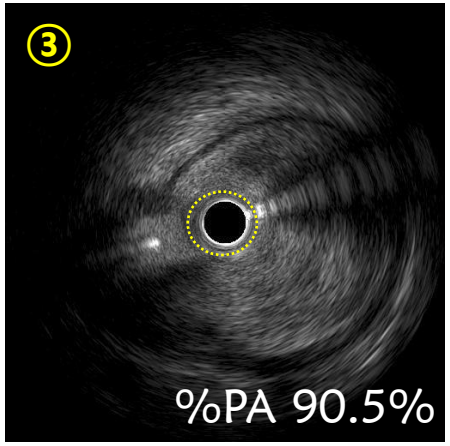
Post DCA

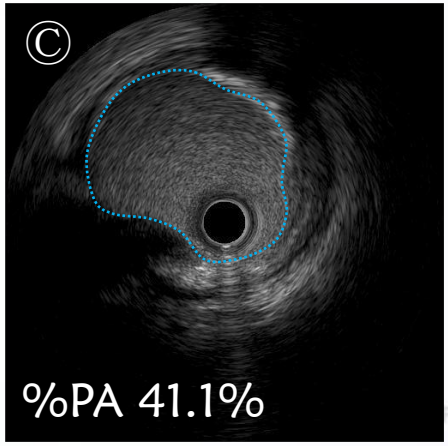


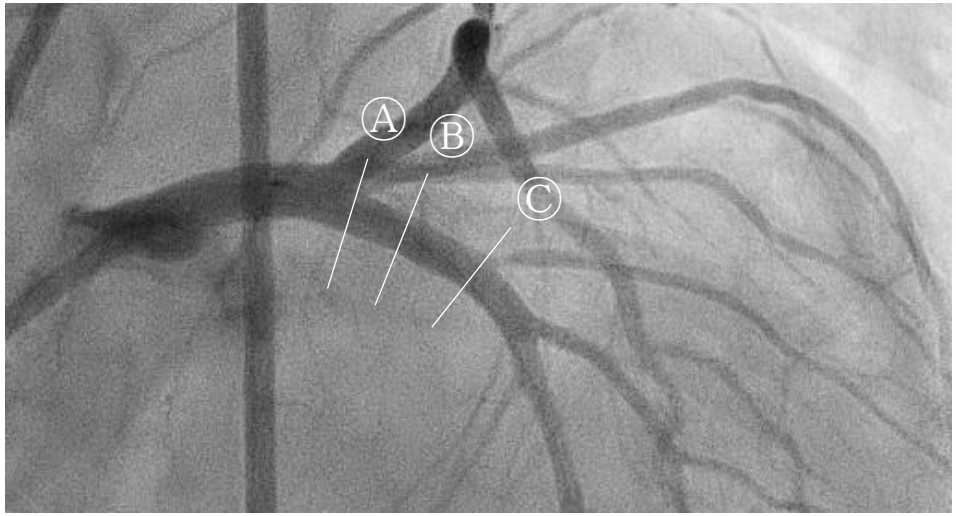



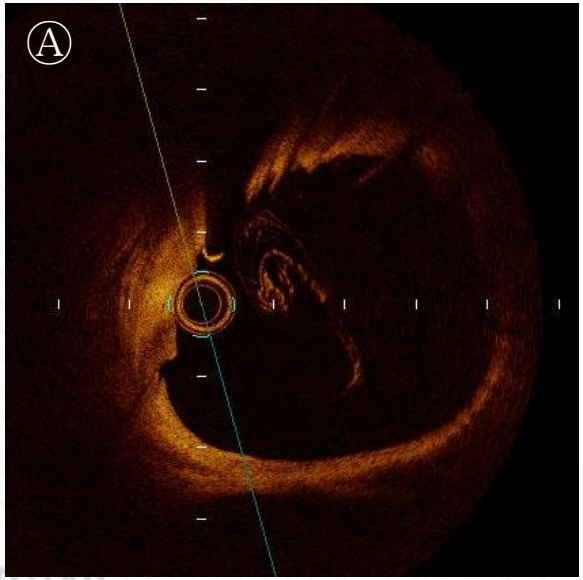



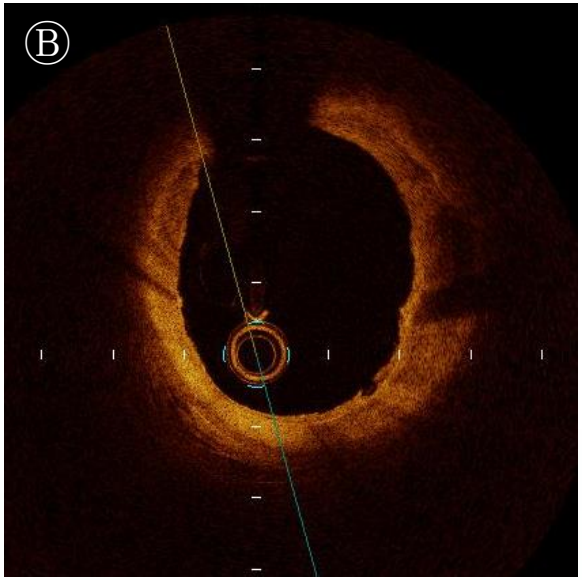



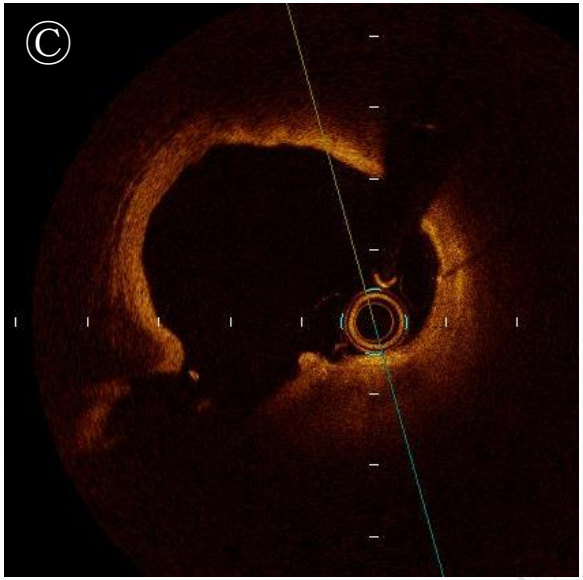



# OCT study after DCB 4.0×20mm



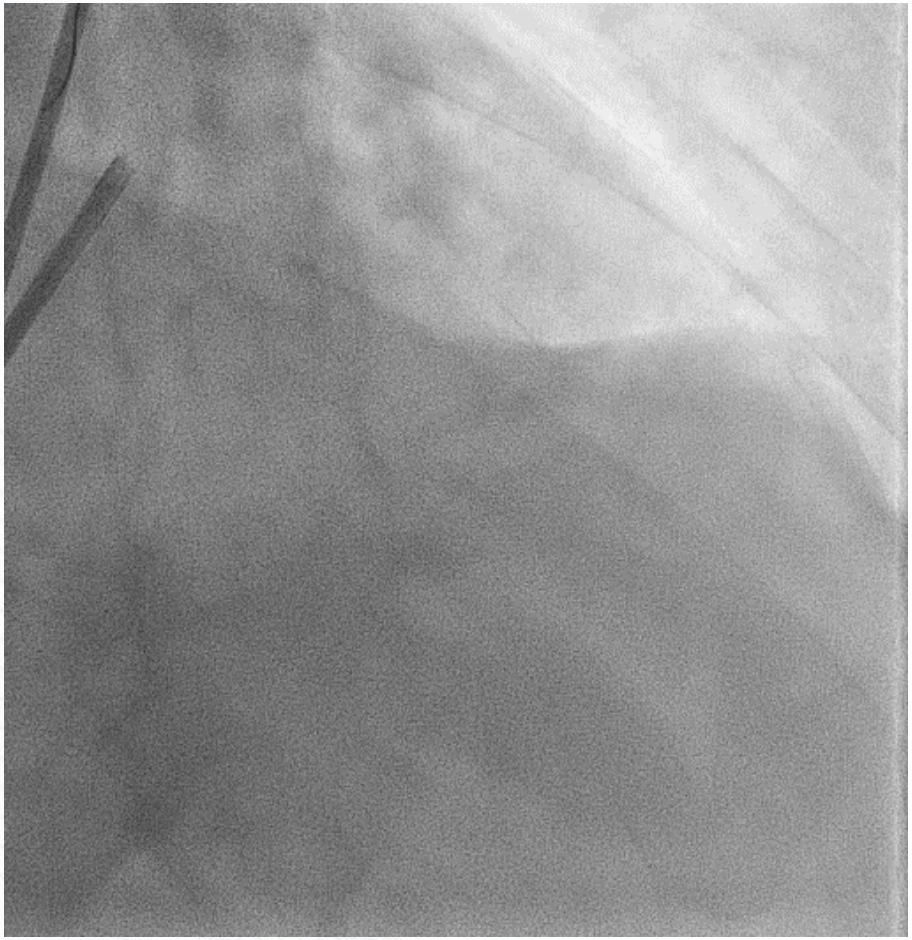



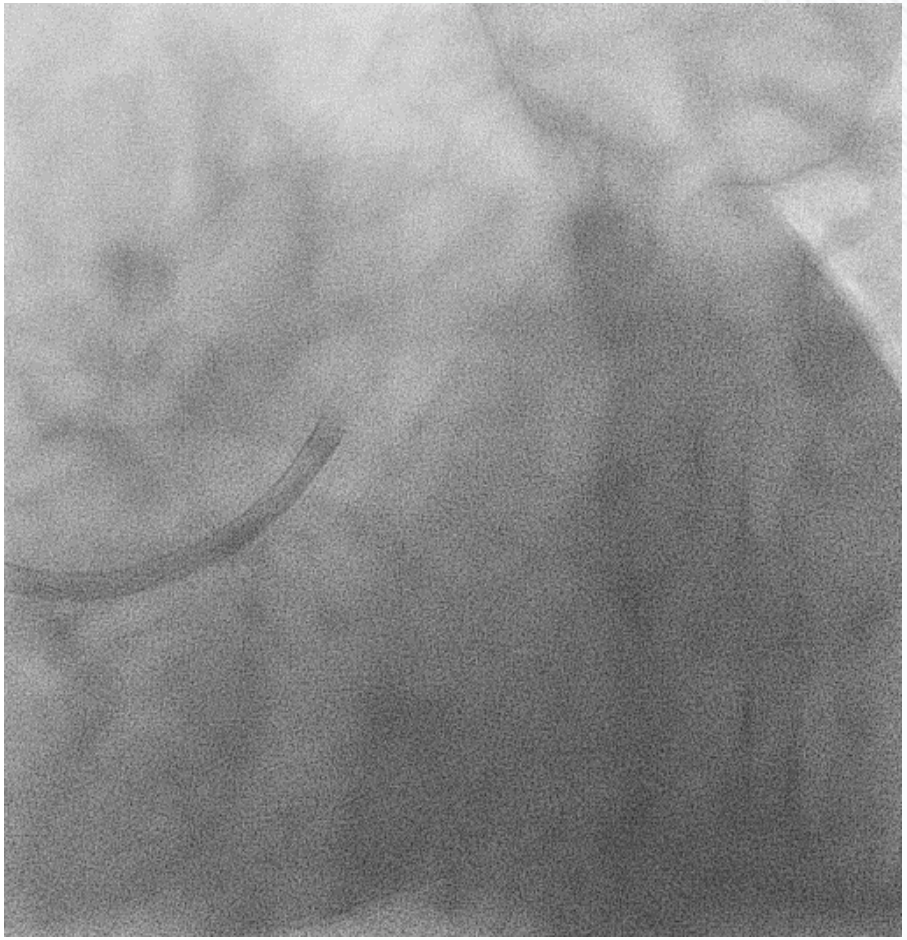



# **Case 4 :** 66yo: M ; **LAD** CTO with trifurcation LMT

Final Angiogram





# Advantage

1. Decreasing the number of the stent in LMT true bifur. area
2. Possibility of avoiding overlapping 2 stents
3. Quick discontinuation of antiplatelet therapy

Impact of directional coronary atherectomy followed by drug-coated balloon strategy to avoid the complex stenting for bifurcation lesions

Okutsu M, Sunao Nakamura et al  Heart and Vessel 2022

Short-term outcome of percutaneous coronary intervention with directional coronary atherectomy followed by drug-coated balloon: a preliminary report

Akihiko Sato,  Mikihiro Kijima et al  Cardiovascular Intervention and Therapeutics  2019

Efficacy of drug-coated balloon angioplasty after directional coronary atherectomy for coronary bifurcation lesions (DCA/DCB registry)

Shunsuke Kitani,  Mikihiro Kijima et al  CCI  2021

Stentless Strategy by Drug-Coated Balloon Angioplasty following Directional Coronary Atherectomy for Left Main Bifurcation Lesion

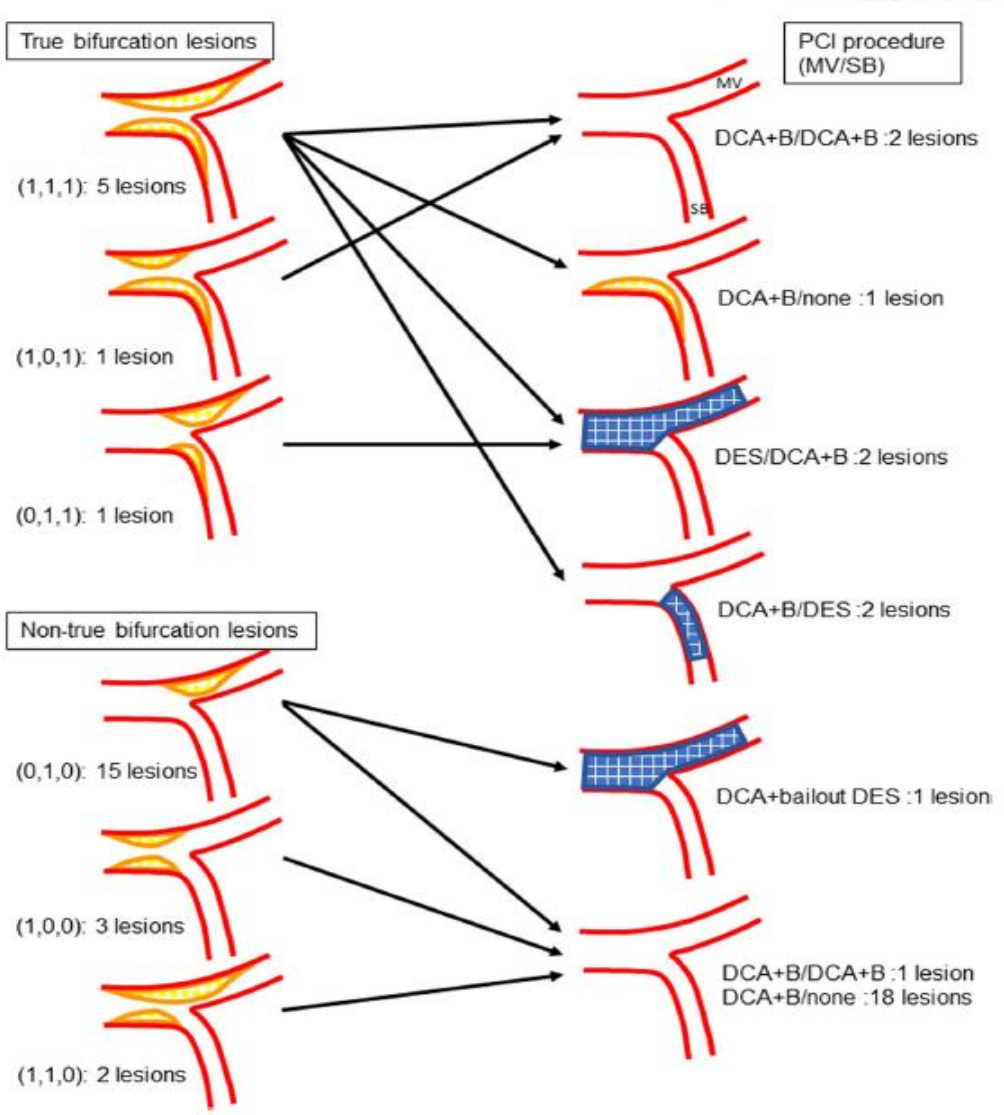
Norihiko Kobayashi  Journal of Interventional Cardio. 2021

# Impact of directional coronary atherectomy followed by drug-coated balloon strategy to avoid the complex stenting for bifurcation lesions

Heart and Vessel 2022

**LMT AREA 28 cases 31 lesion**

| | $n=26$ |
|---|---|
| IVUS | |
| Pre procedure | |
| MLA, $mm^2$ | $2.6 \pm 1.4$ |
| VA, $mm^2$ | $14.6 \pm 5.0$ |
| PA, % | $80.4 \pm 10.5$ |
| Post DCA | |
| MLA, $mm^2$ | $9.9 \pm 2.6$ |
| VA, $mm^2$ | $16.7 \pm 5.5$ |
| PA, % | $41.0 \pm 9.7$ |
| Post DCB | |
| MLA, $mm^2$ | $10.6 \pm 2.8$ |
| VA, $mm^2$ | $17.8 \pm 4.4$ |
| PA, % | $39.0 \pm 11.5$ |
| Acute gain, $mm^2$ | $7.9 \pm 3.3$ |
| Deep cut | 8 (30.8) |



# Intra-Coronary Imaging

| IVUS | 34 lesions |
|---|---|
| Pre procedure | |
| MLA, $mm^2$ | 2.7±1.6 |
| VA, $mm^2$ | 14.9±5.3 |
| PA, % | 80.5±10.9 |
| Post DCA | |
| MLA, $mm^2$ | 9.7±2.8 |
| VA, $mm^2$ | 16.5±5.3 |
| PA, % | 42.2±8.9 |
| Post DCB | |
| MLA, $mm^2$ | 10.4±2.9 |
| VA, $mm^2$ | 17.5±4.5 |
| PA, % | 39.6±10.5 |
| Acute gain, $mm^2$ | 7.7±3.3 |
| Deep cut | 11 (32.3) |

| OCT | 34 lesions |
|---|---|
| Pre procedure | |
| MLA, $mm^2$ | 2.2±1.7 |
| Post procedure | |
| MLA, $mm^2$ | 8.7±2.9 |
| Acute gain, $mm^2$ | 6.7±3.0 |
| 6M-follow-up | |
| MLA, $mm^2$ | 6.3±3.3 |
| Late lumen loss, $mm^2$ | 2.5±3.0 |

# Clinical F/U Result

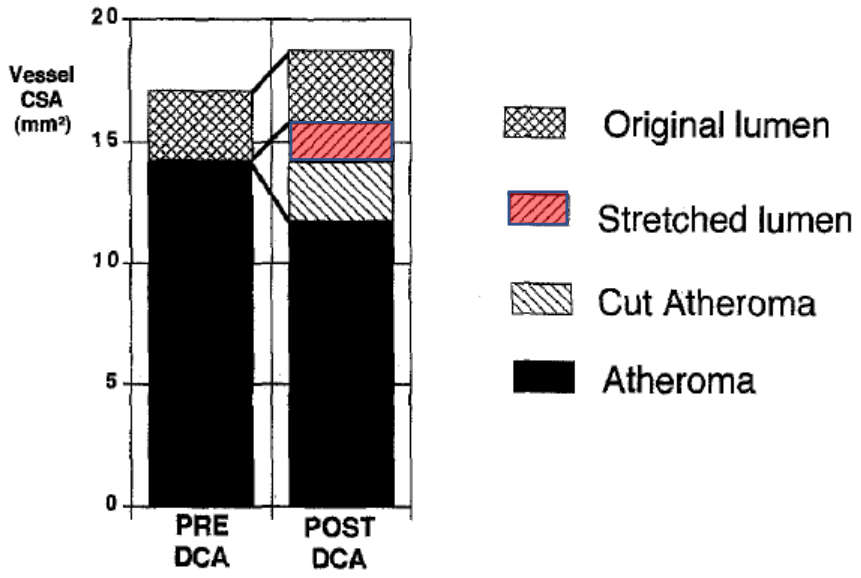
| | |
|---|---|
| **In-hospital MACE** | |
| Cardiac death | 0 |
| Procedural cardiac tamponade | 0 |
| Target vessel-rerated MI | 0 |
| Unplanned TVR | 0 |
| **6M-MACE** | |
| Cardiac death | 0 |
| Target vessel-rerated MI | 0 |
| Ischemia driven TVR | 3 (10.7) |

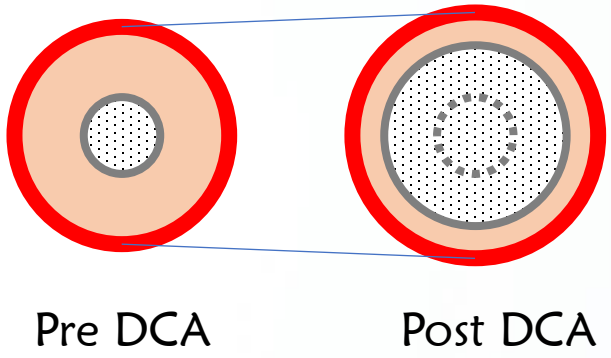
# Potential…

"DCA makes Vessel can move very freely whatever he want" ???

# Unique advantages of no stent strategy with DCA

## Vessel enlargement

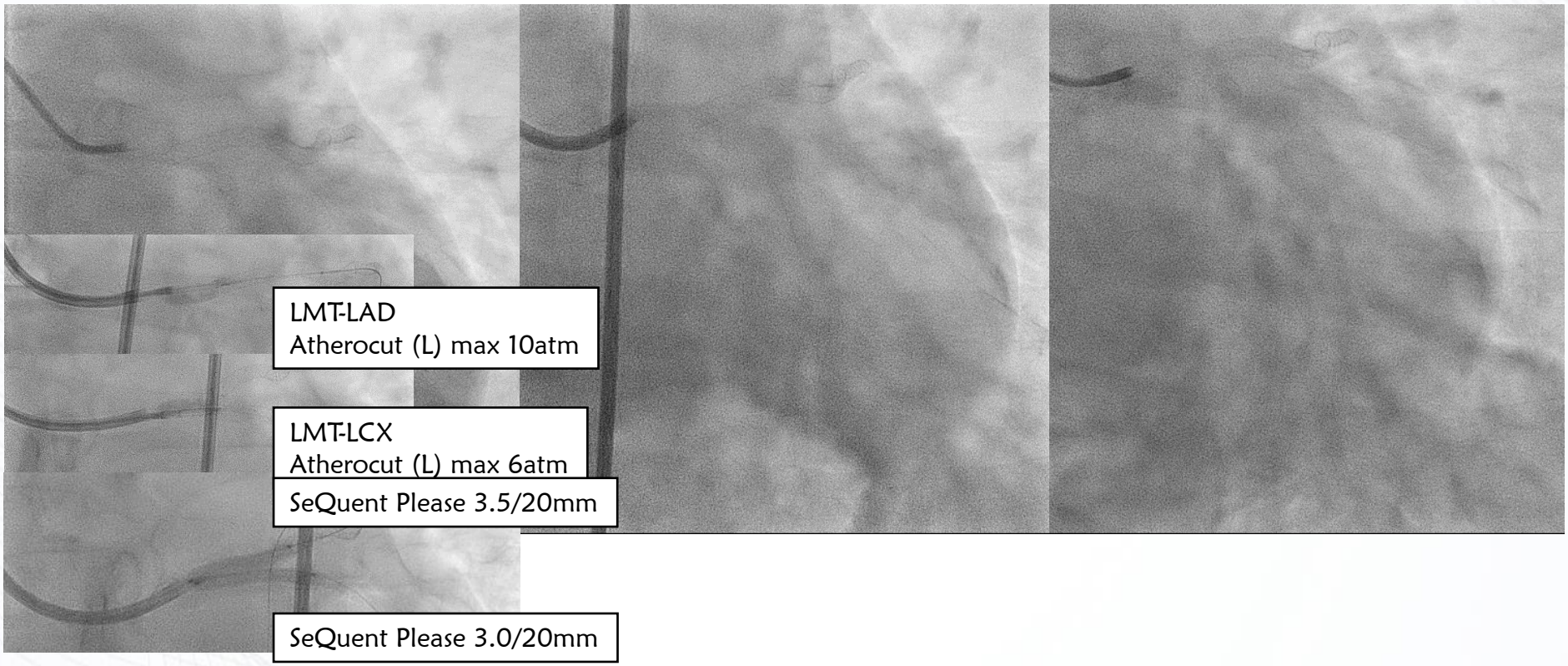



(Shigeru Nakamura, et al. Am Heart J 1995)

# Vessel remodeling effect after DCA+DCB

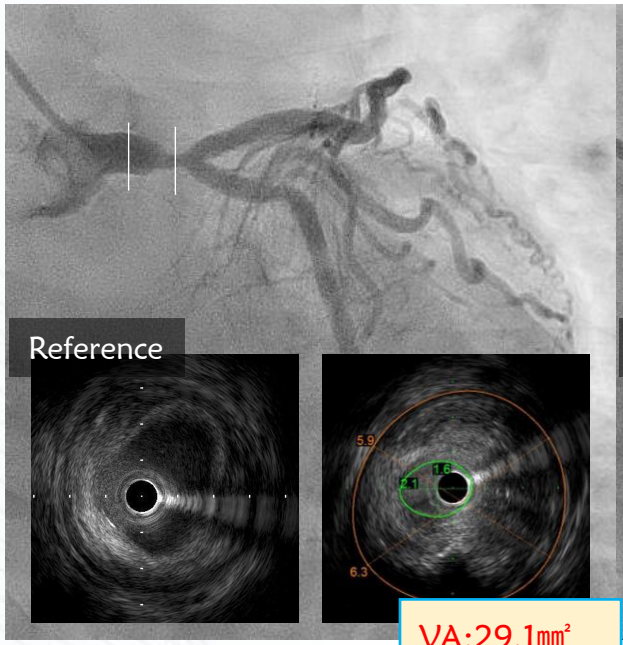
## Positive remodeling lesion at baseline



# Vessel remodeling effect after DCA+DCB

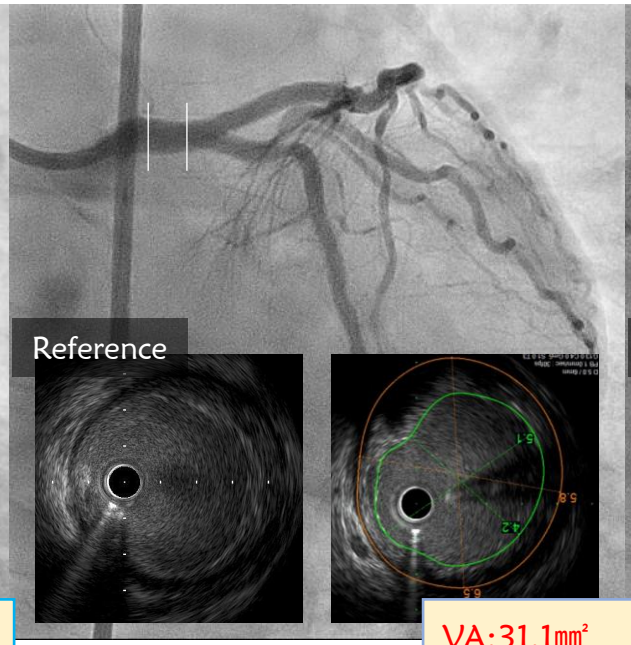
## Positive remodeling → Negative reverse remodeling

Pre



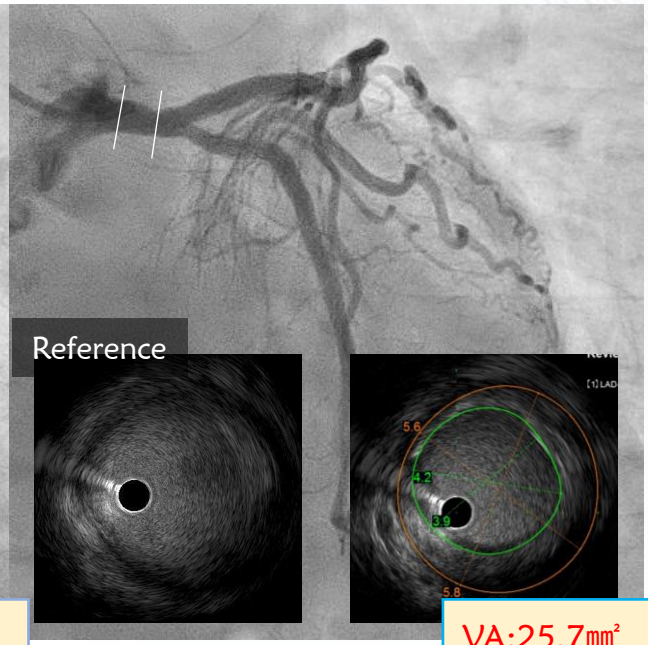

VA:29.1㎟
R-index:1.17

Post




VA:31.1㎟
R-index:1.14

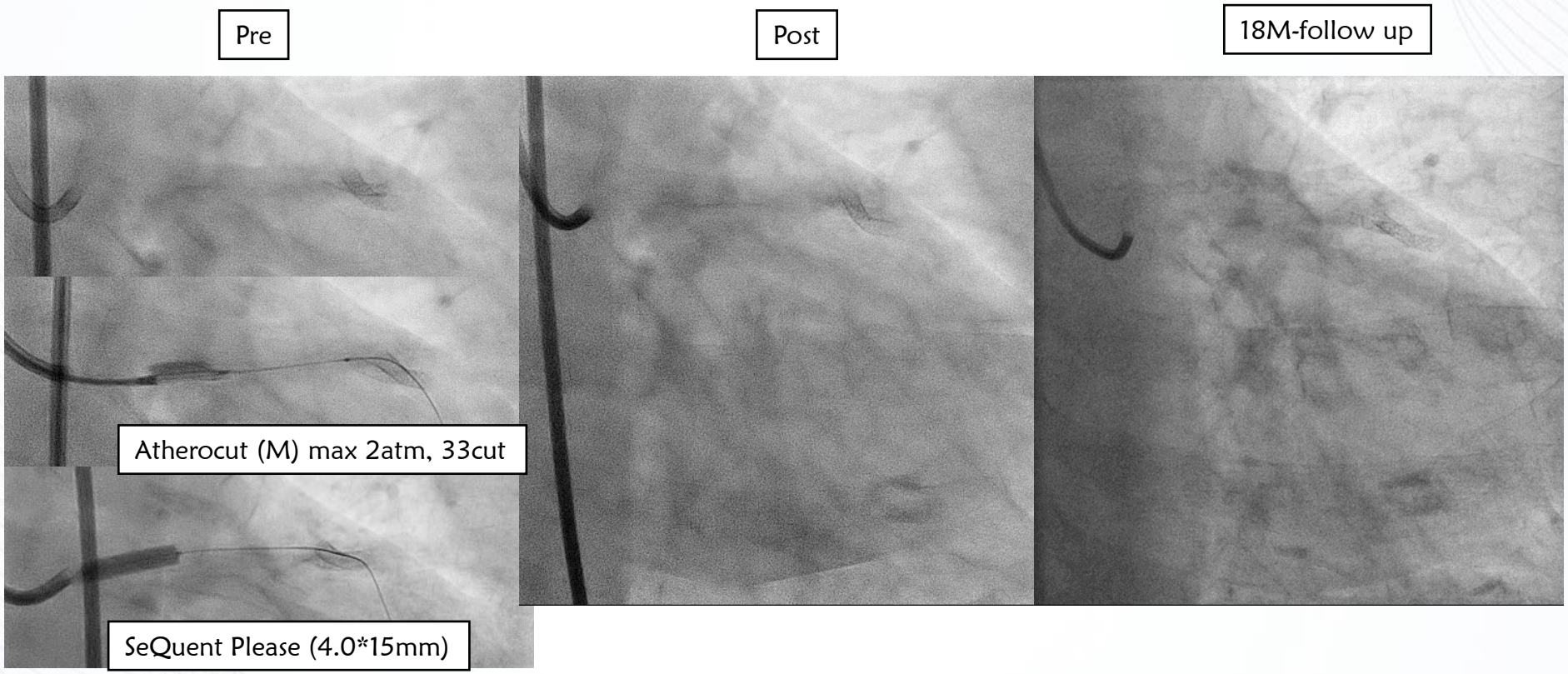
18M-follow up




VA:25.7㎟
R-index:1.03

# Vessel remodeling effect after DCA+DCB

## Negative remodeling lesion at baseline



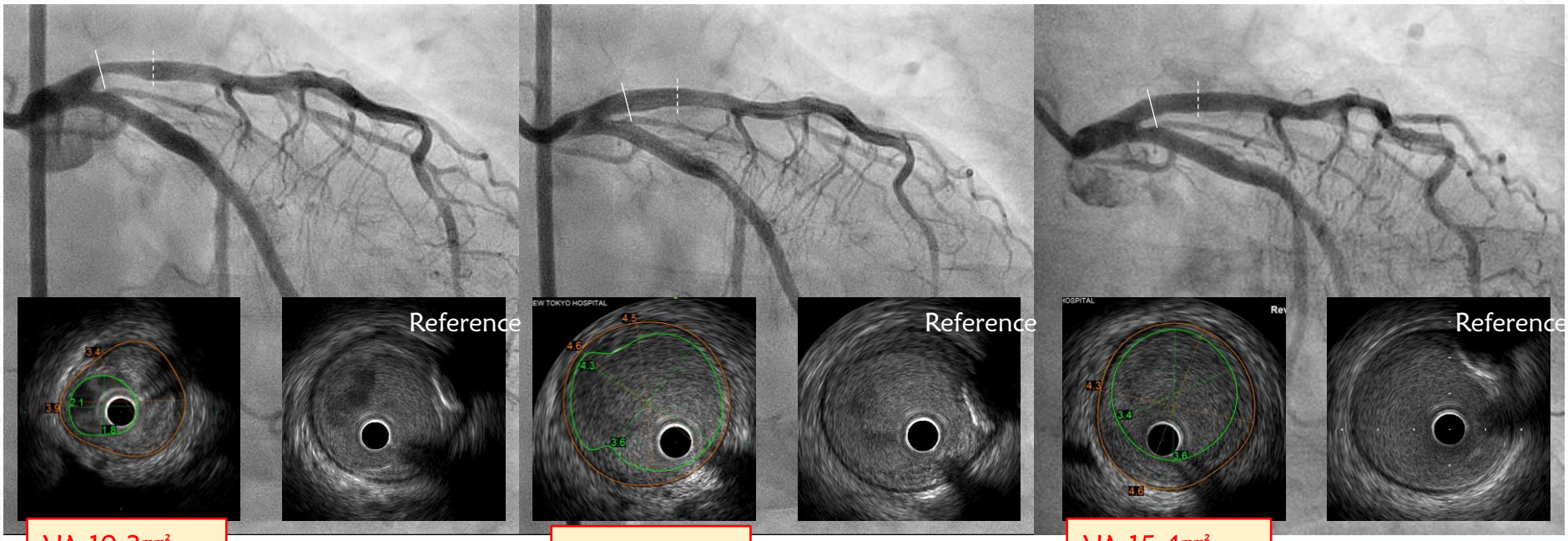
# Vessel remodeling effect after DCA+DCB

## Negative remodeling → Positive reverse remodeling

Pre

Post

18M-follow up



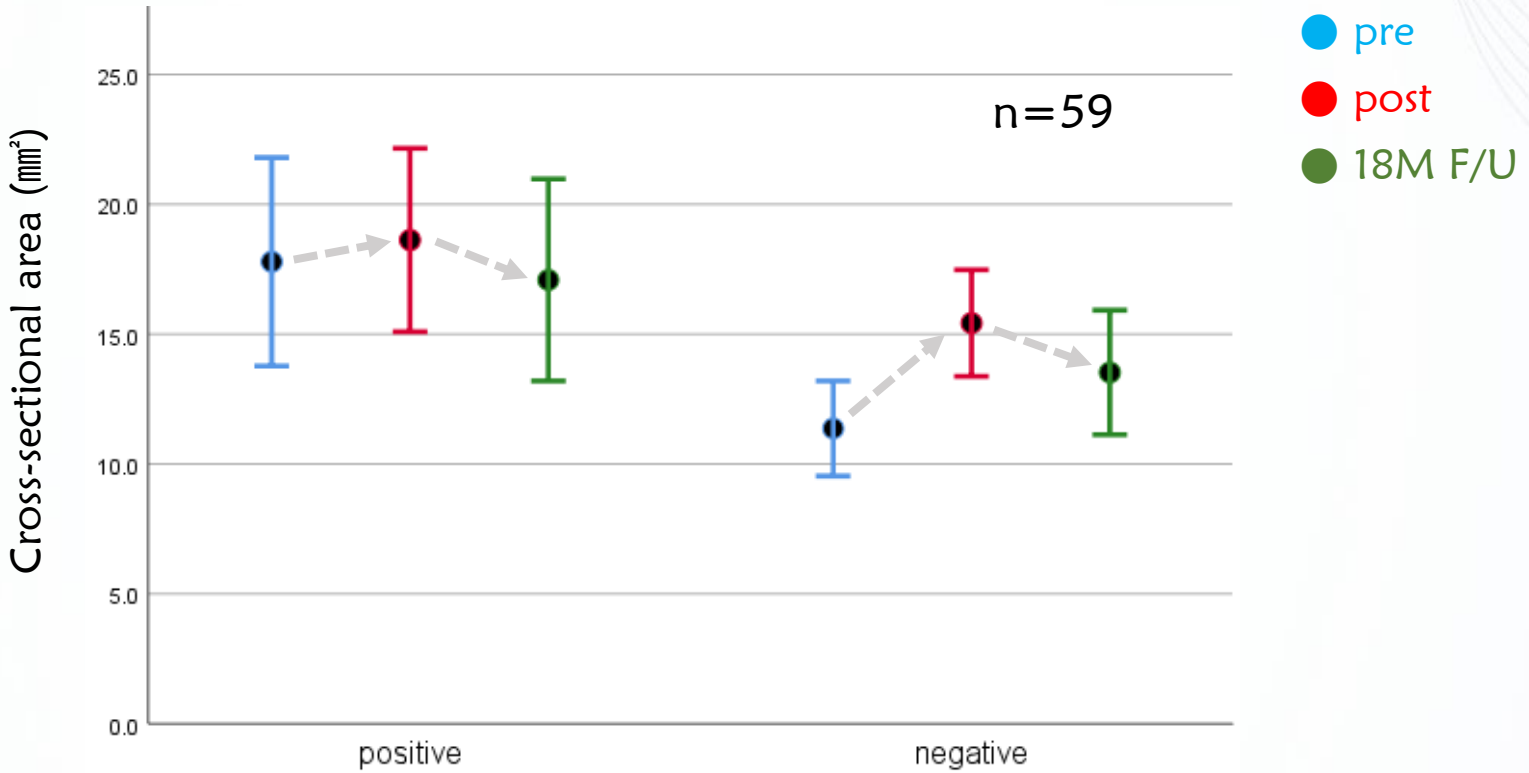

VA:10.3㎟
R-index: 0.71

VA:16.4㎟
R-index: 1.04

VA:15.4㎟
R-index: 0.99

# Vessel area change after DCA+DCB

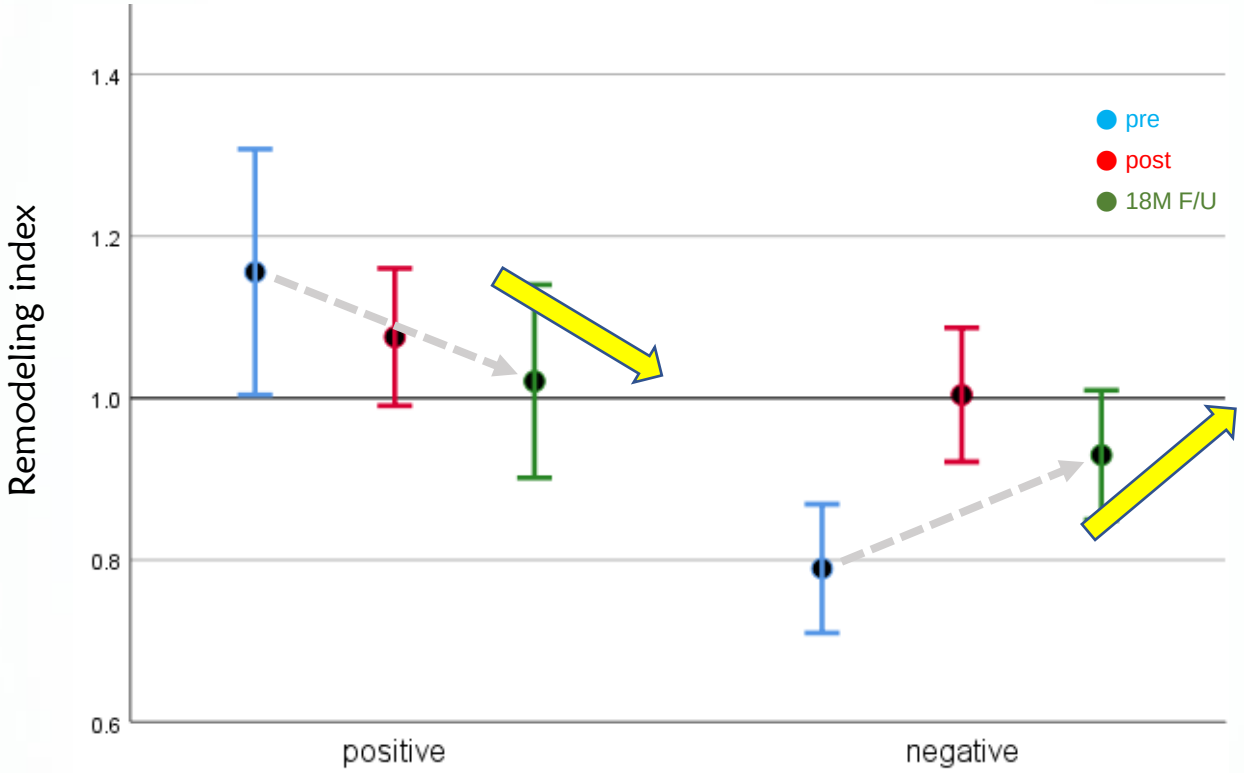
Both positive, negative remodeling vessel increased in area once and then decreased



# Vessel remodeling index after DCA+DCB

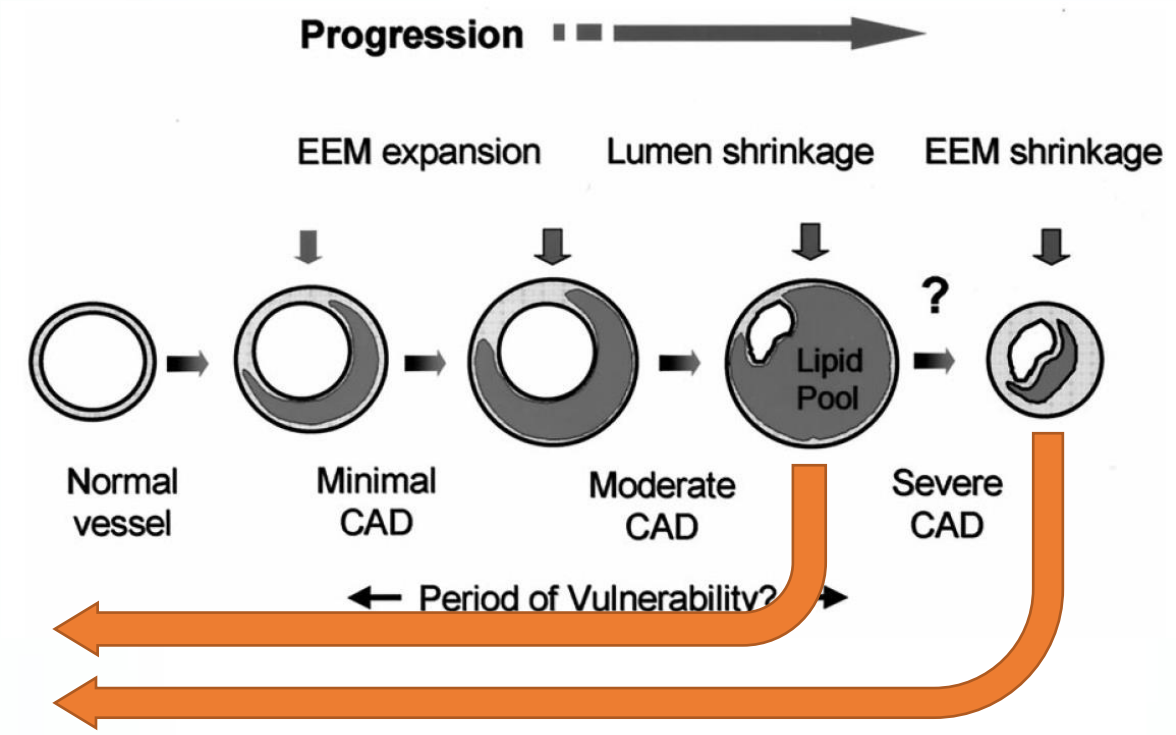
Both positive and negative remodeling lesions seems to return to normal size.

n=59



# Potential…

"DCA makes Vessel can move very freely whatever he want" ???




(Schoenhagen et al. J Am Coll Cardiol 2001)

DCA has a potential of reverse remodeling towards normal vessel size in both positive and negative remodeling lesions at baseline

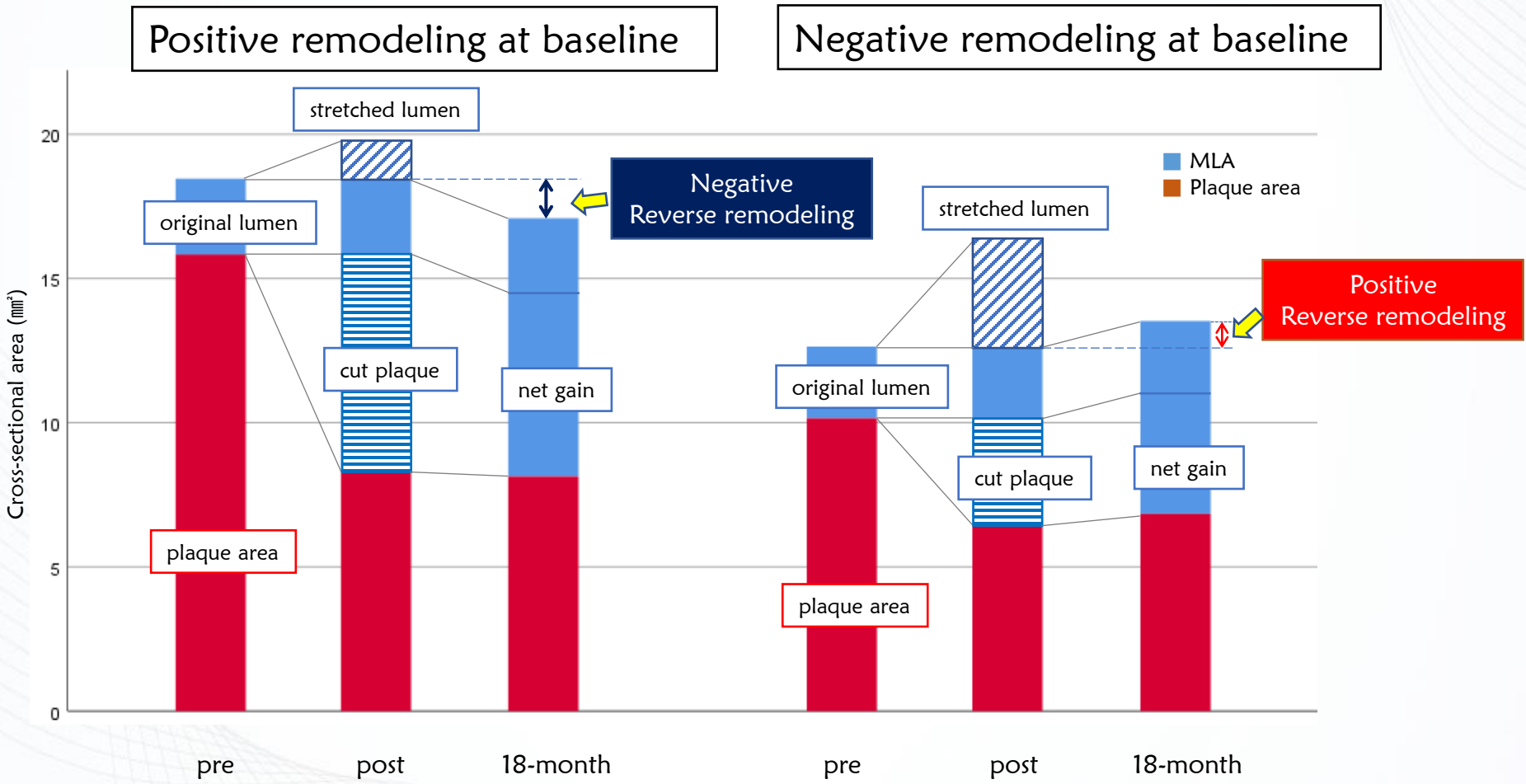
We are still on the way to solve

"unclarified validity "and "effectiveness" of DCA-B

# Reverse remodeling after DCA+DCB

## IVUS cross sectional area

n=59



# Case 1

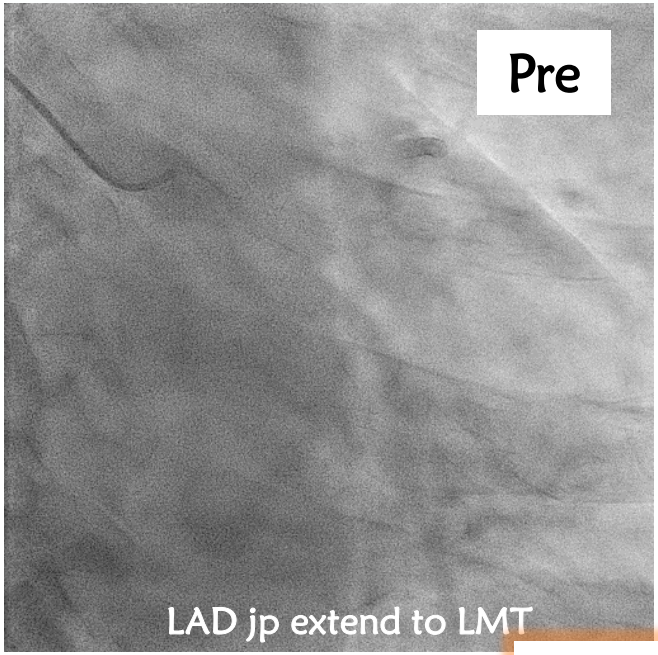
Unstable angina

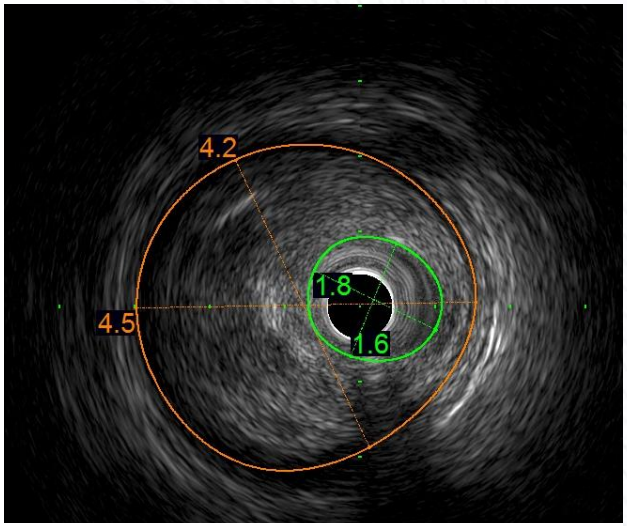
HT+, DL+, DM-,

CKD-, Smoke-

LDL-C: 66mg/dl (at

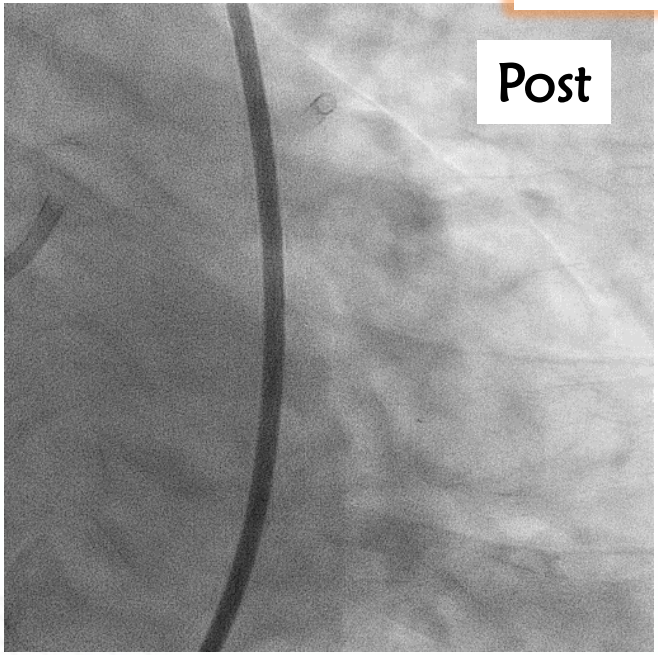
PCI) ⇨ 68mg/dl (6M)

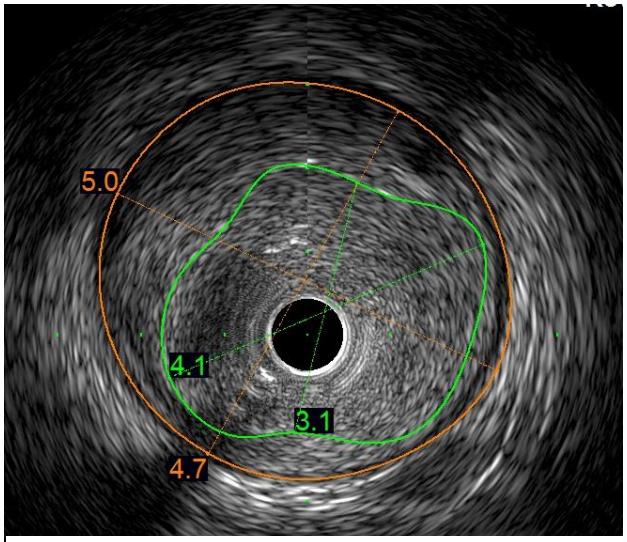



Plaque area 84.5%

No DEEP CUTTING

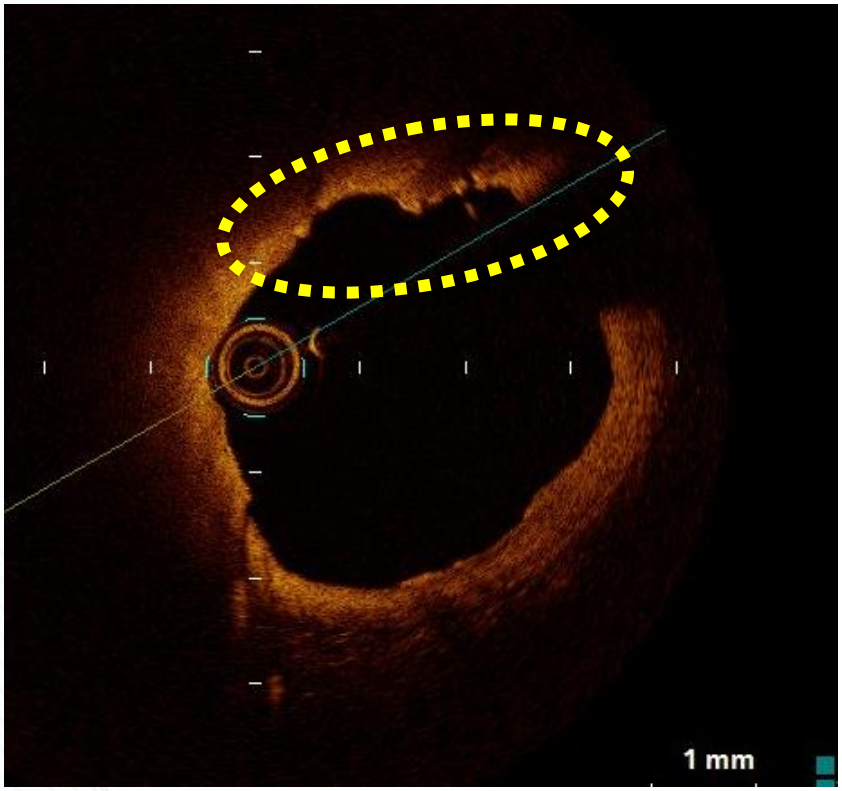


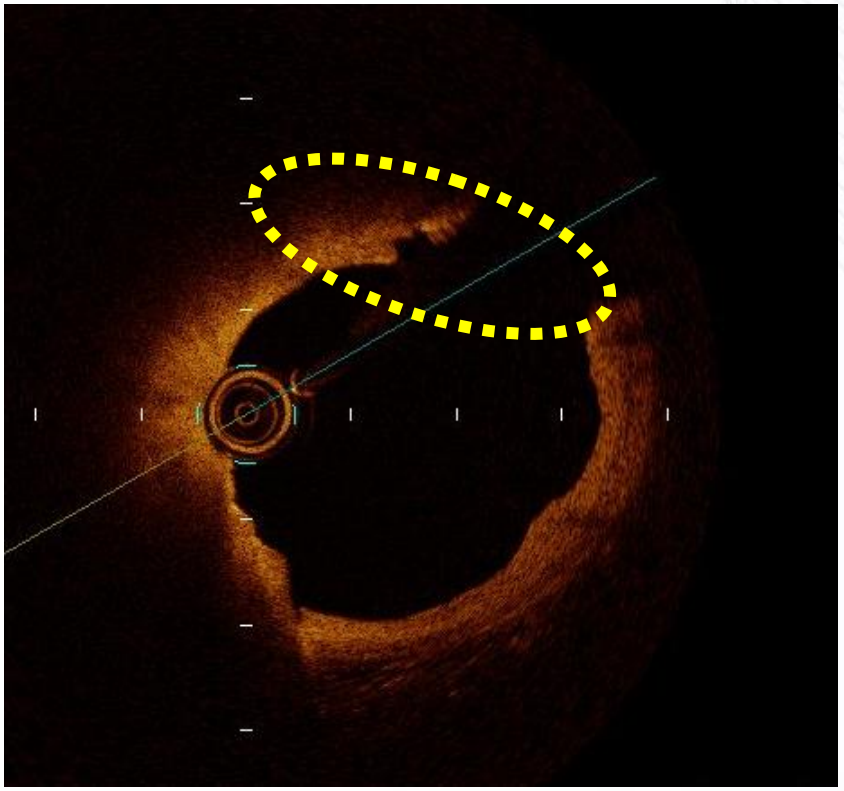




Plaque area 45.8%

# Case 1

## Post PCI OCT (DCA +DCB)

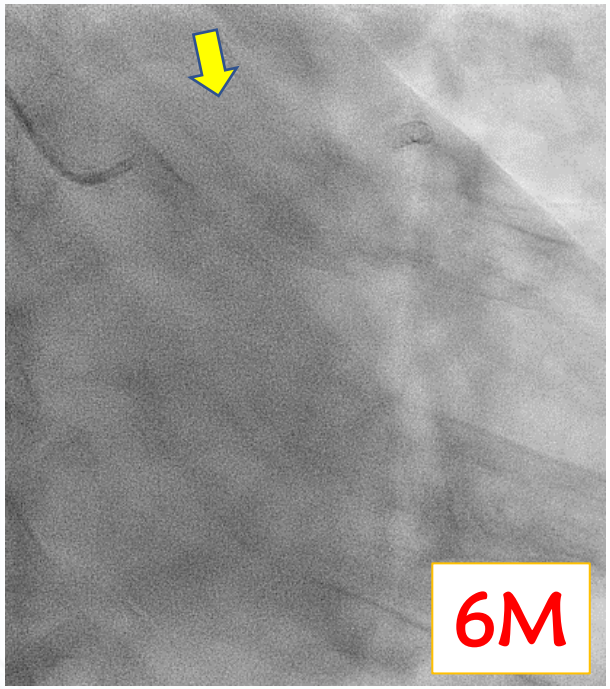


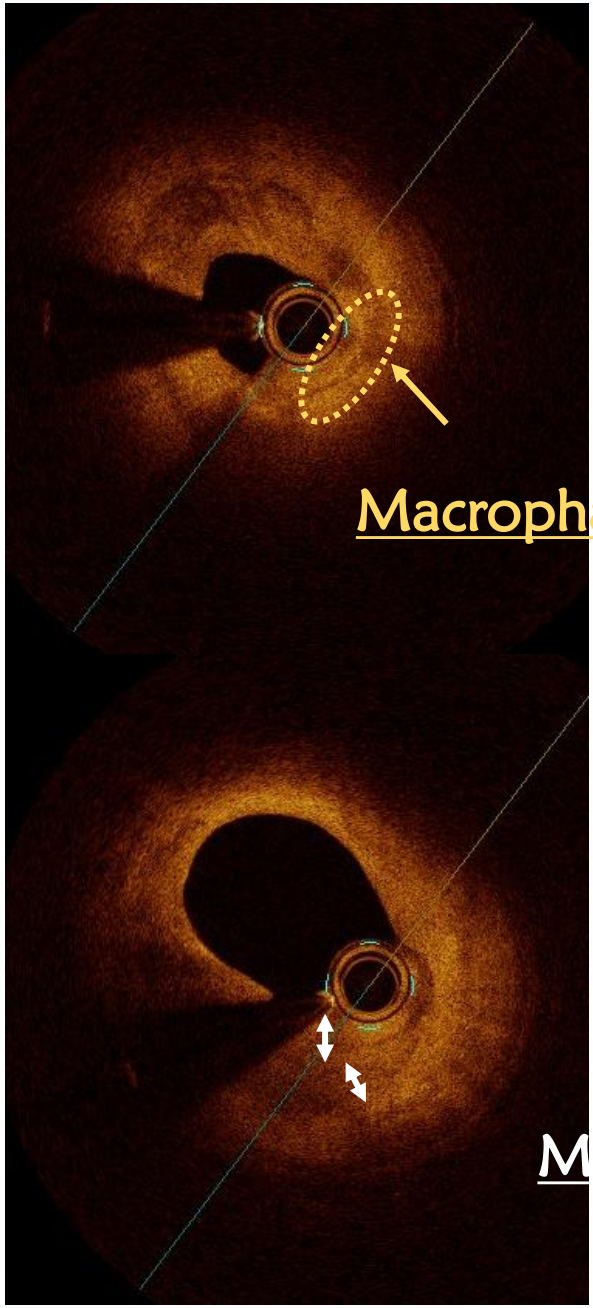
Surface Irregularity and Distorted shape of lumen,

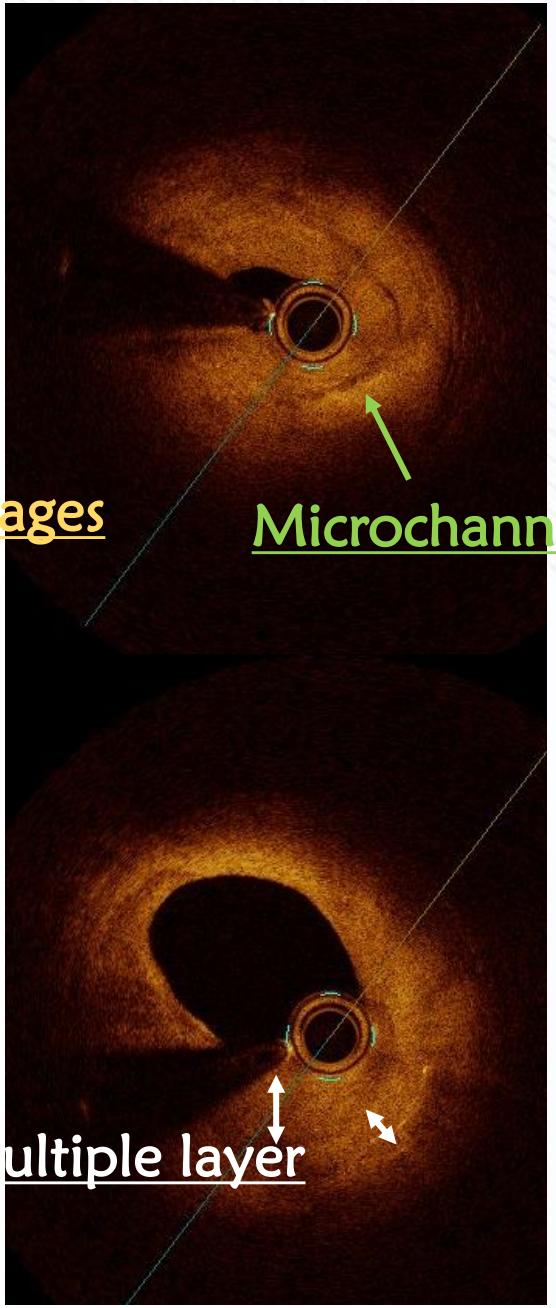
Surface of Vessel is uneven and stratum like appearance.

# OCT at F/U : 6M




Inflammation (MQ), Microchannel, and Multiple healing events (multi-layer) may be associated with TLR.



# Case 2

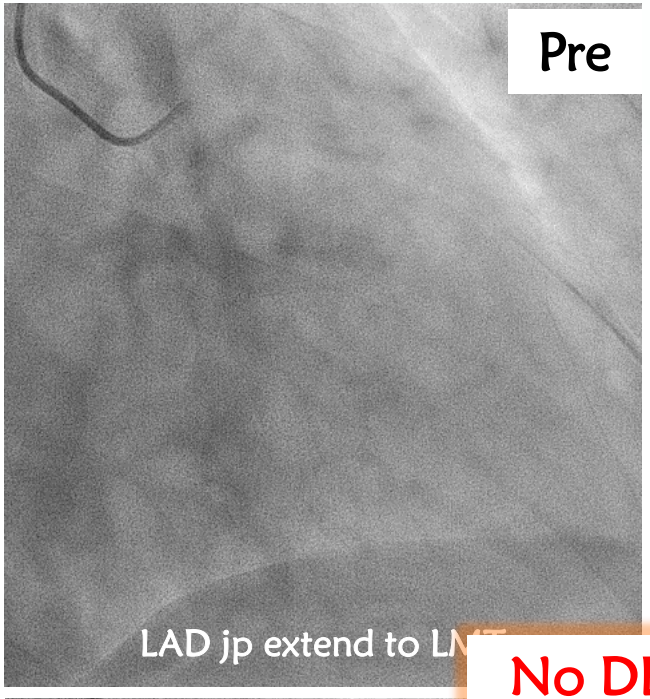
Unstable angina

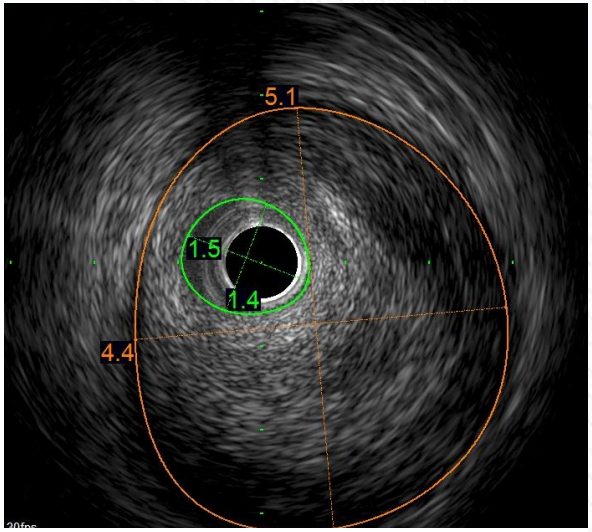
HT - , DL+, DM - ,

CKD-, Smoke-

LDL-C: 170mg/dl (at

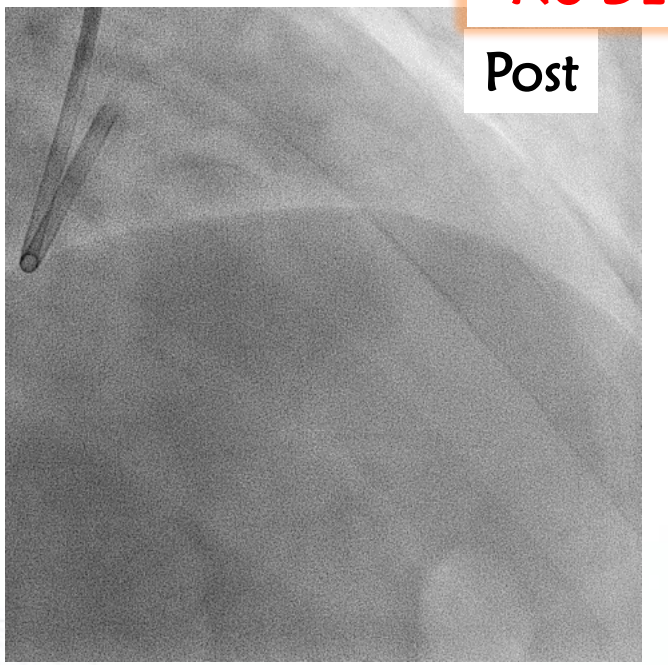
PCI) ⇨ 71mg/dl (6M)

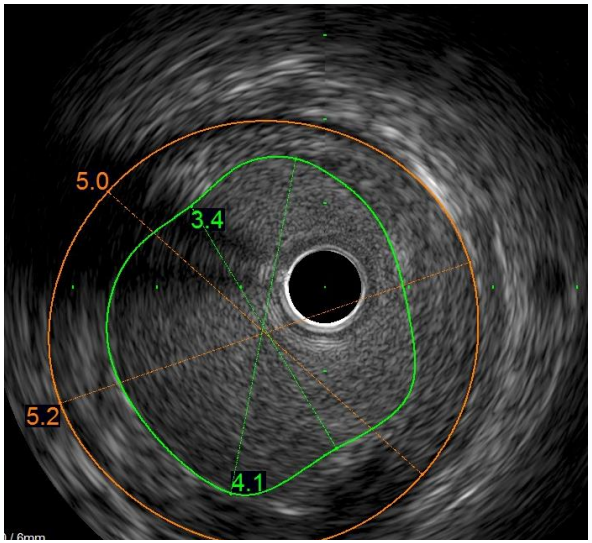



Plaque area 90.8 %

No DEEP CUTTING

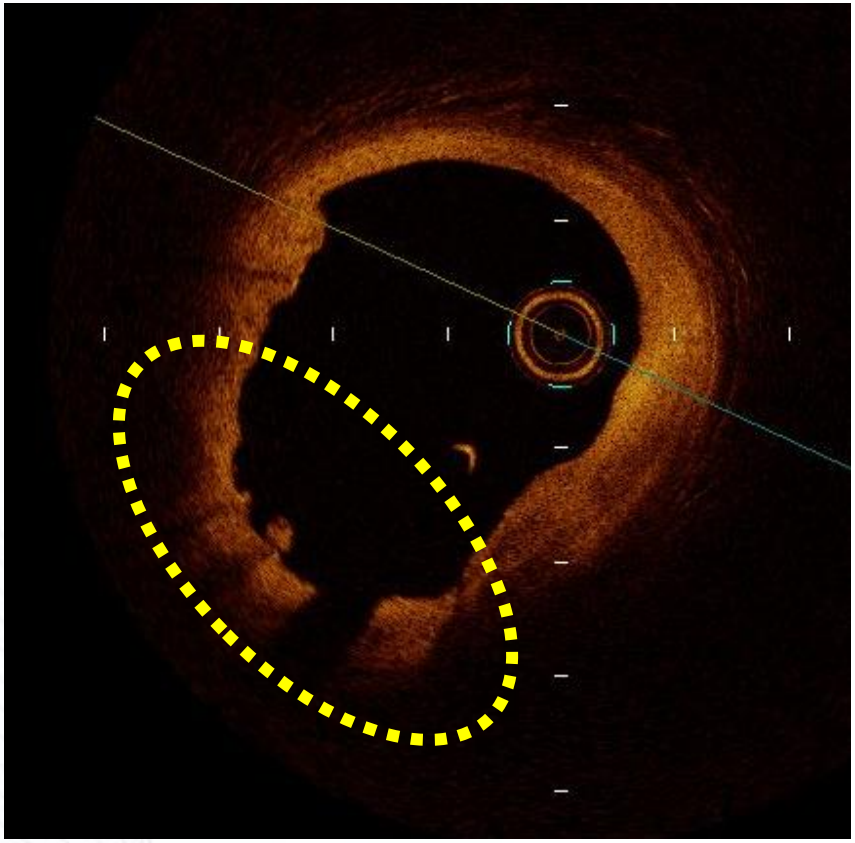


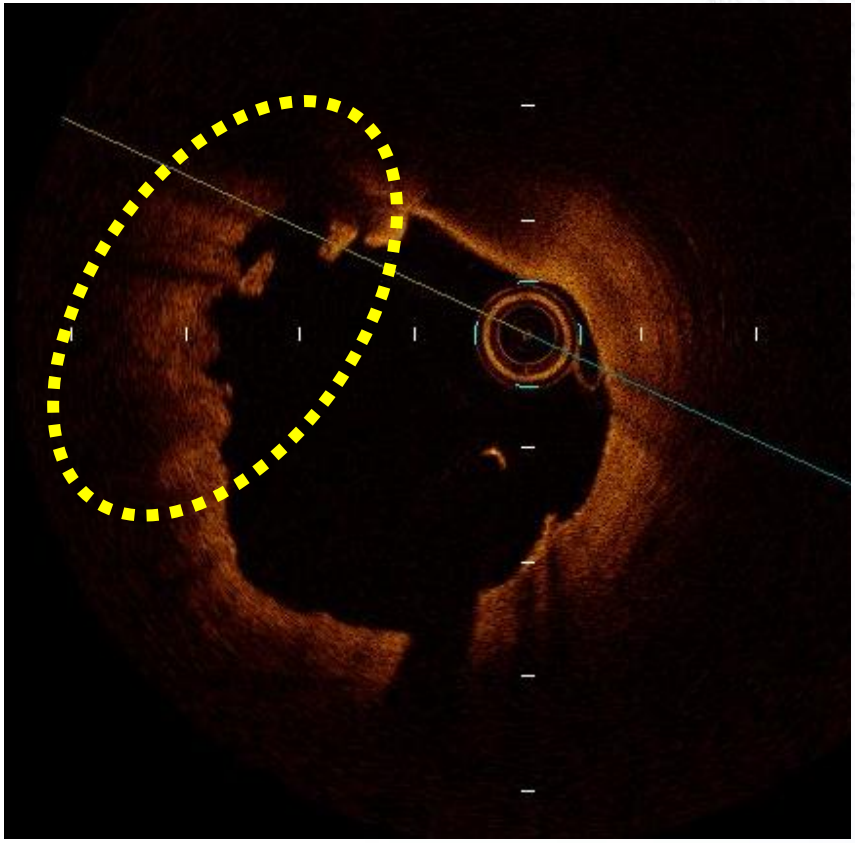




Plaque area 47.3 %

# Case 2

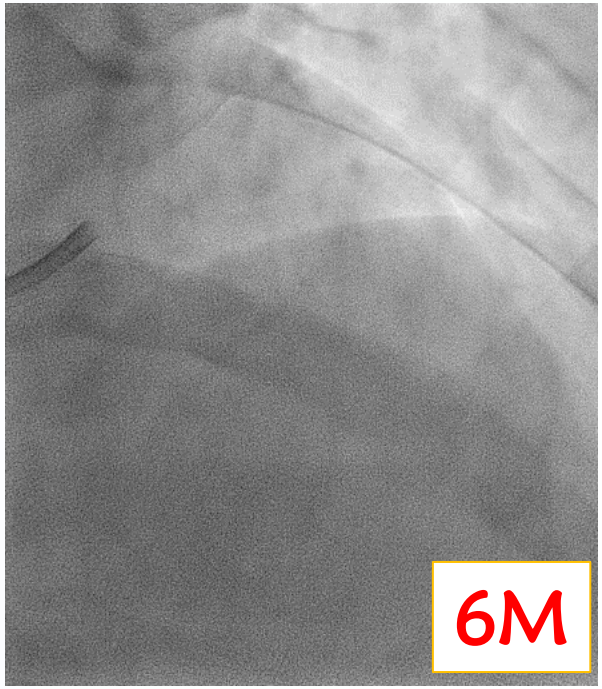
## Post PCI OCT (DCA +DCB)

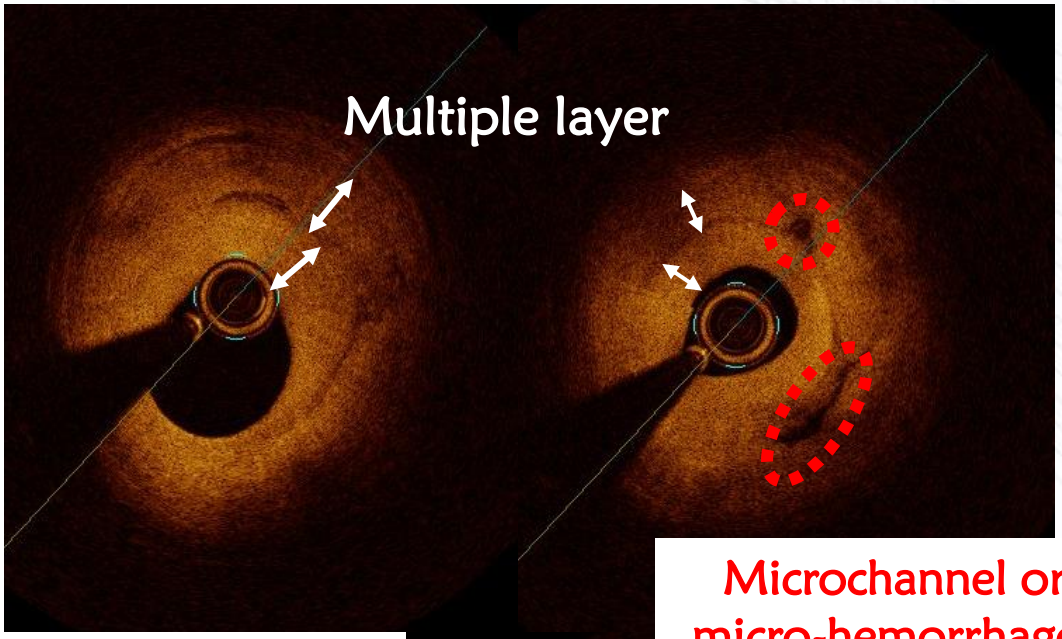




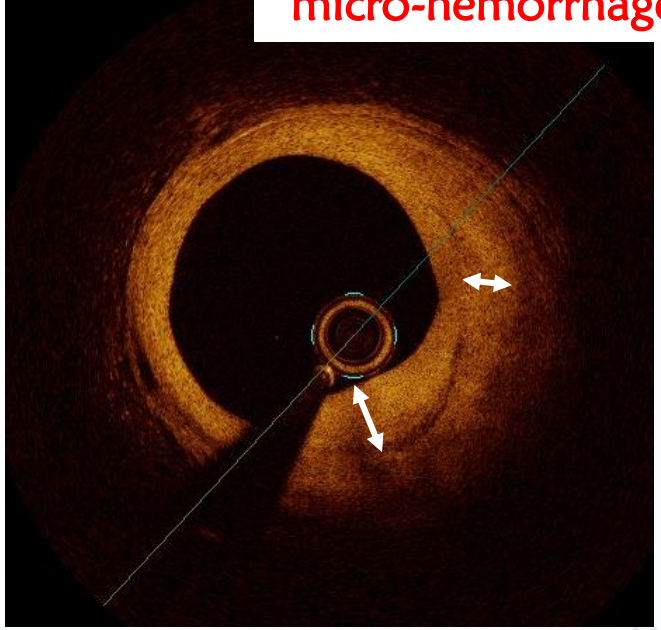
Surface Irregularity and Distorted shape of lumen,

Surface of Vessel is uneven and stratum like appearance.




Microchannel or micro-hemorrhage?

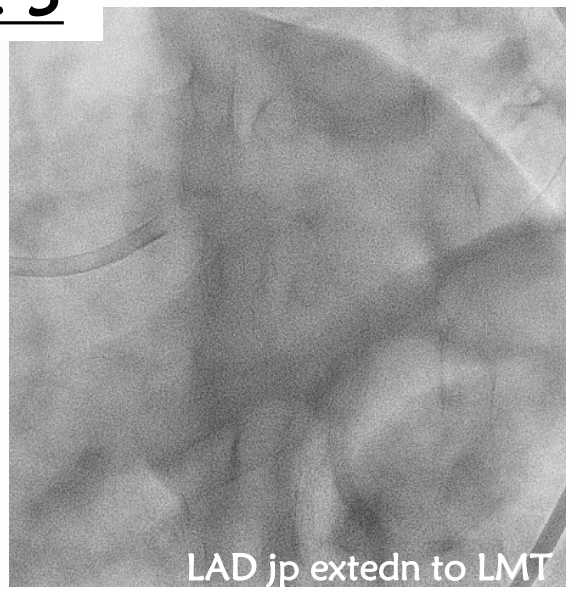


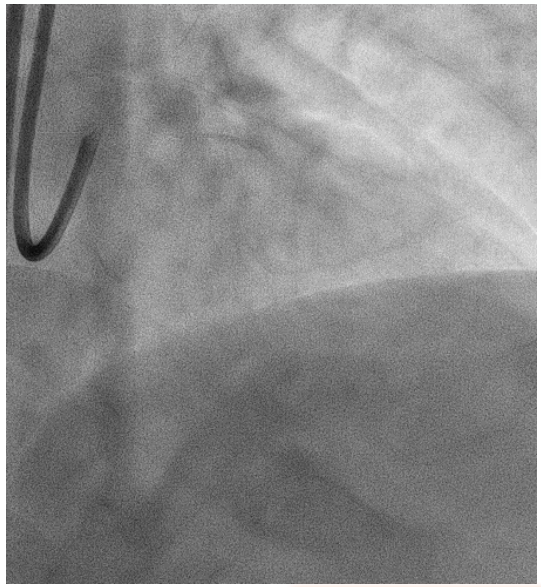
OCT at F/U : 6M

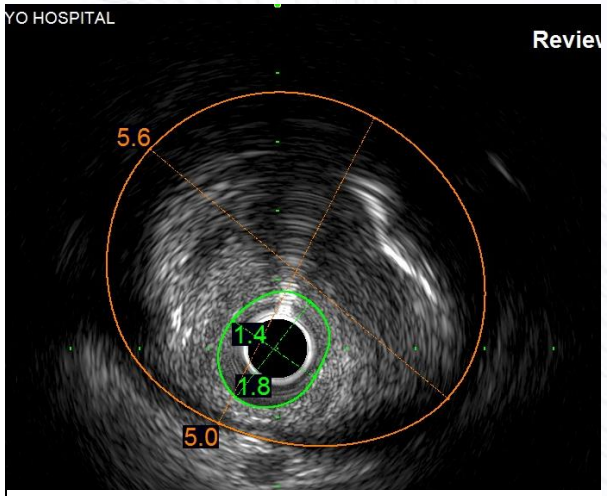
Multiple healing events (multi-layer) and microchannel or its disruption (micro-hemorrhage between layer) may be associated with TLR.

# Case 3

Pre



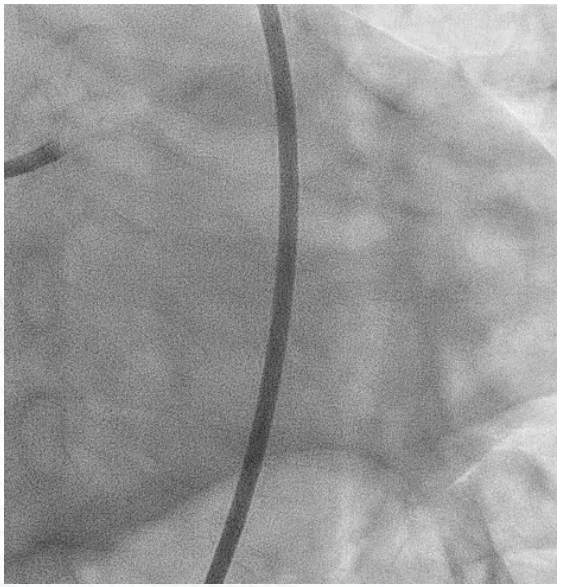



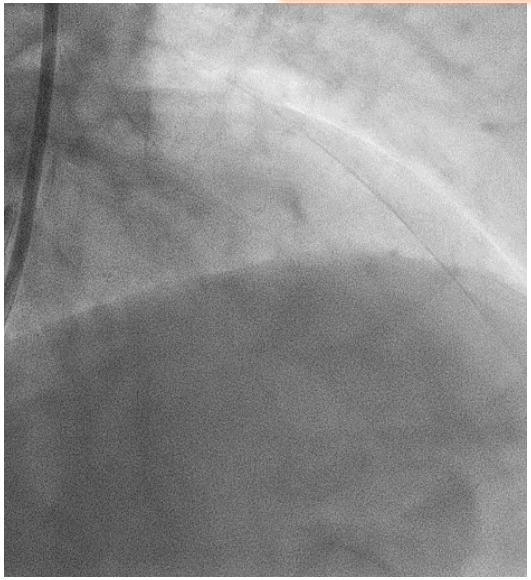


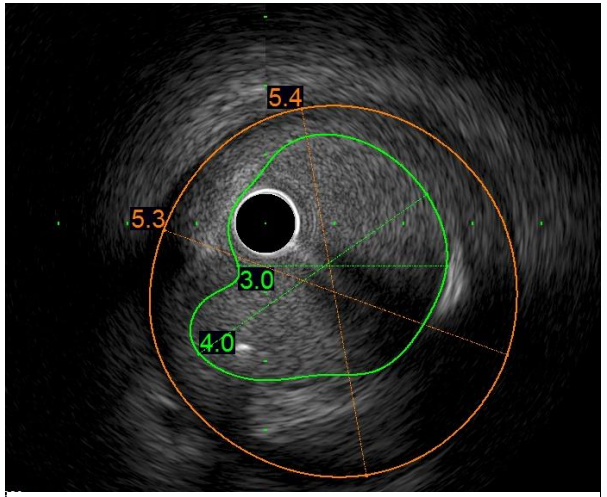

Plaque area 90.6 %

No DEEP CUTTING

Post



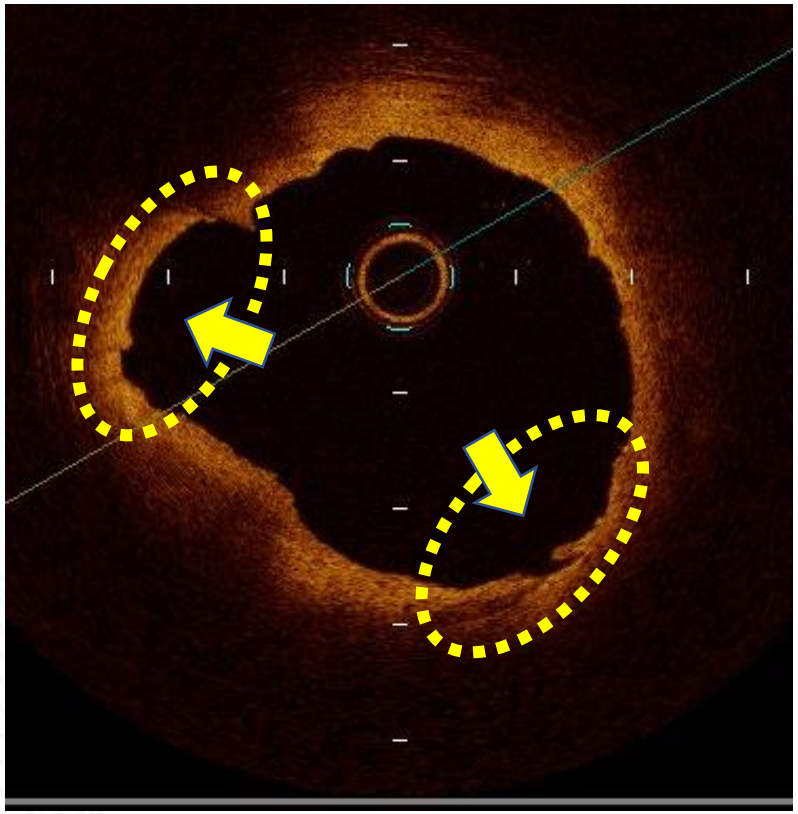


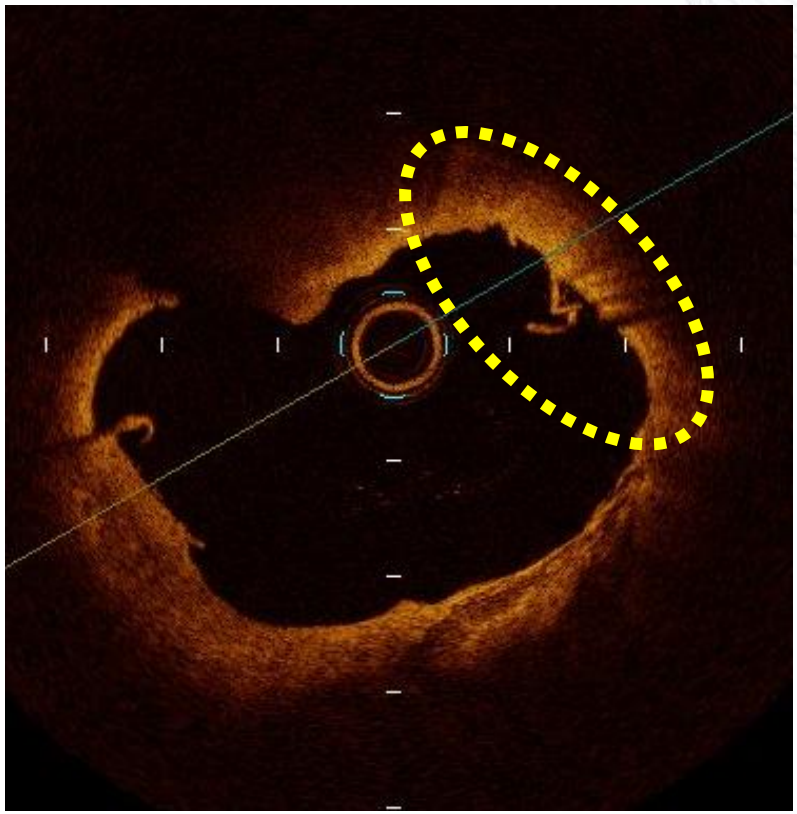



Plaque area 40.9 %

# Case 3

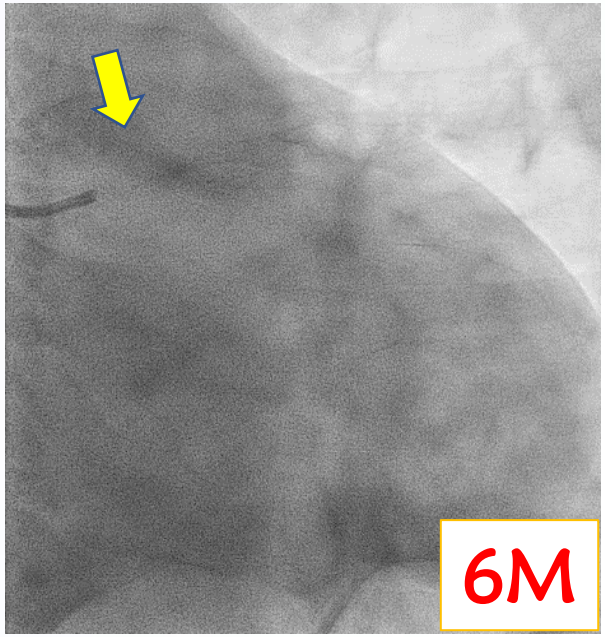
## Post PCI OCT (DCA +DCB)

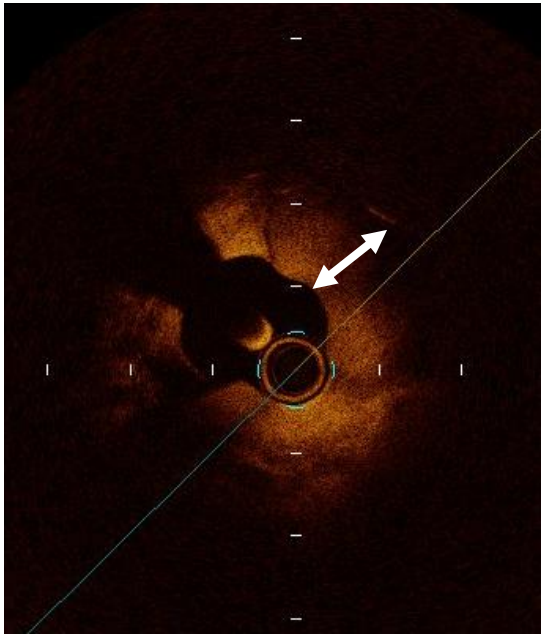


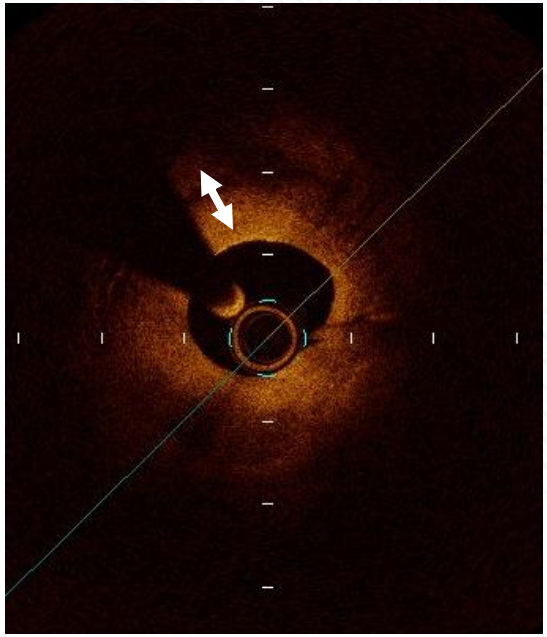


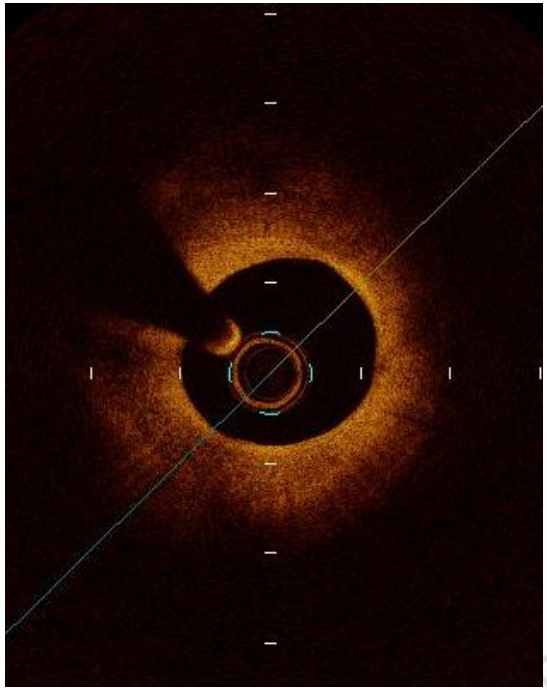
Surface Irregularity and Distorted shape of lumen,

Surface of Vessel is uneven and Stratum like appearance.







OCT at F/U : 6M

Excessive layer (thick neointima) formation may be another mechanism for TLR.

# Consideration

1. Clinical presentation (e.g. UAP) and Co.Risk factors can be associated with plaque progression after DCA + DCB

2. Multiple healing events, which form multiple layer, may be one of the mechanisms for plaque progression after DCA + DCB.

3. Microstructures such as microchannel (and micro-plaque homorrhage between layers) can relate to plaque progression.

4. Inflammation (macrophages) and excessive healing (thick-neointima) may be also mechanisms for plaque progression after DCA + DCB.

**We supposed Distorted shape of lumen, Uneven Surface ;**

**Stratum like appearance Might cause Un-Even Endothelialization.**

**Which means resulting "Multilayer Healing"**