How to achieve optimal bifurcation stenting, use of 3D-OCT guide

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Disclosure

Junya Shite M.D.

Consultant honoraria:

Abbott

Nipro

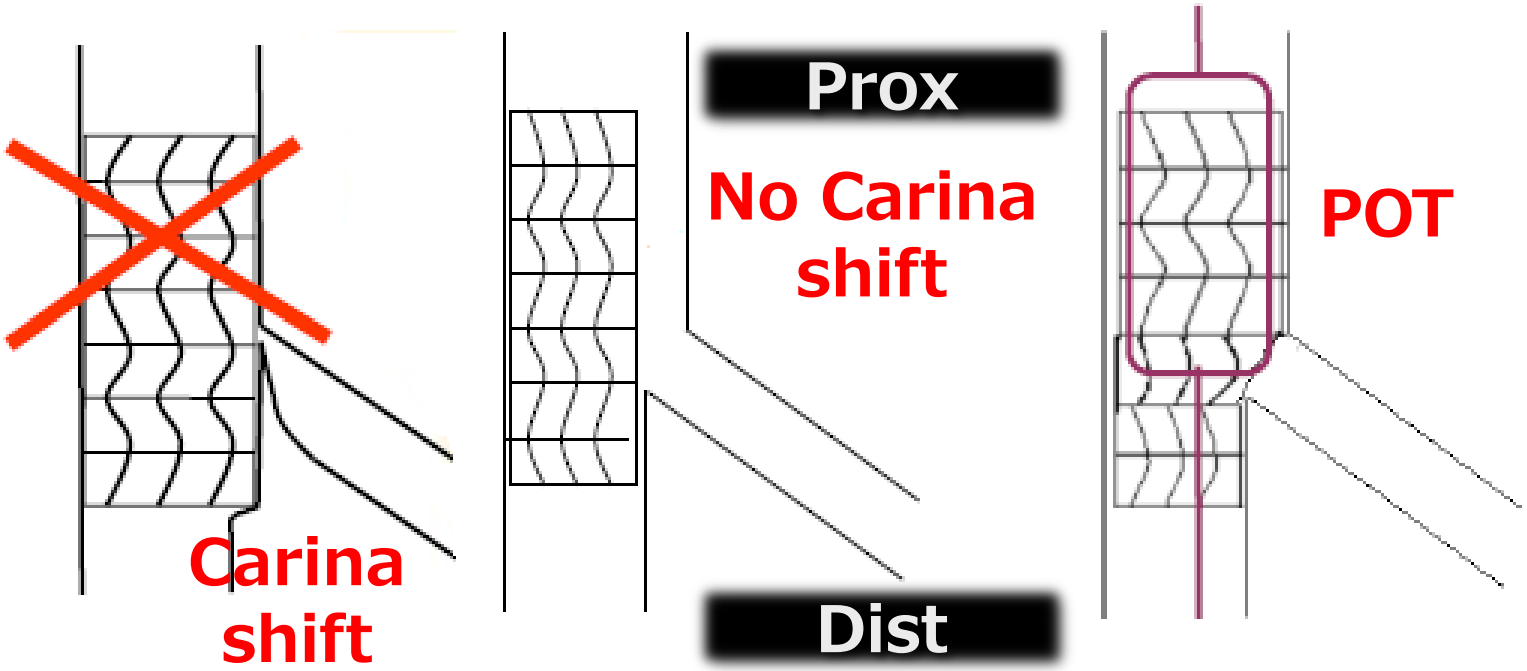
Terumo

How should we implant stent in bifurcation?

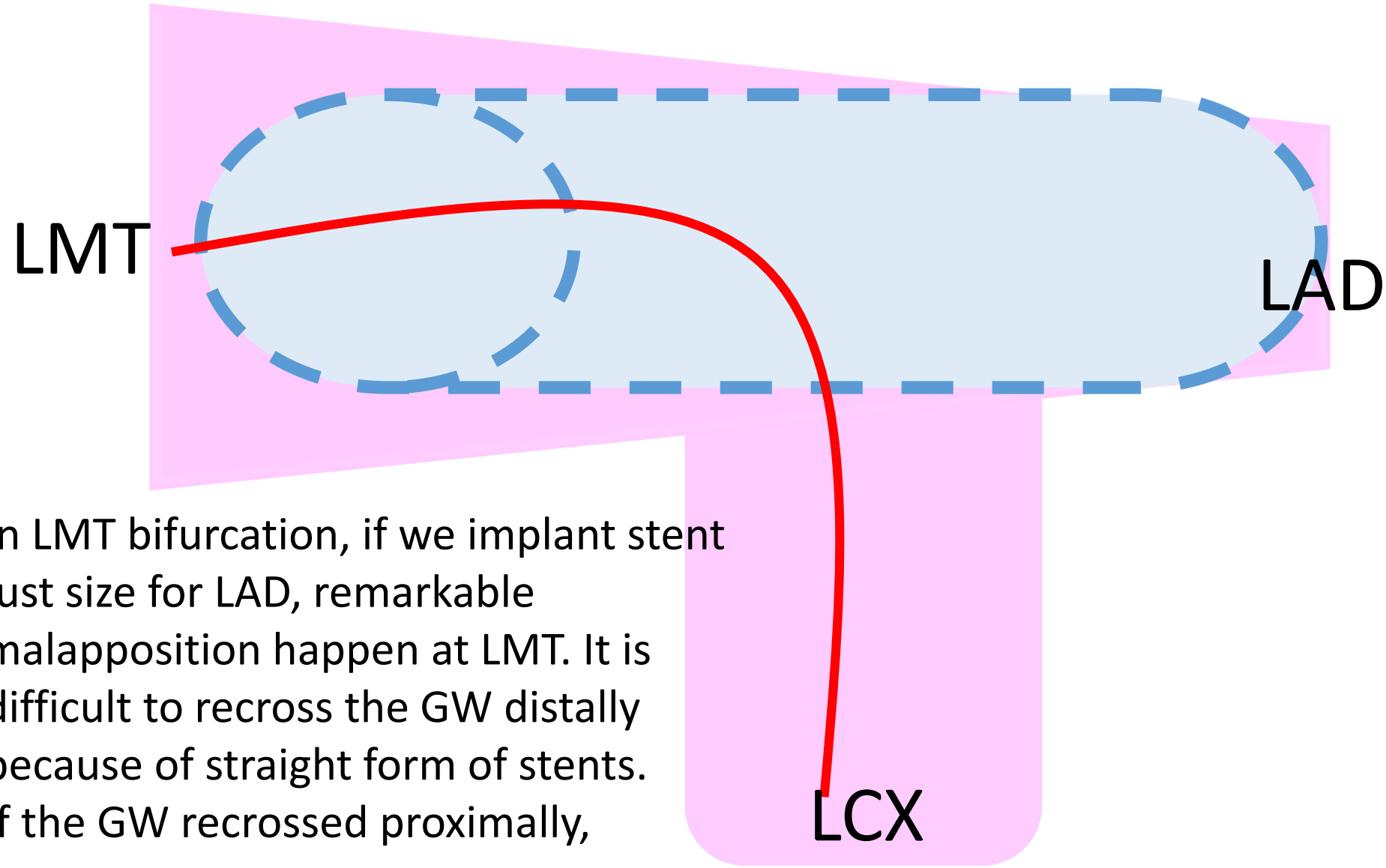
We should select single stenting with kissing balloon technique (KBT) as possible, otherwise two stenting with culotte etc.

For optimal stenting, full stent expansion, good apposition and less jailed struts at side branch orifice should be obtained.

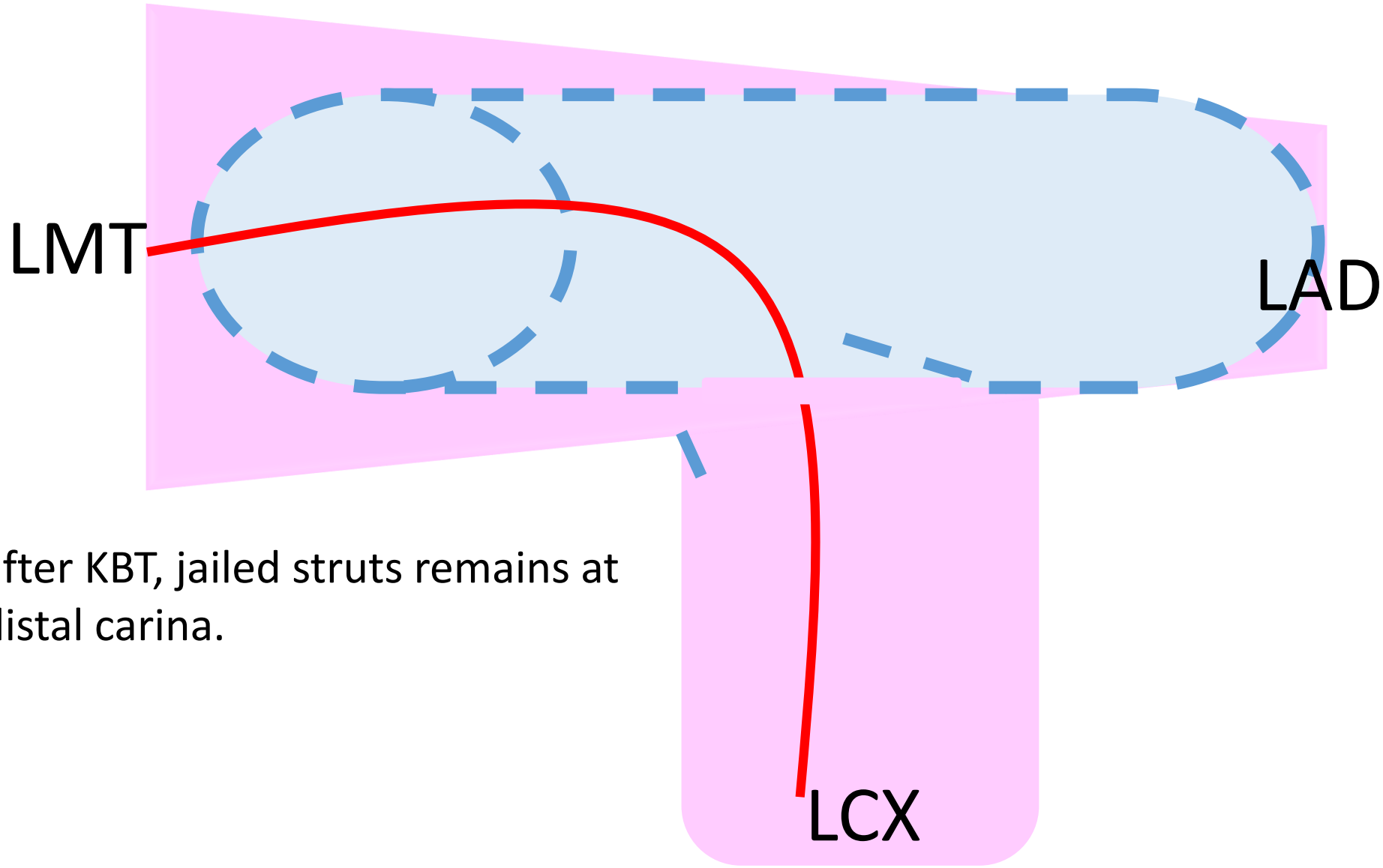
In bifurcation, there is a vessel size change in main vessel at proximal and distal of side branch.
If the stent size selected to adjust proximal site, stent distal edge dissection and carina shift may happen. If the stent selected to adjust distal site, no edge dissection and no carina sift may happen, however, stent malapposition occurrs. Proximal optimization technique (POT) should be performed .



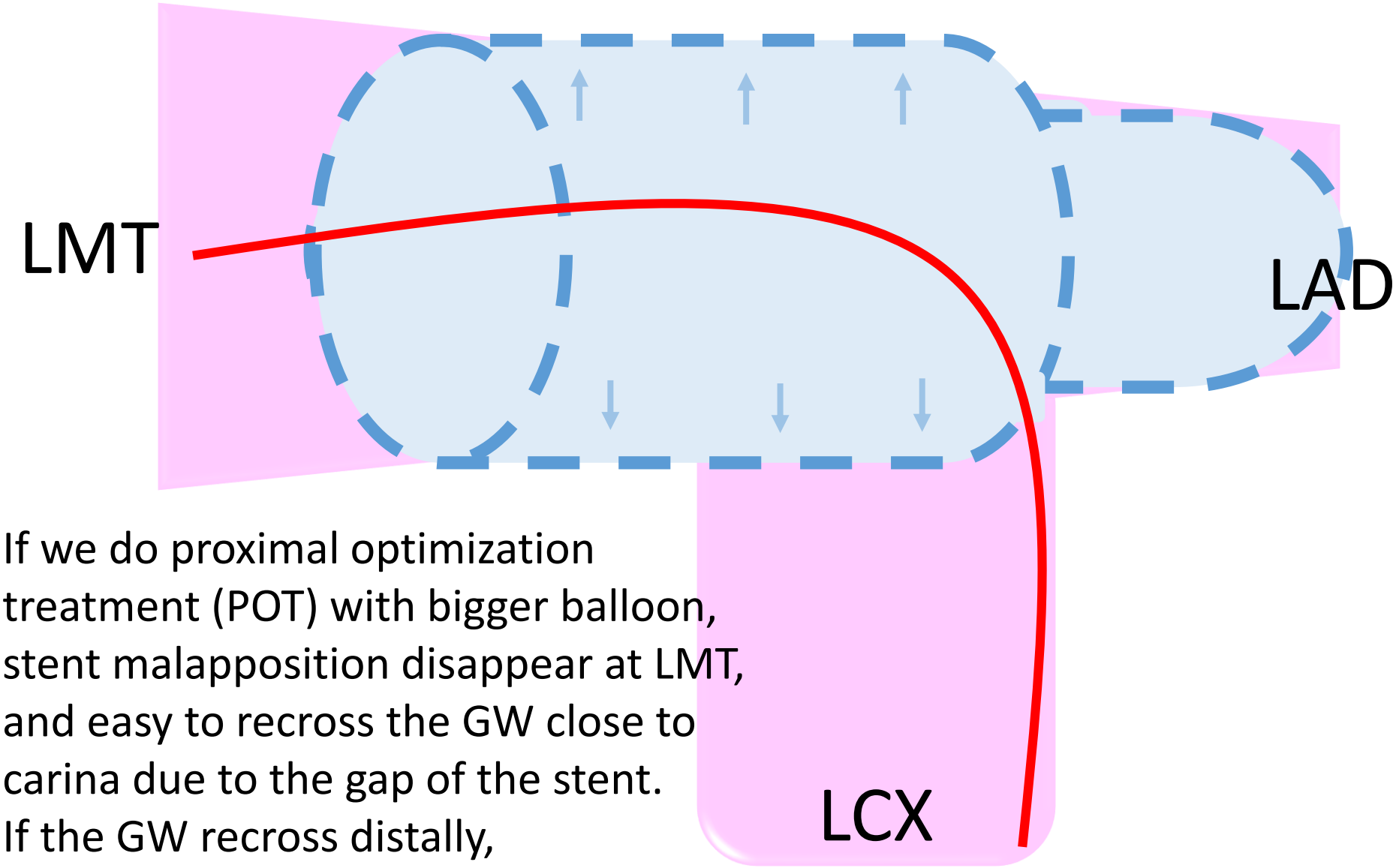
1 Stankovic EBC 2012



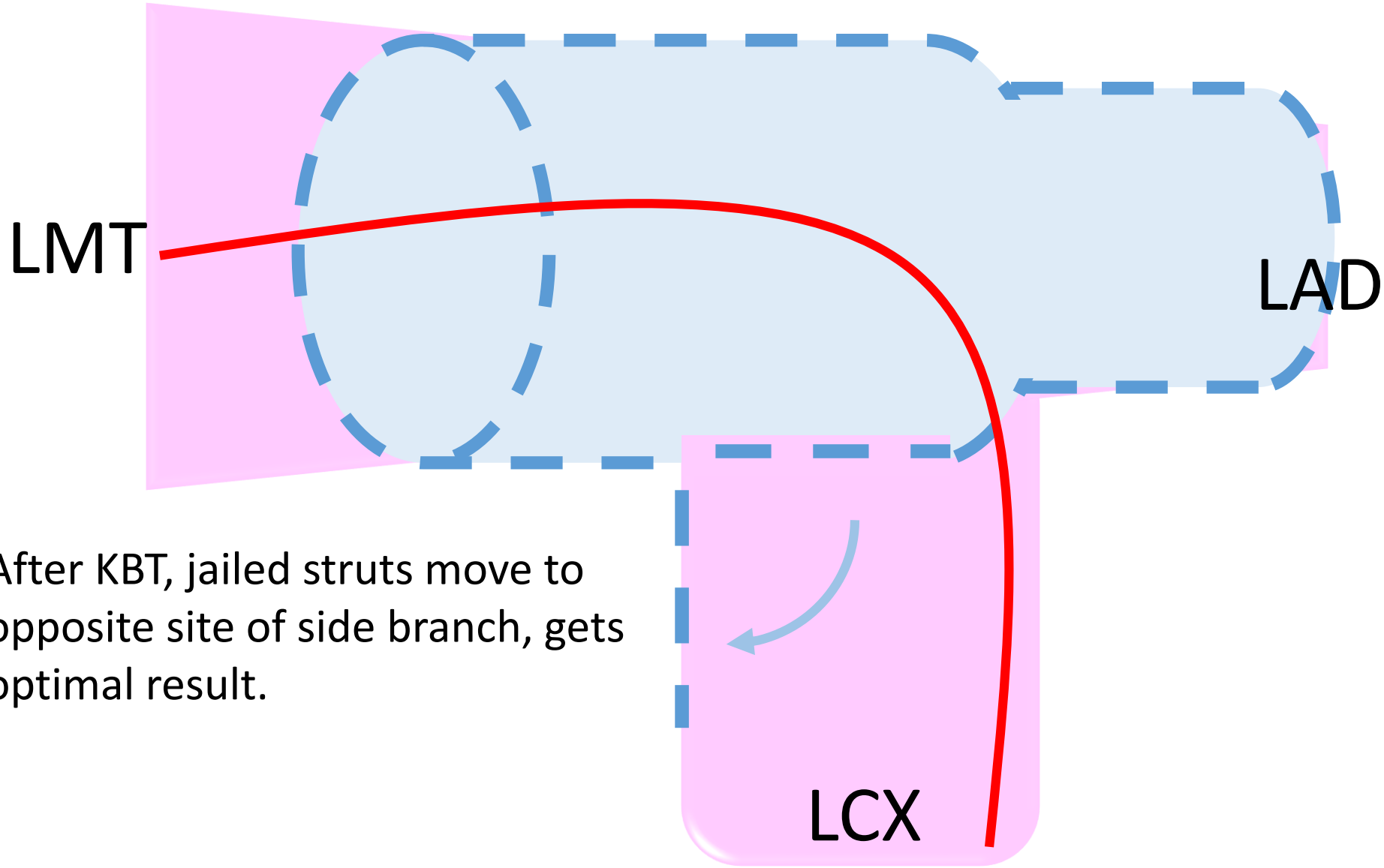
In LMT bifurcation, if we implant stent just size for LAD, remarkable malapposition happen at LMT. It is difficult to recross the GW distally because of straight form of stents. If the GW recrossed proximally,



after KBT, jailed struts remains at distal carina.



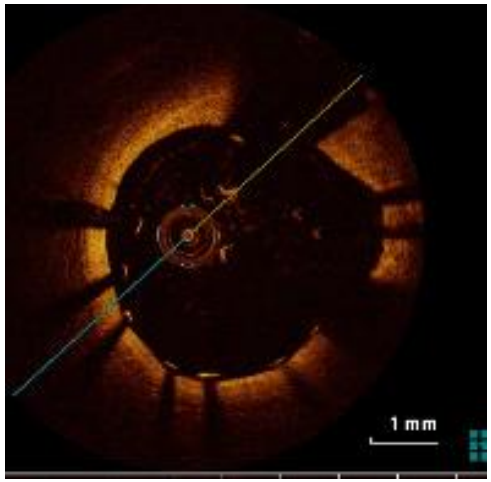
If we do proximal optimization treatment (POT) with bigger balloon, stent malapposition disappear at LMT, and easy to recross the GW close to carina due to the gap of the stent.
If the GW recross distally,

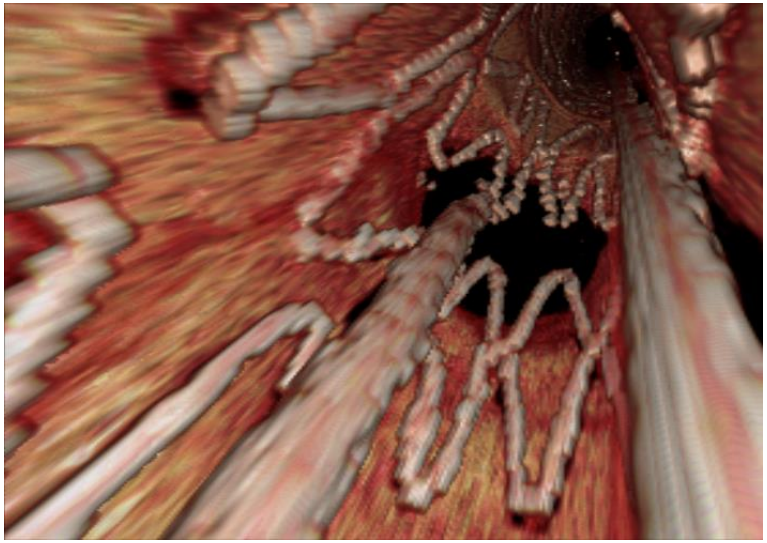


After KBT, jailed struts move to opposite site of side branch, gets optimal result.

3D-OCT gives image information

- Stent apposition
- Stent cell figure
- Location of stent link in relation to side branch orifice
- GW recrossing position

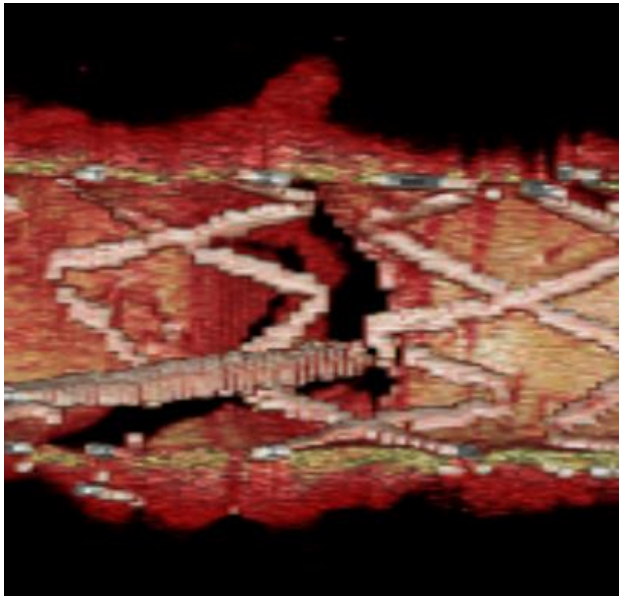


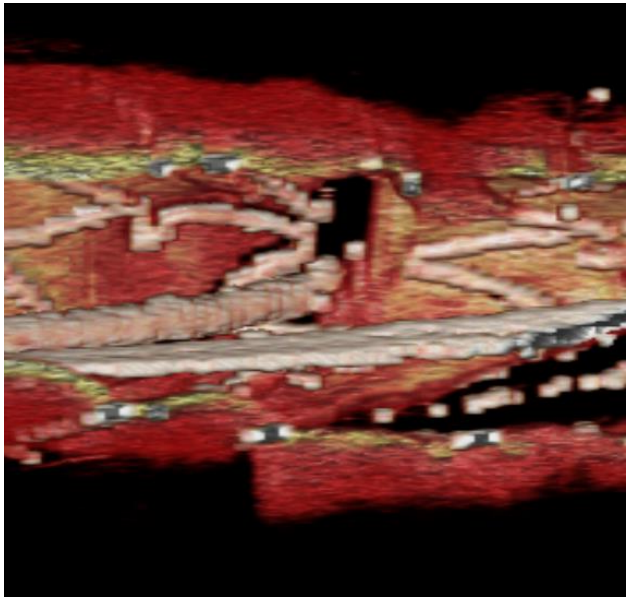


Using specific off-line
3D-software provided by Dr. Okamura

3D OCT investigators

Stent link disturbs side branch opening





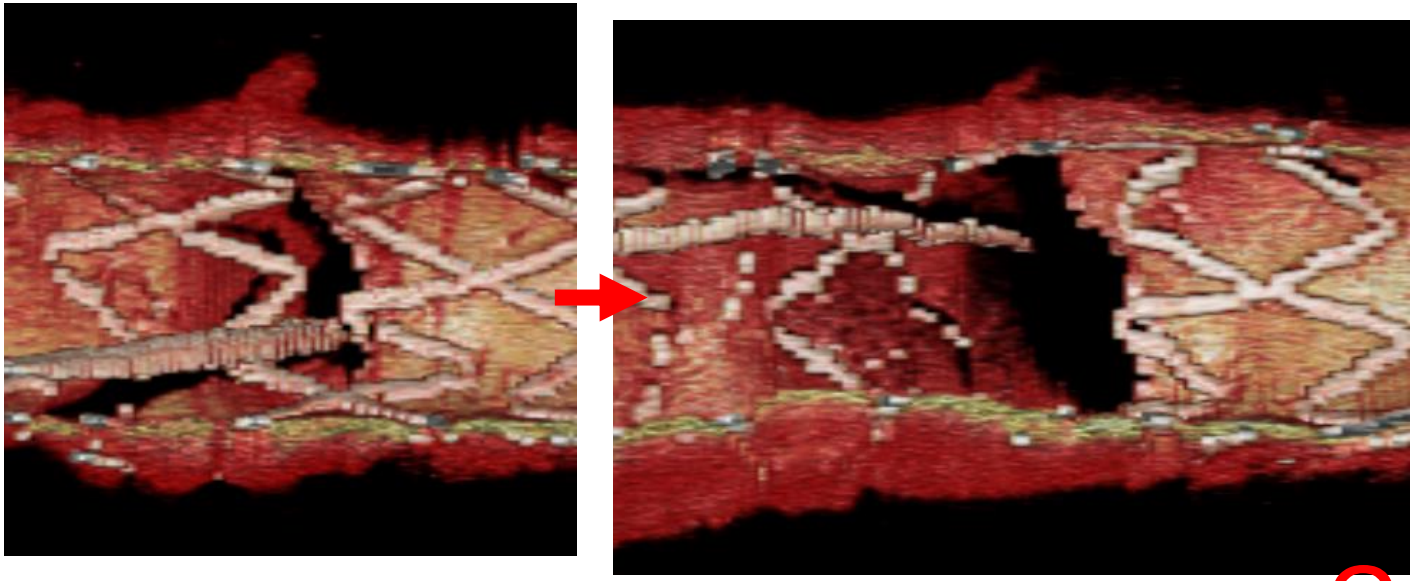
Stent link did not locate at side branch orifice:

Link Free type

Optimal GW recross point:

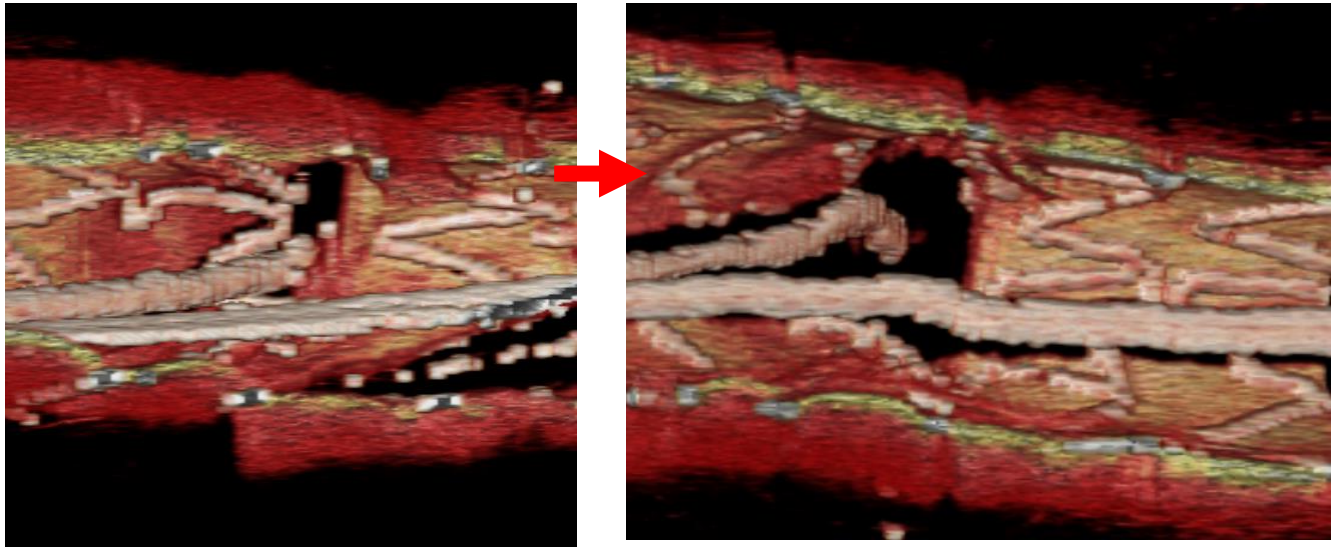
Distal cell close to carina

Link Free type



GW distal cell recross and KBT

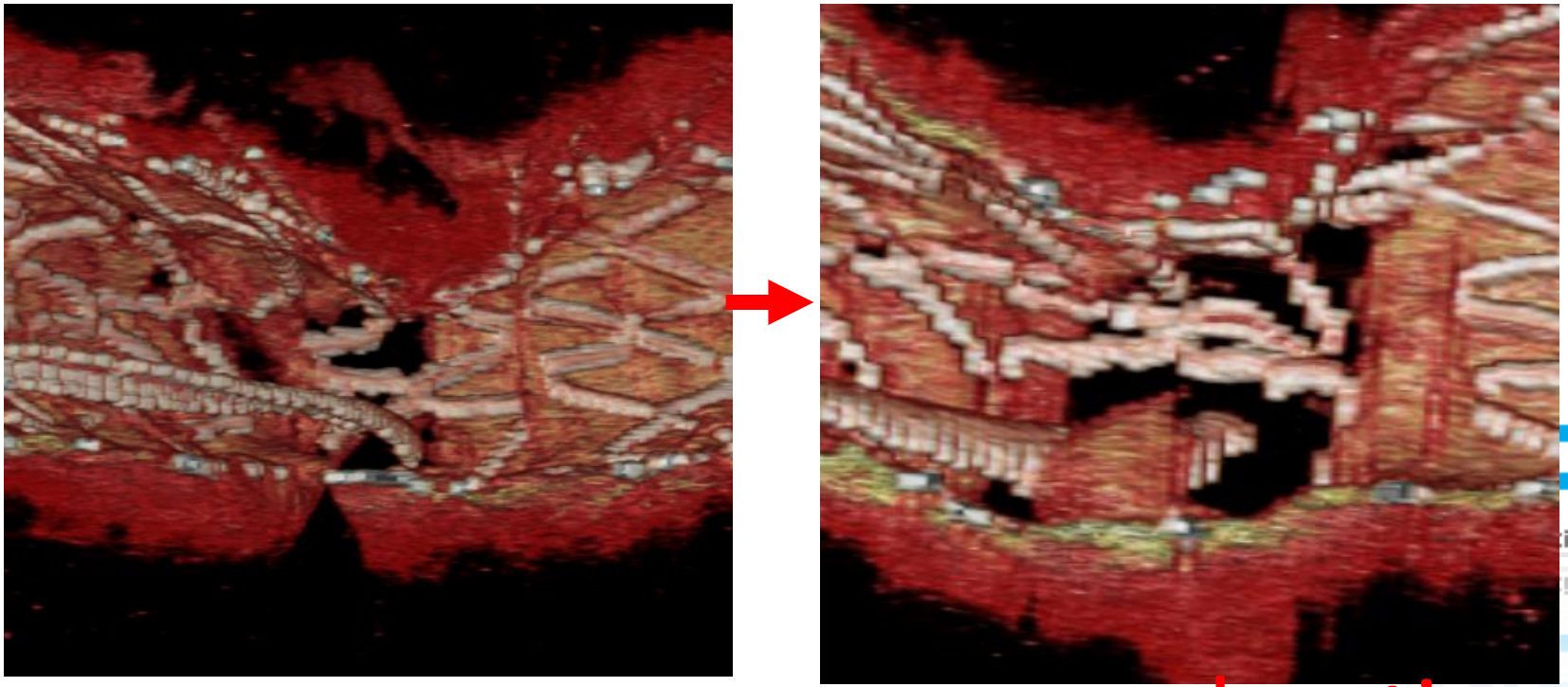
Optimal



If the stent link locates closed to carina

Link Connecting to carina type

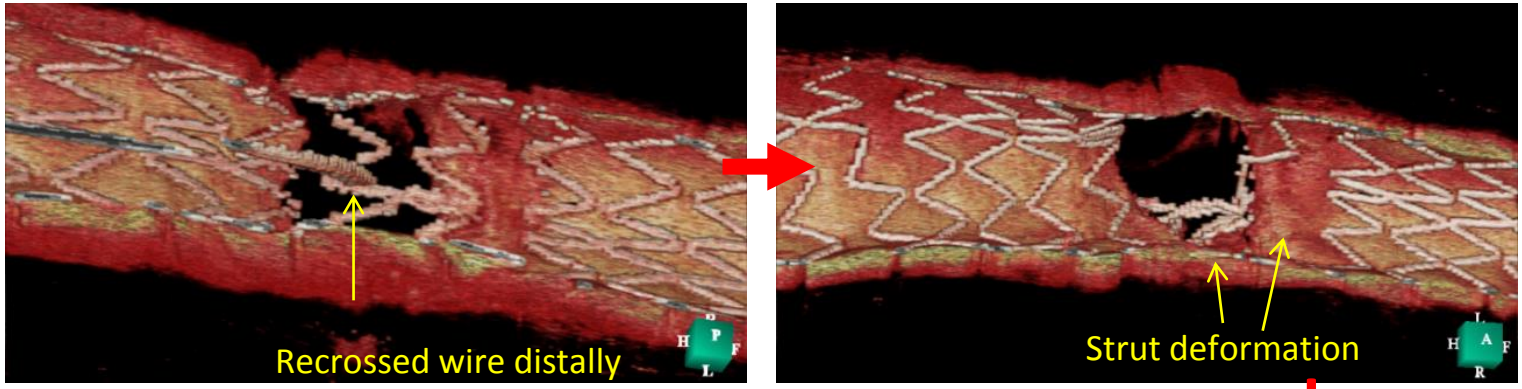
It is difficult to remove the jailed struts by KBT.



suboptimal

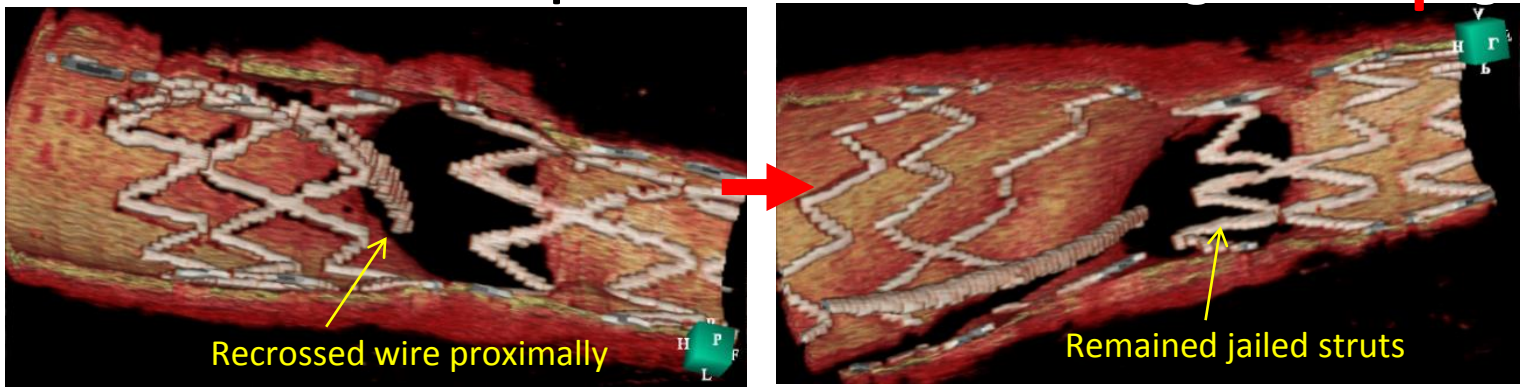
Link Connecting to carina type

GW recross distal cell



GW recross proximal cell

suboptimal



3D OCT investigators

3D-OCT Bifurcation Registry : Impact of 3D-OCT guided Optimal Side Branch Dilation on Residual Jailed Struts and Clinical Outcome at 9 Month

Takayuki Okamura, Ryoji Nagoshi, Tatsuhiro Fujimura, Yoshinobu Murasato, Masahiro Yamawaki, Shiro Ono, Takeshi Serikawa, Yutaka Hikichi, Hiroaki Norita, Fumiaki Nakao, Tomohiro Sakamoto, Toshiro Shinke, Junya Shite

on behalf of the 3D-OCT Bifurcation Registry Investigators

Methods

Subject entry:
2014 ~ 2015.

Stenting for main vessel

GW recross to side branch

OCT assessment for GW recross point

on-site 3D-OCT guide
3 hospitals

2D-OCT guide
7 hospitals

Optimal recrossing
No Yes

Kissing ballooning to main vessel and side branch

OCT final assessment for main vessel

Clinical and Angio follow-up at 9 month

3D OCT investigators

3D-guide vs 2D-guide

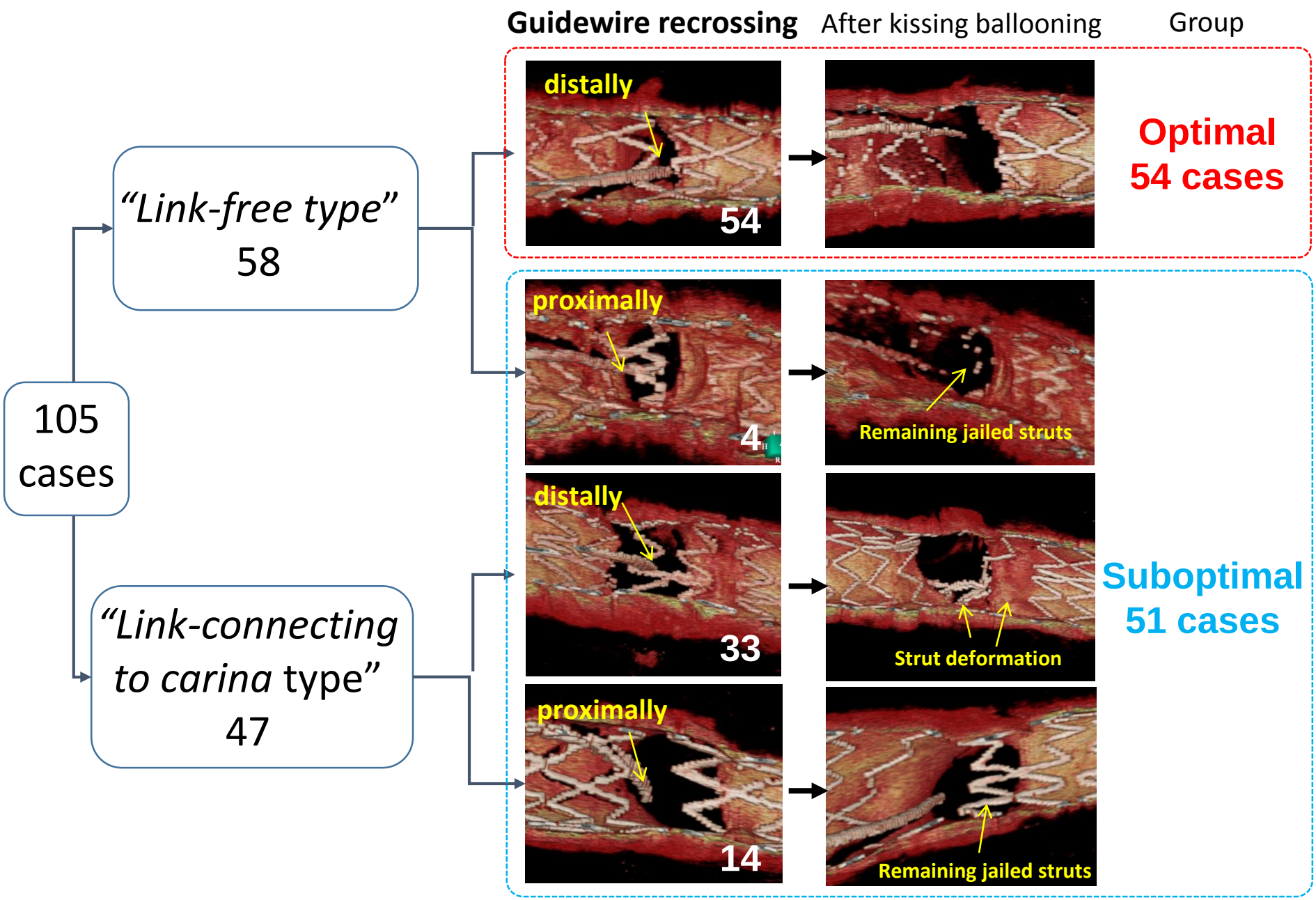
	All (n = 105)	3D-guide (n = 55)	2D-guide (n = 50)	P value
GW Distal recrossing (%)	87/105 (83)	50/55 (91)	37/50 (74)	0.0362
Average recross times (min-max times)	1.3±0.6 (1-3)	1.55±0.69 (1-3)	1.08±0.34 (1-3)	<0.001
≥2 recross (%)	27/105 (26)	24/55 (44)	3/50 (6)	<0.001
Contrast volume (ml)	158±52	146±46	171±55	0.0130
Radiation time (min)	34.1±16.5	36.7±16.8	31.2±15.8	0.0911

3D OCT investigators

Factors contributing to incidence of jailed struts at side branch ostium

Parameters	Estimate	Standard Error	t value	p value	Standard Beta
Link-connecting type	0.0289	0.0075	3.82	0.0002	0.3414
GW not distal rewiring	0.0344	0.0098	3.50	0.0007	0.3098
Angle SB-DMV	0.0007	0.0003	2.26	0.0261	0.1985
PMV reference diameter	0.0195	0.0128	1.53	0.1301	0.1572
No smoking	0.0108	0.0079	1.36	0.1757	0.1293
Intercept	0.0722	0.0424	1.70	0.0918	0
Female	-0.010	0.0085	-1.20	0.2324	-0.1123
No hypertension	-0.017	0.0122	-1.39	0.1680	-0.1167
SB balloon size	-0.037	0.0202	-1.87	0.0645	-0.2014

Frequency of jailing configuration and GW rewiring position



Clinical Outcome at 9 Month

	All	Optimal	Suboptimal	P value
n	100	52	48	
MACE	6(6)	3(5.7)	3(6.3)	1.0000
Death	1(1.0)	0(0)	1(1.0)	0.4800
Non fatal MI	0(0)	0(0)	0(0)	-
Revascularization				
TVR	1(1.0)	1(1.92)	0(0)	1.0000
TLR	4(4.0)	2(3.9)	2(4.2)	1.0000
Stent thrombosis	1(1.0)	0(0)	1(1.0)	0.4800

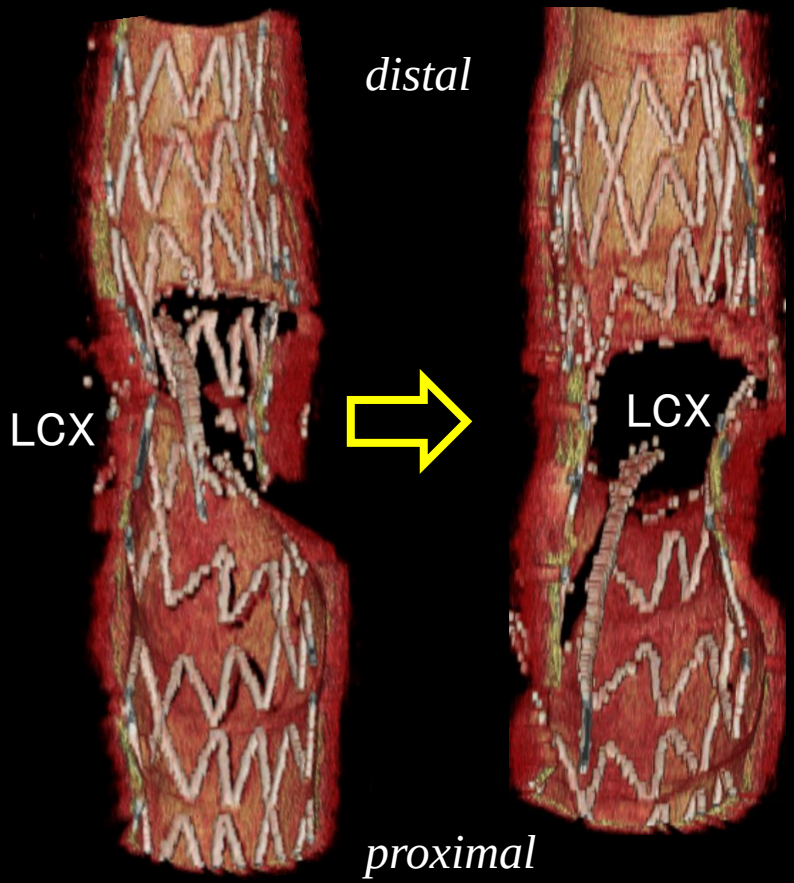
3D OCT investigators

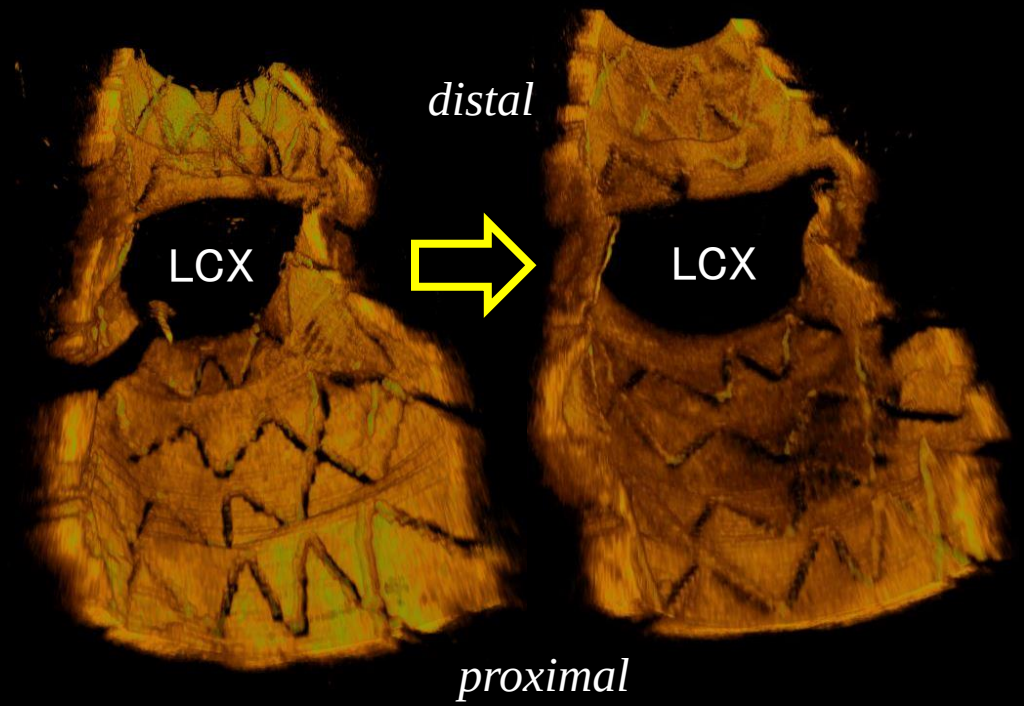
Angiographic ISR at 9 Month

	All	Optimal	Suboptimal	P value
n	87	48	39	
ISR	12(13.8%)	4(8.3%)	8(20.5%)	0.1254
PMV	0(0%)	0(0%)	0(0%)	-
DMV	1(1.1%)	1(2.1%)	0(0%)	1.0000
Side Br Orifice	12(13.8%)	4(8.3%)	8(20.5%)	0.1254

Representative Examples

Optimal





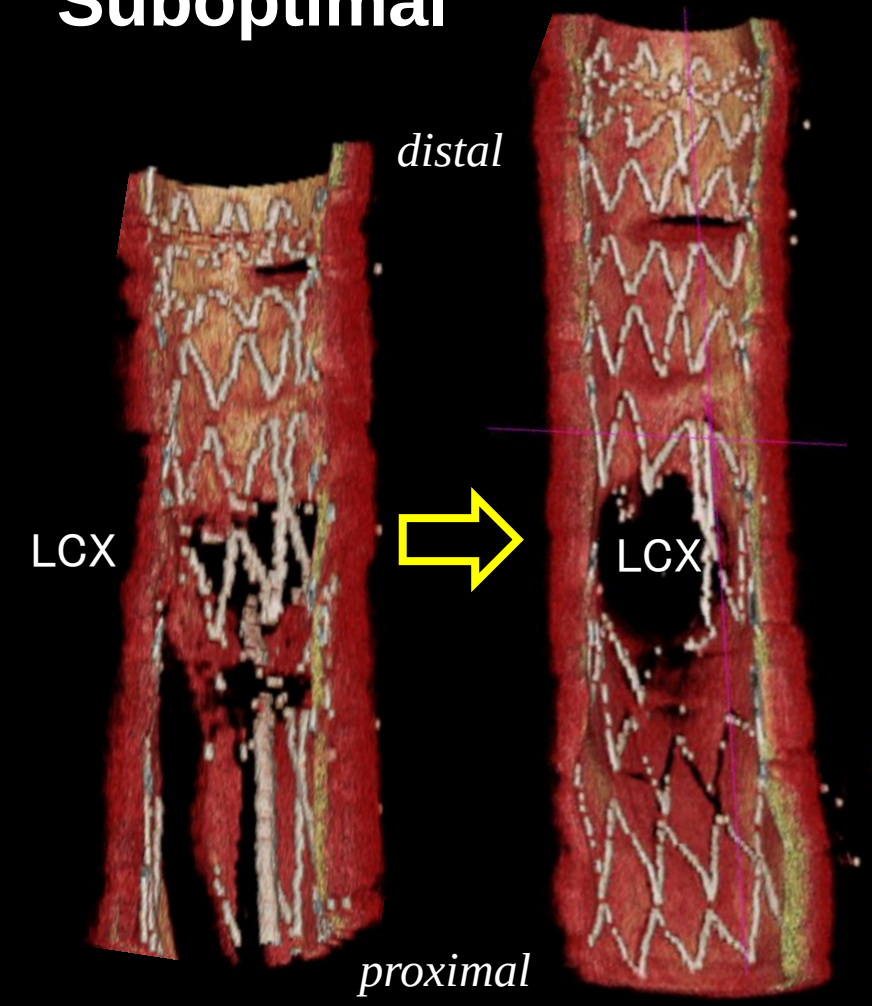
pre; 7.02mm^2
NC; 1

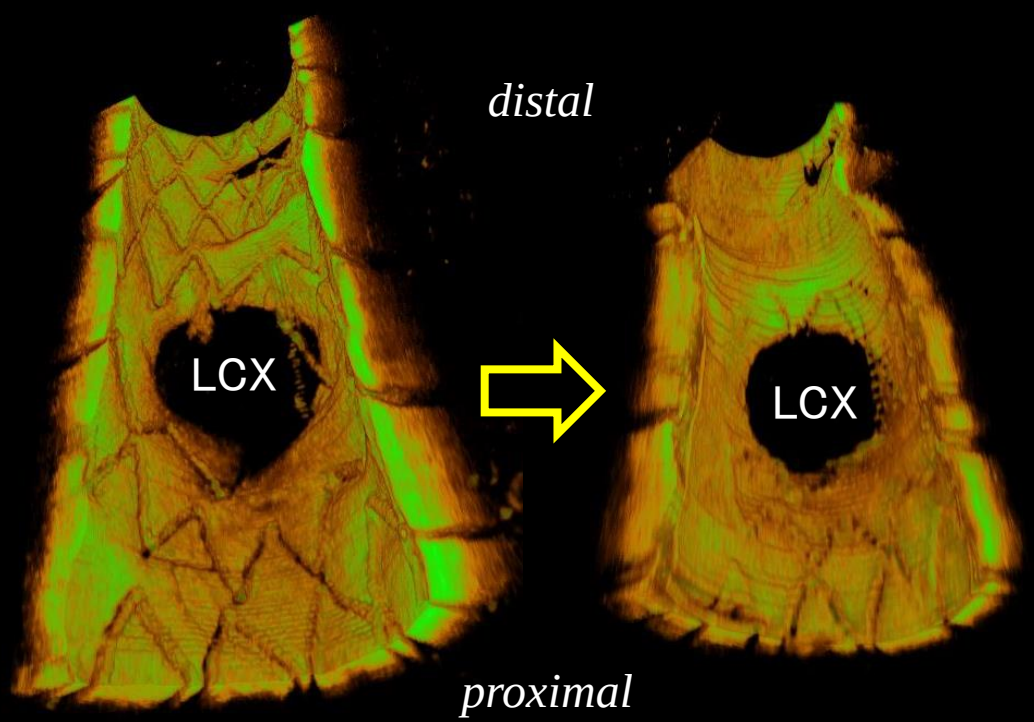
post; 8.94mm^2
NC; 1

Percent serial change in the SBOA= (8.94−7.02)/7.02 = 0.273

Representative Examples

Suboptimal





pre; 7.29mm^2
NC; 4

post; 4.54mm^2
NC; 1

Percent serial change in the SBOA = (4.54−7.29)/7.29 = −0.377

Summary

- Achievement of distal GW recrossing under 3D-guidance was more frequent than under 2D-guidance, without significant increase of radiation time and contrast volume.
- The jailing configuration at the side branch ostium and the GW rewiring position before kissing ballooning were strongly associated with the incidence of residual jailed struts at side branch ostium.

3D OCT investigators

Summary

- There were no significant difference in clinical outcome at 9 month FU between optimal and suboptimal groups.
- However, rate of angiographic ISR at side branch ostium in the suboptimal group tend to be higher than that of the optimal KBD group.

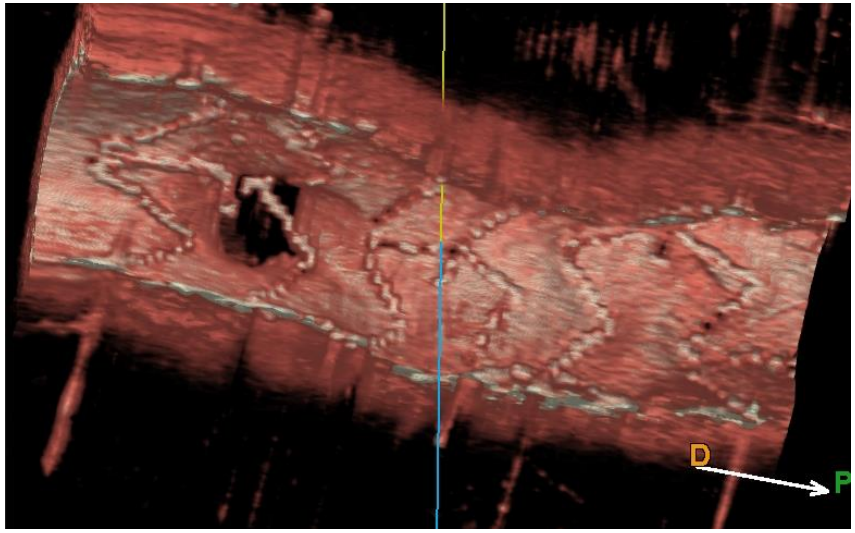
Feasibility and usefulness of three-dimensional optical coherence tomography guidance for optimal side branch treatment in coronary bifurcation stenting

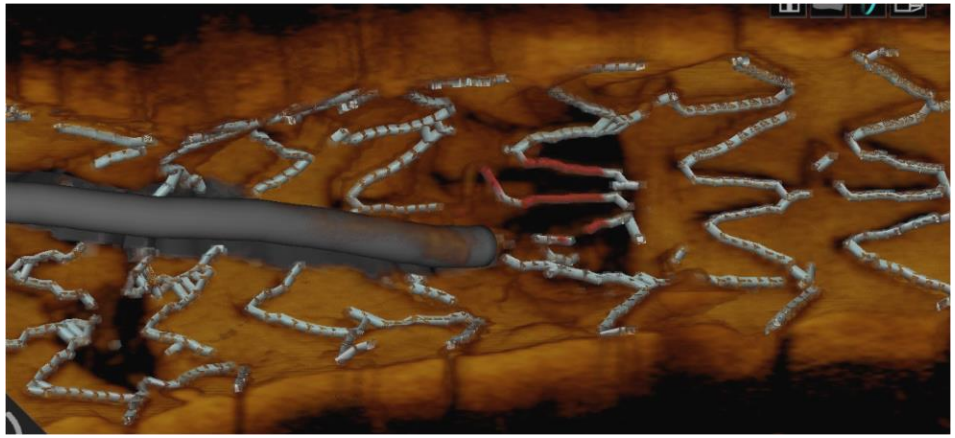
International Journal of Cardiology,
250;270-274, 2018

Impact of Guidewire Recrossing Point into Stent Jailed Side-Branch for Optimal Kissing Ballooning Guided by 3D Optical Coherence Tomography

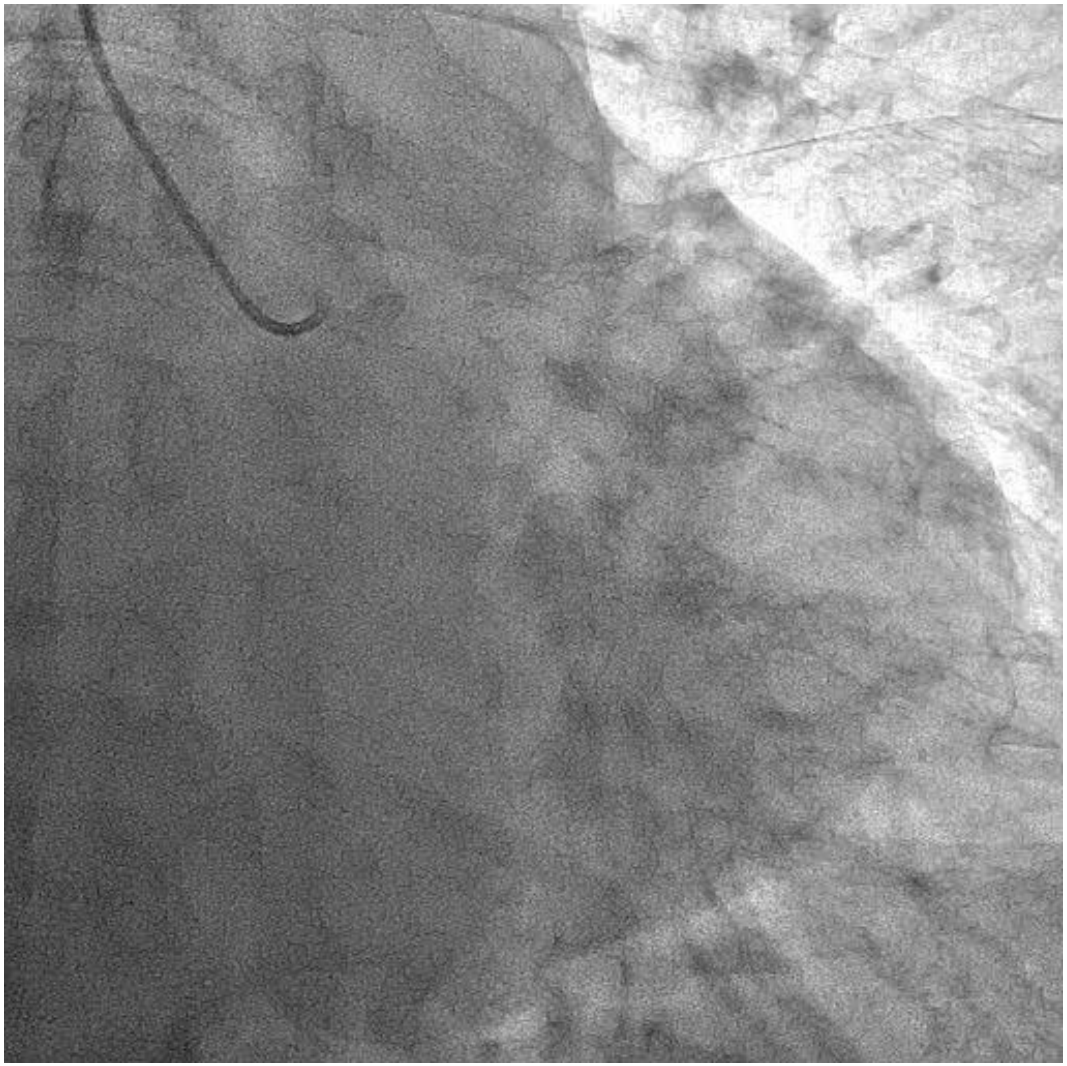
Euro Intervention
13; e1785-e1793, 2018

Now the Terumo or Abbott 3D-OCT software are available for bifurcation PCI guide in clinical practice

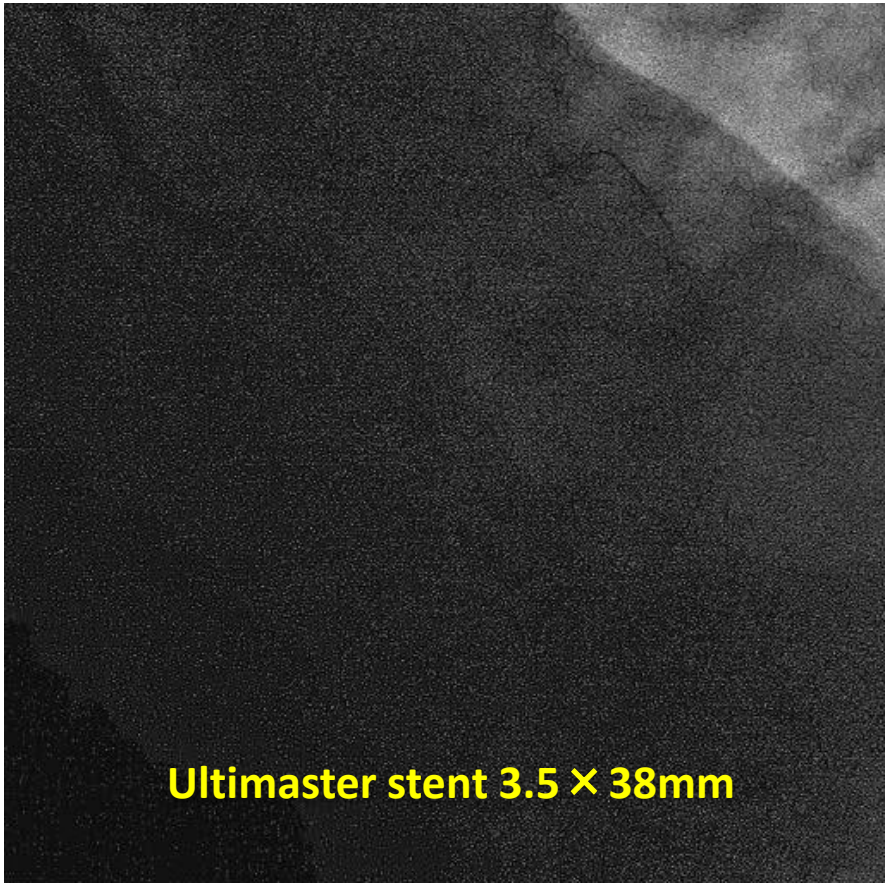




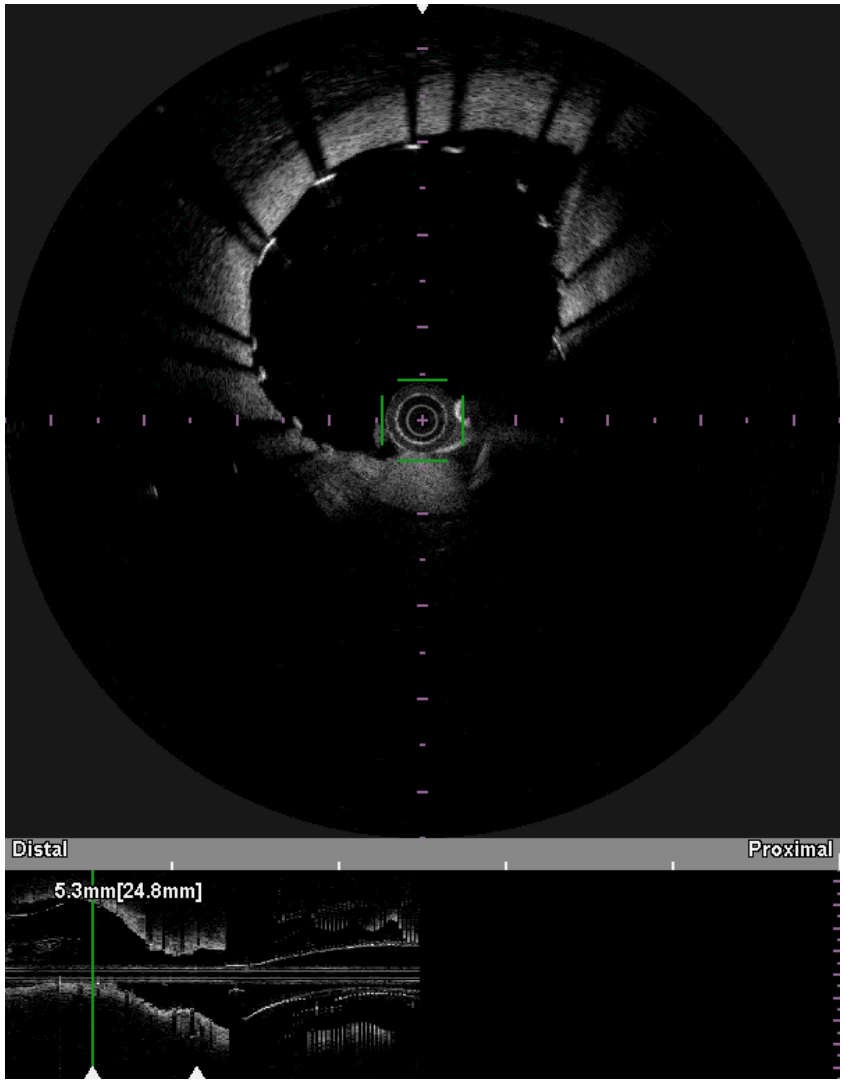
OFDI guide LMT-LCx case

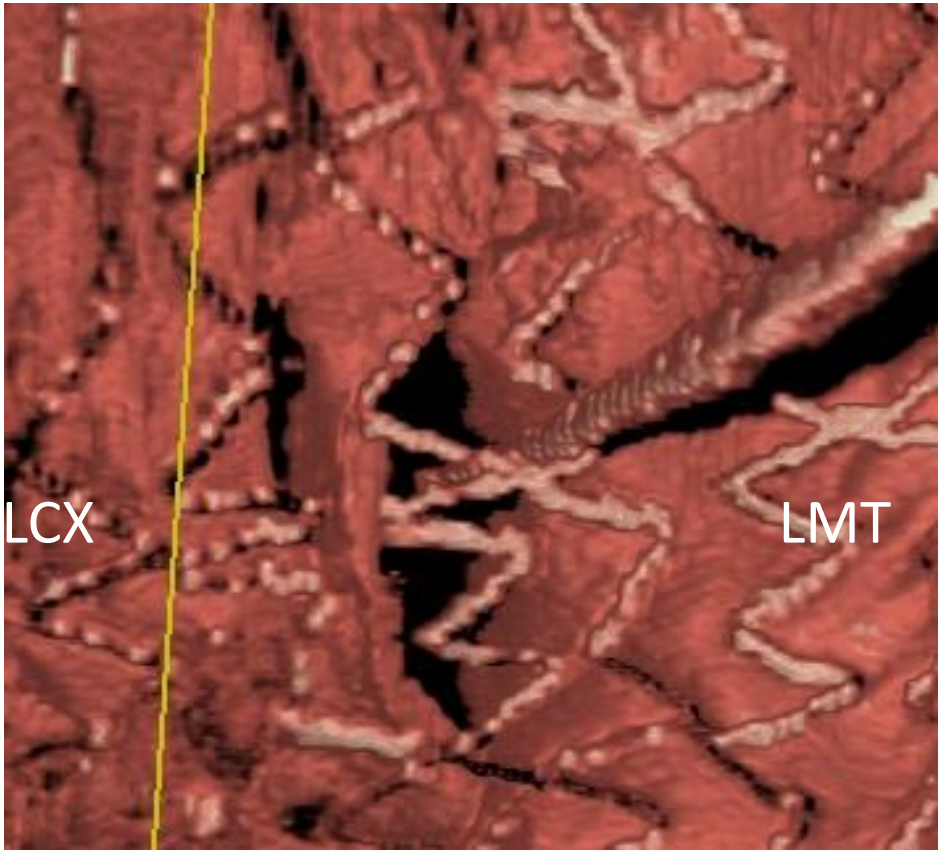


Stenting

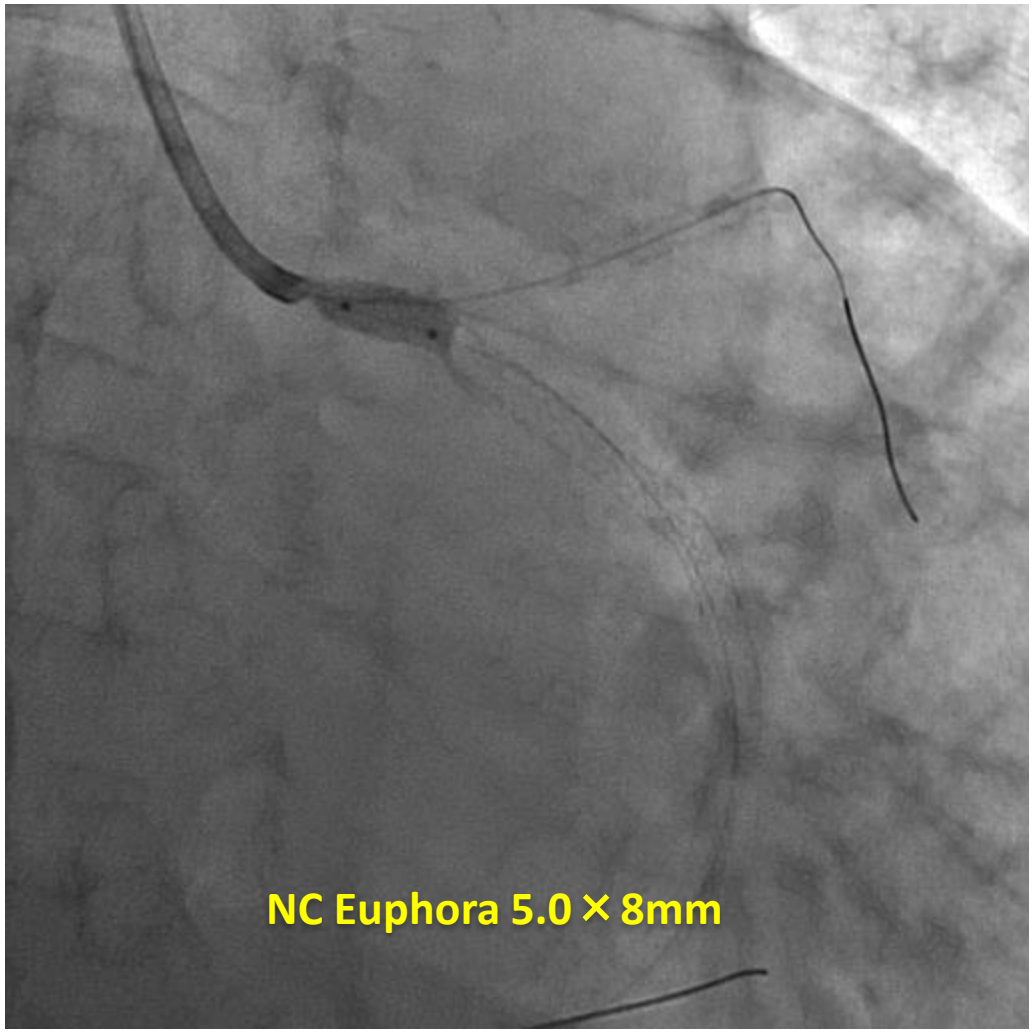


Recross1

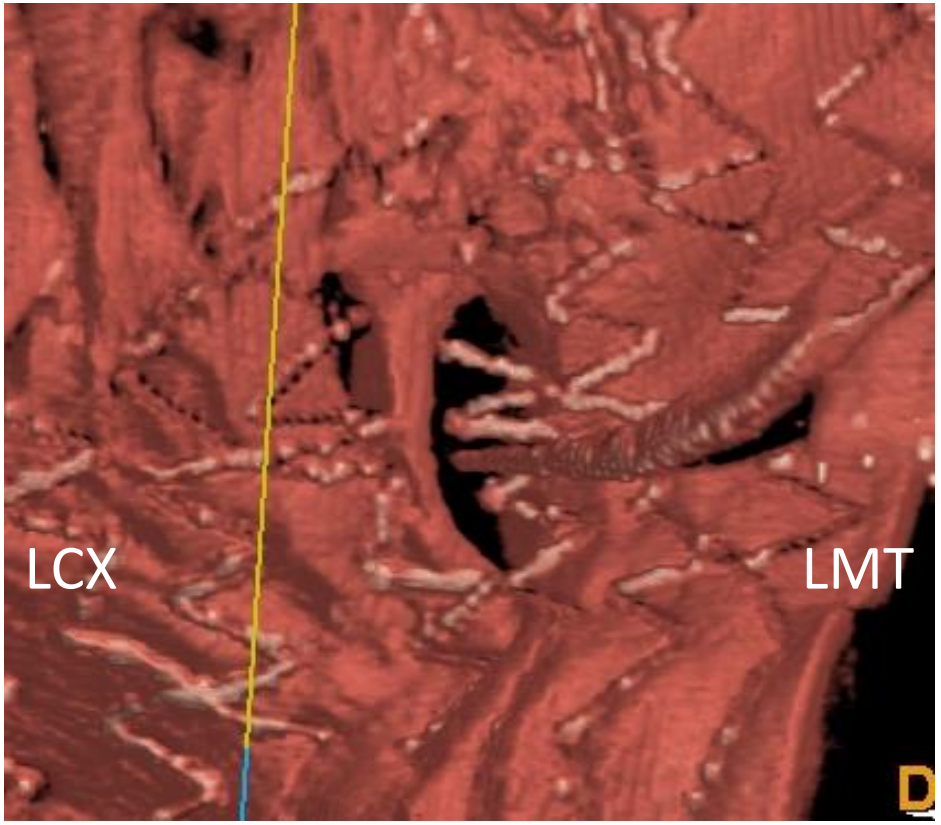




POT

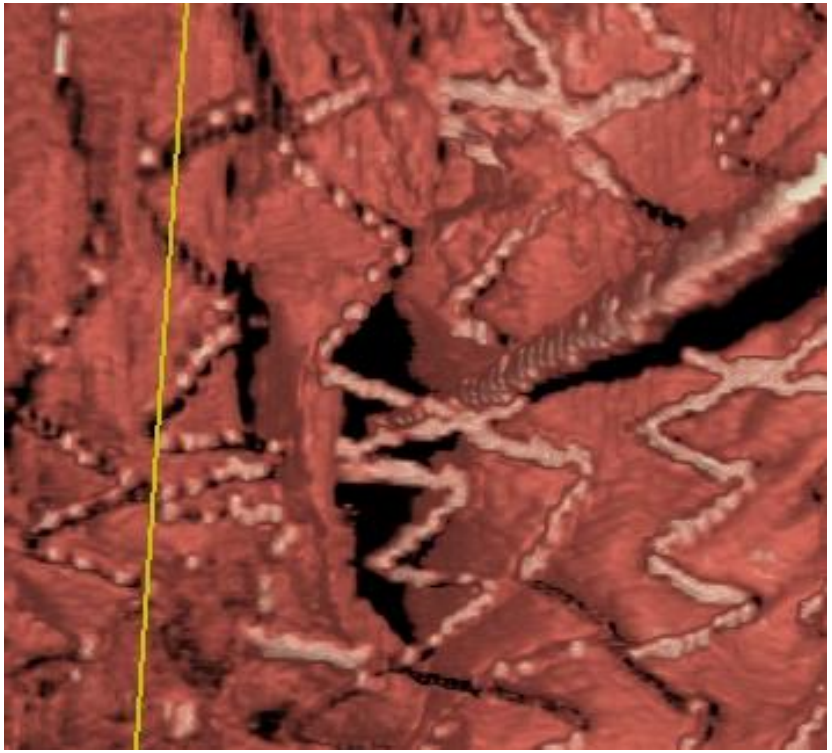


Recross2

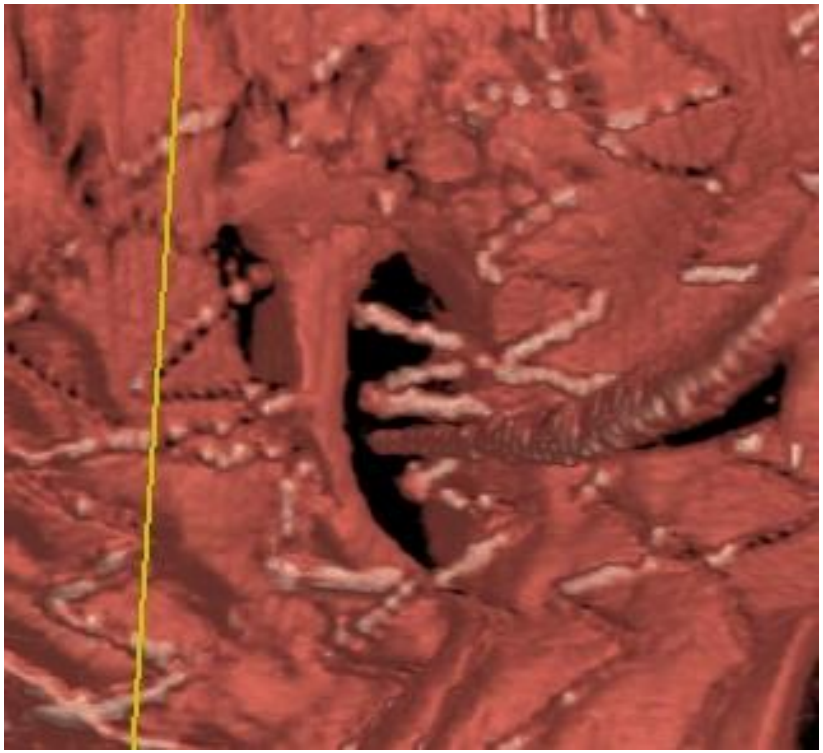


POT前後

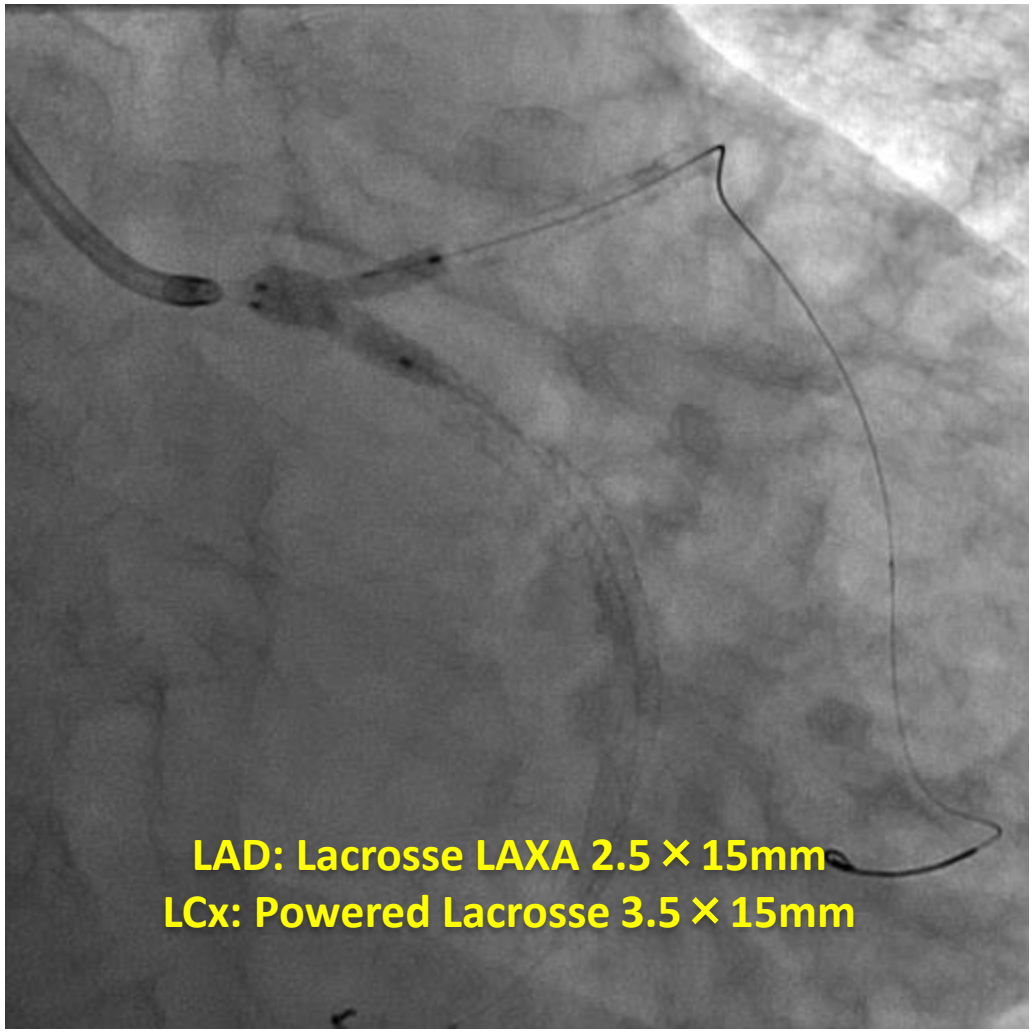
Before POT



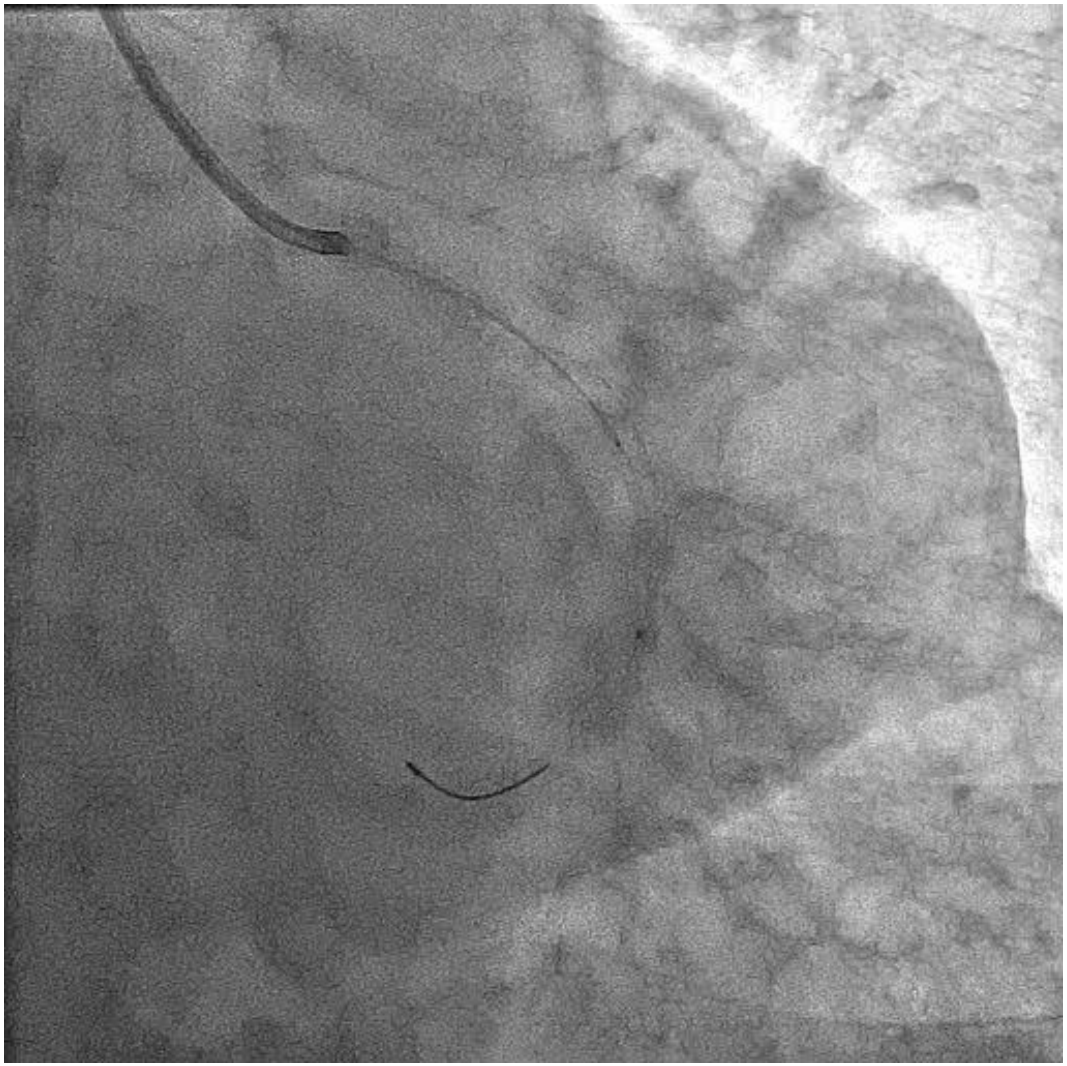
After POT



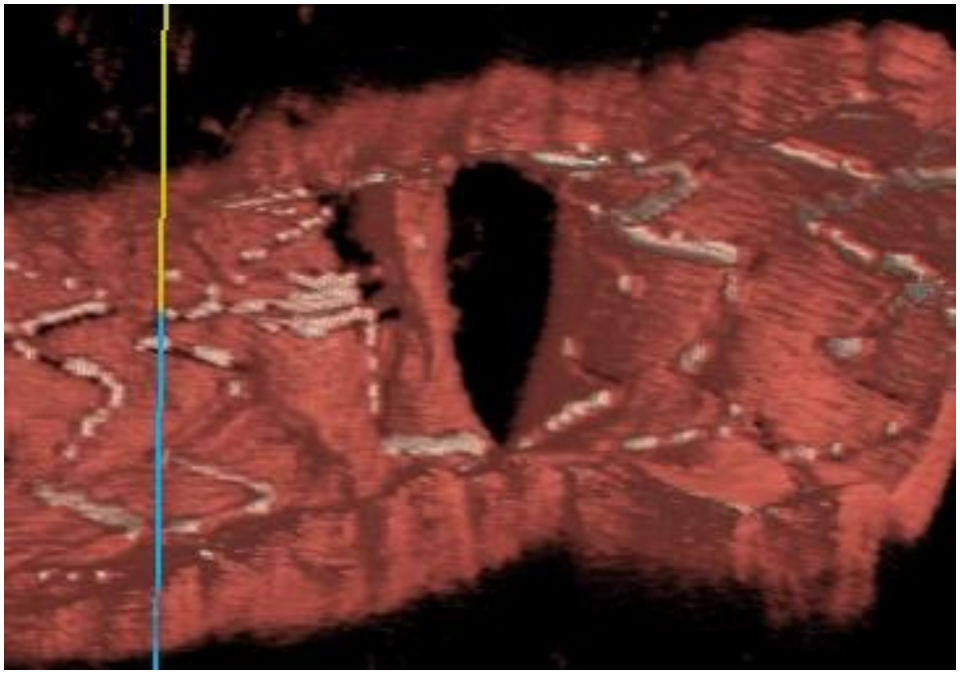
KBT

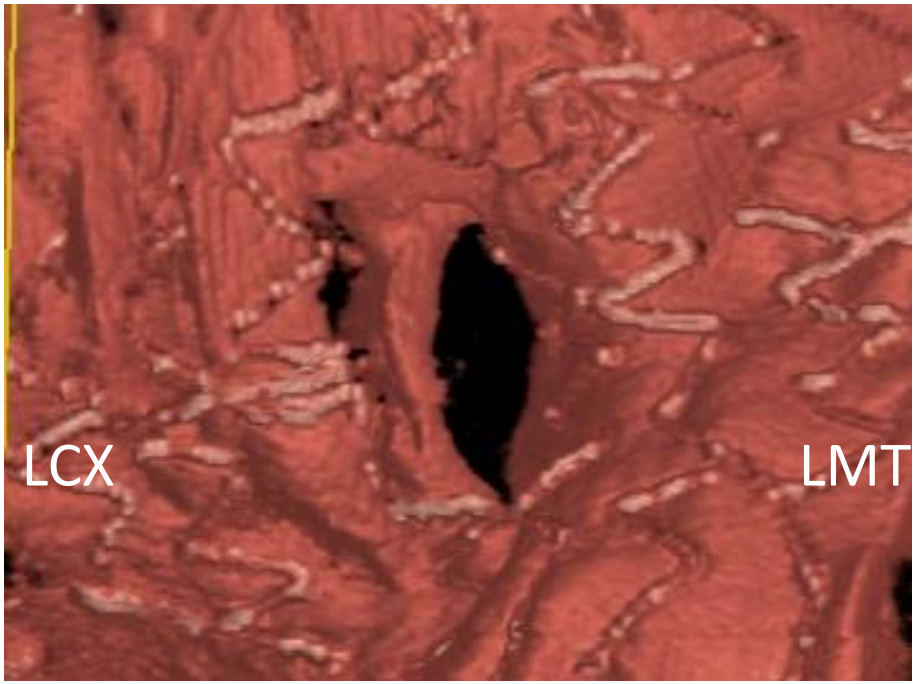


Final

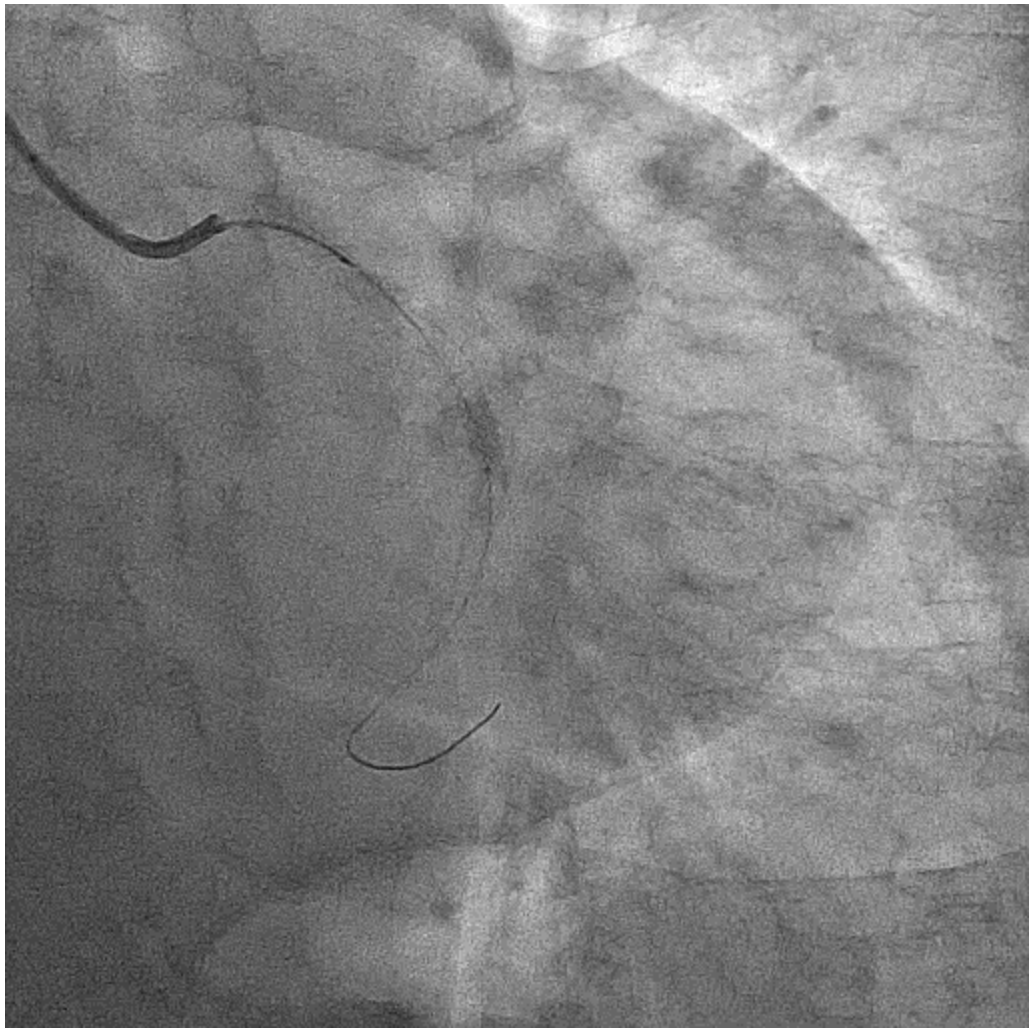


Final 3D

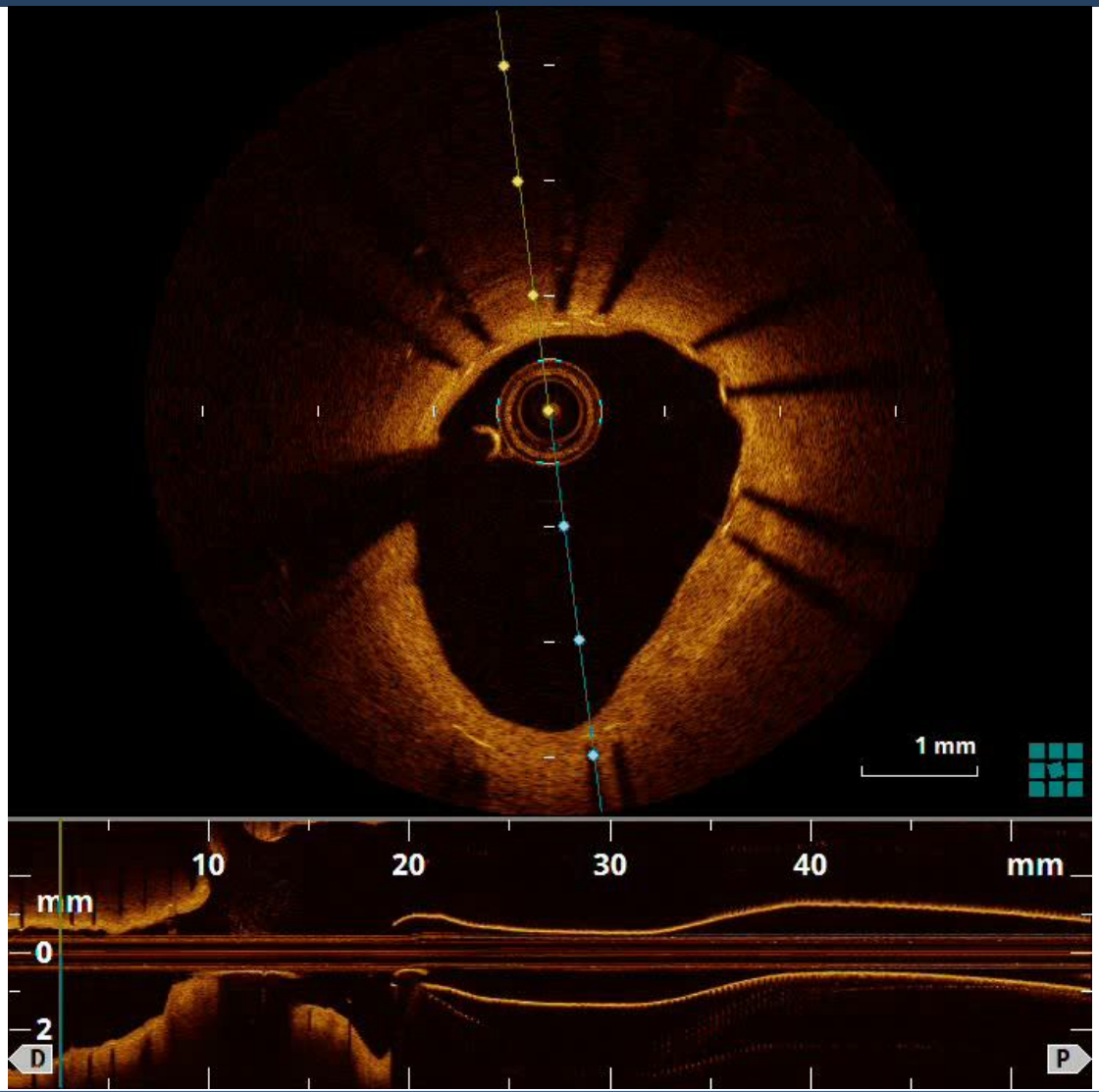




8M F/U



8M Ultimaster

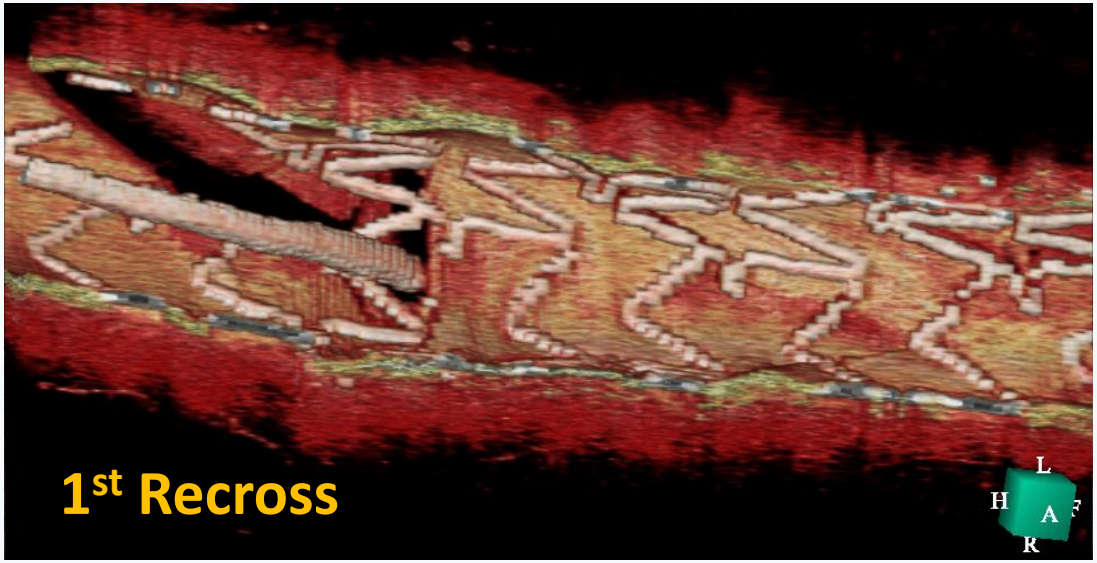


A Novel Push-Fold Method for Removing Side Branch-Jailed Stent Struts Under 3D Optical Coherence Tomography Guidance

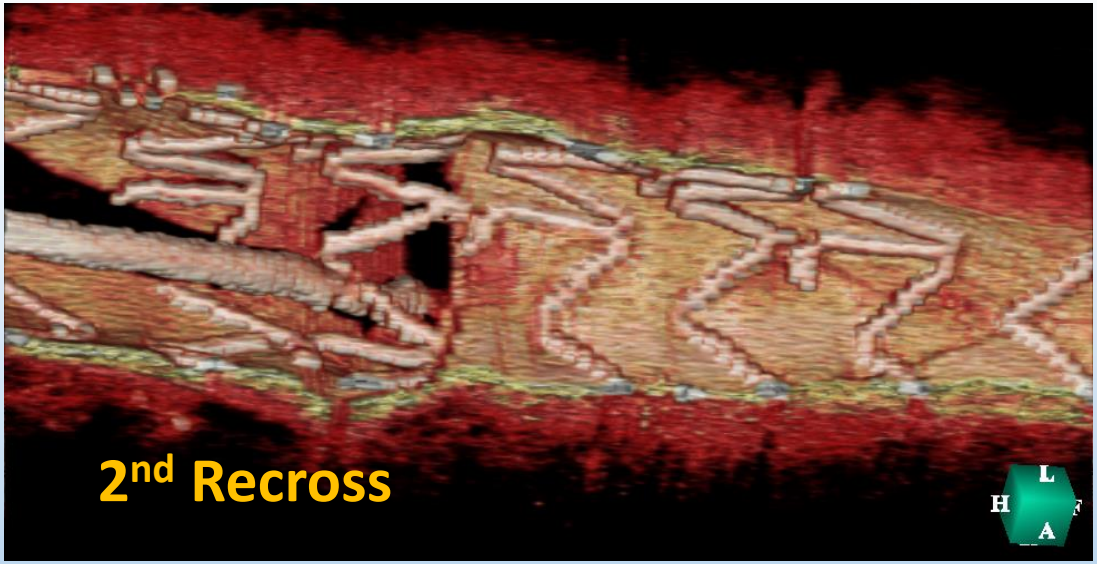
Ryoji Nagoshi, MD,[a] Takayuki Okamura, MD,[b] Junya Shite, Md[a]

JACC cardiovascular intervention 2016

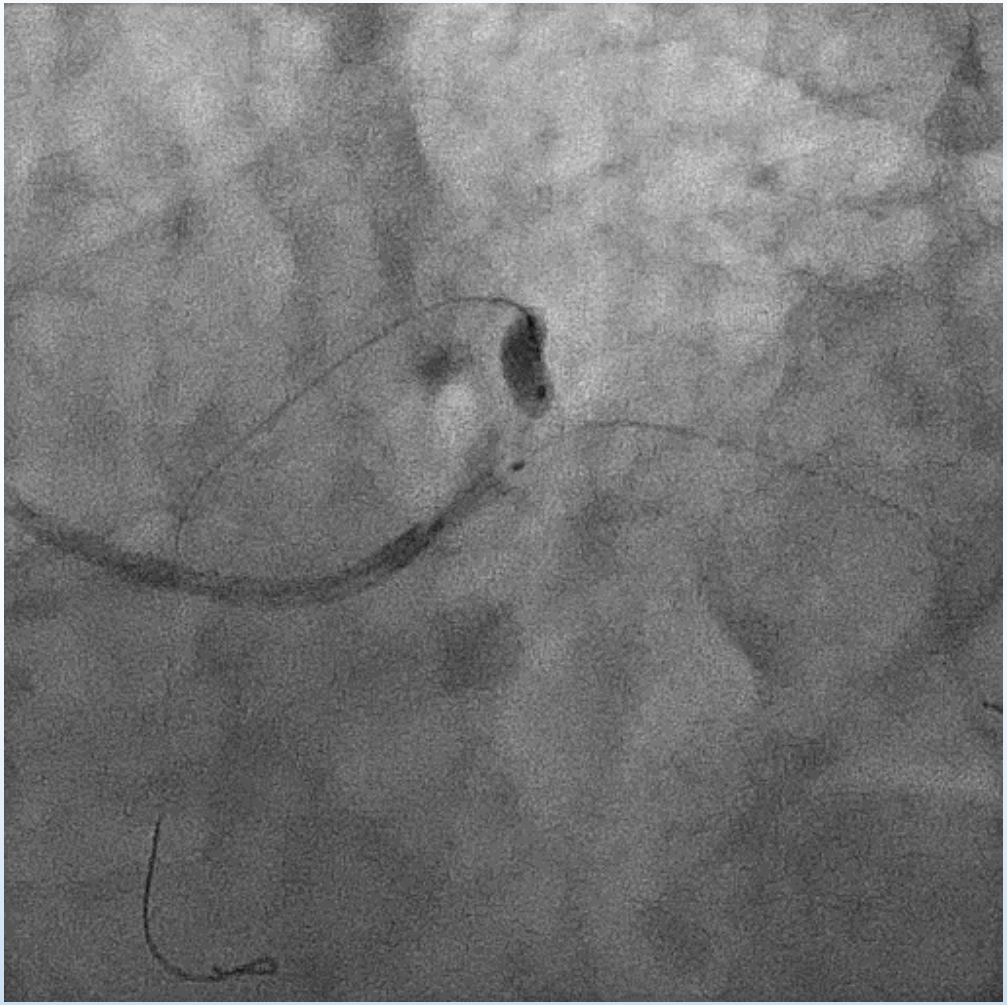
Recross



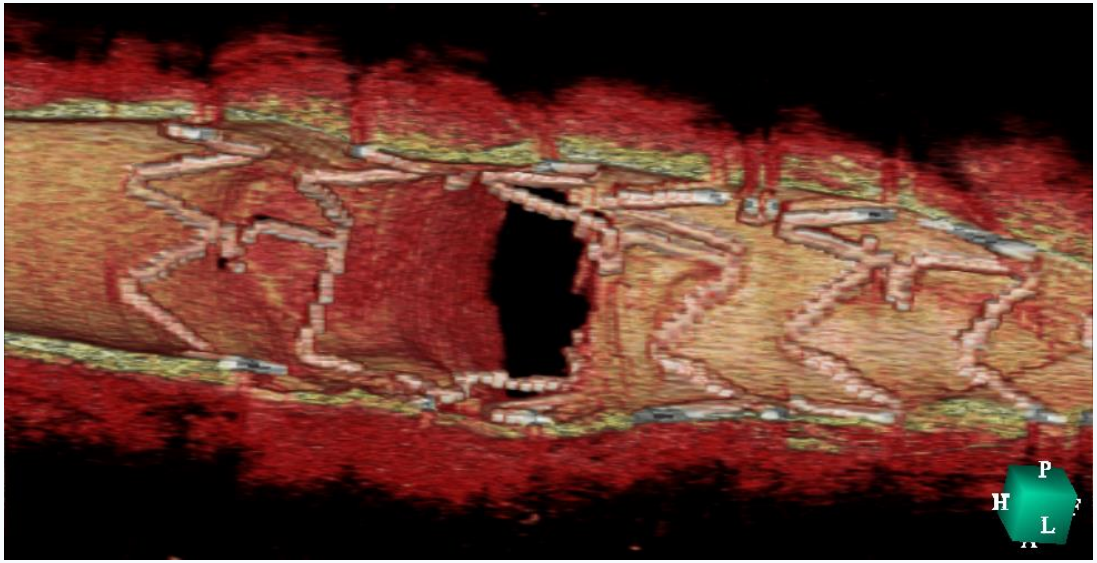
Xience

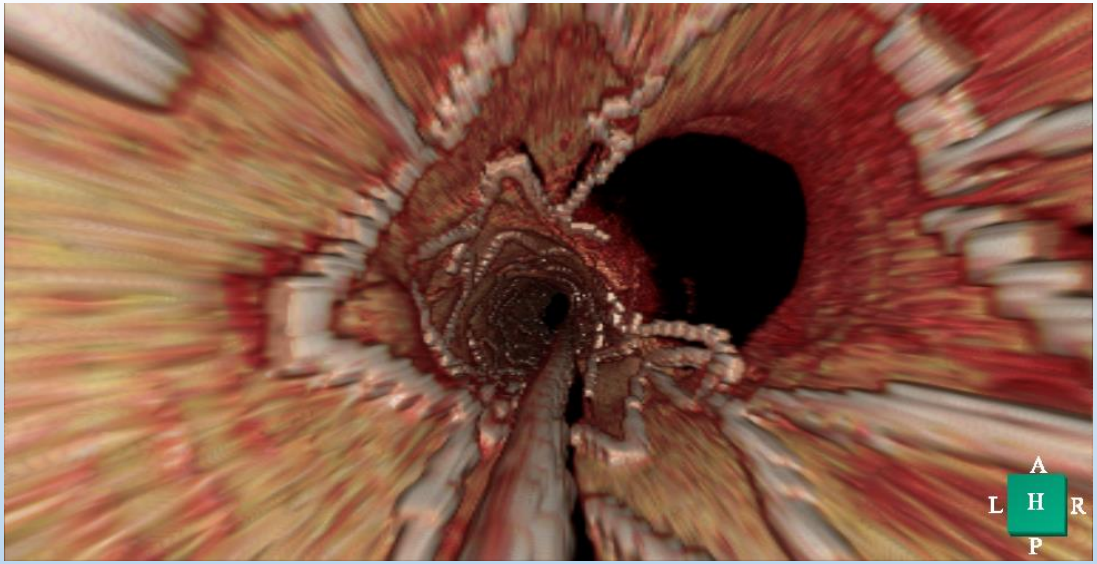


Balloon push-fold method

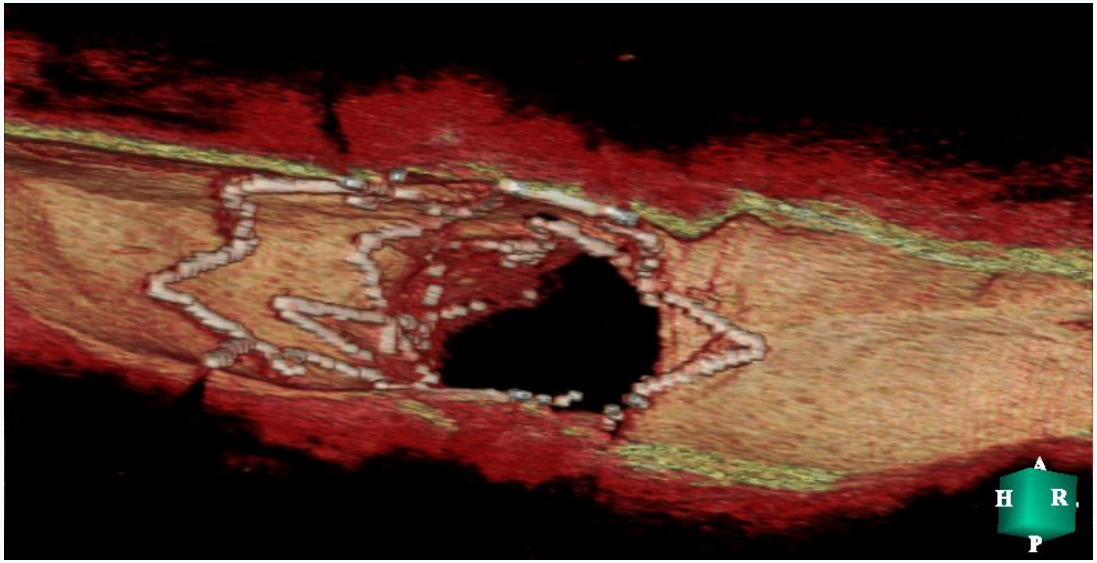


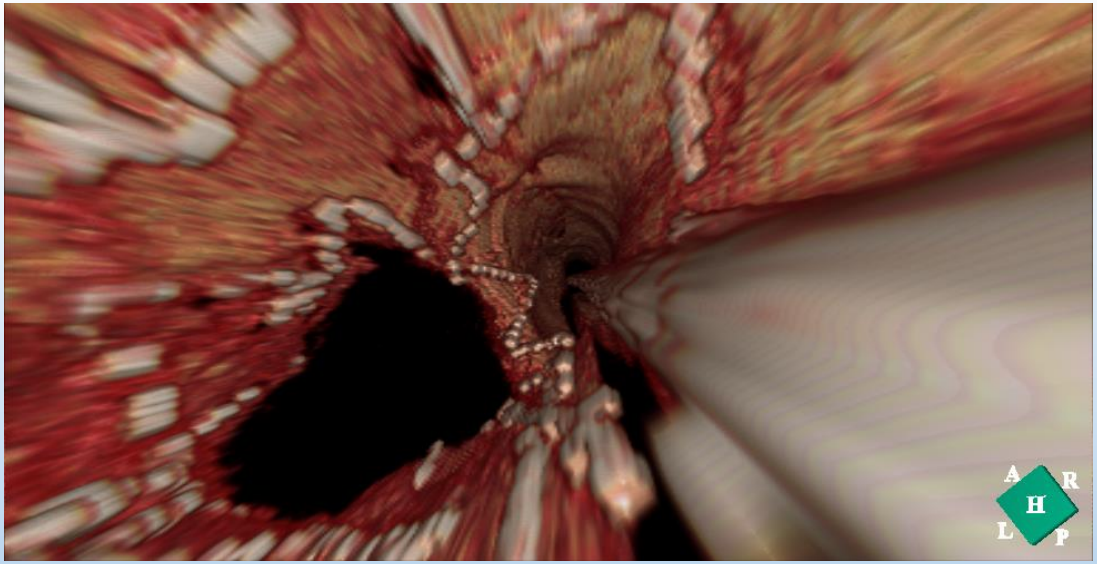
Final 3D pullback from LAD



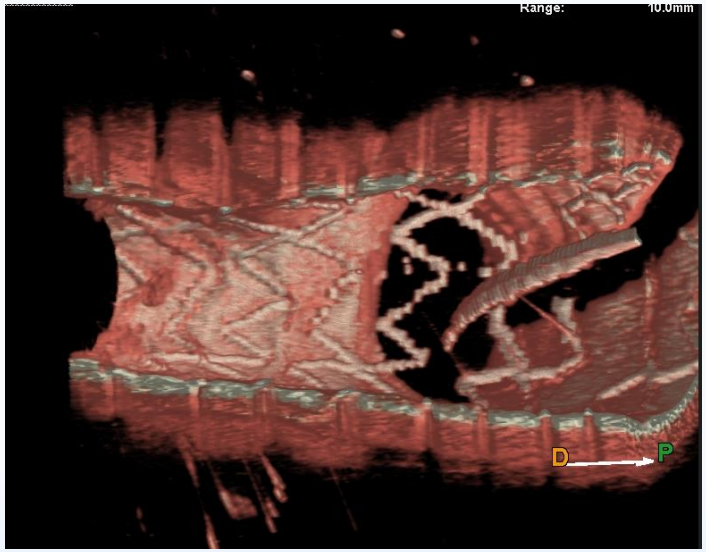


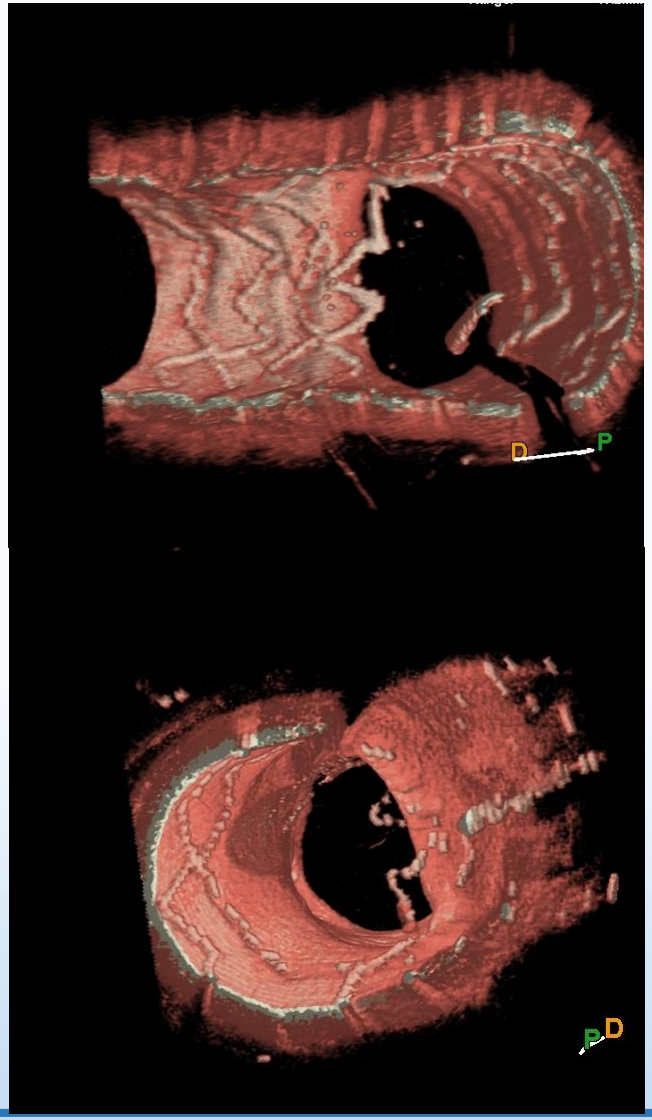
Final 3D pullback from Dx





Ultimaster push





Summary of push method

2005/9 ~

- 32 lesions were attempt push method
- 28 lesions were able to evaluate stent strut shift by 3D-OCT
- Success rate of removing jailed struts at side branch orifice by push method was 64% (18/28)

stent	No	%
Resolute	2	6.20%
R-onyx	6	19%
Synergy	7	22%
Ultimaster	12	38%
Xience	5	16%

3D-OCT guide bifurcation stenting is feasible and effective for optimal stenting.

To investigate an impact of optimal stenting on clinical outcome, a larger-scale study would be needed.

3D OCT investigators

Global Japanese 3D-OCT Bifurcation Registry

OCT guided target bifurcation stenting
target sample size: 600 cases
(Xience 400 cases vs. 2 Link DES 200 cases)

Side-branch dilatation
- SB treat –
400 cases (Xience 2: 2Link 1)

OPTIS™ 3D OCT assessment of GW recrossing position

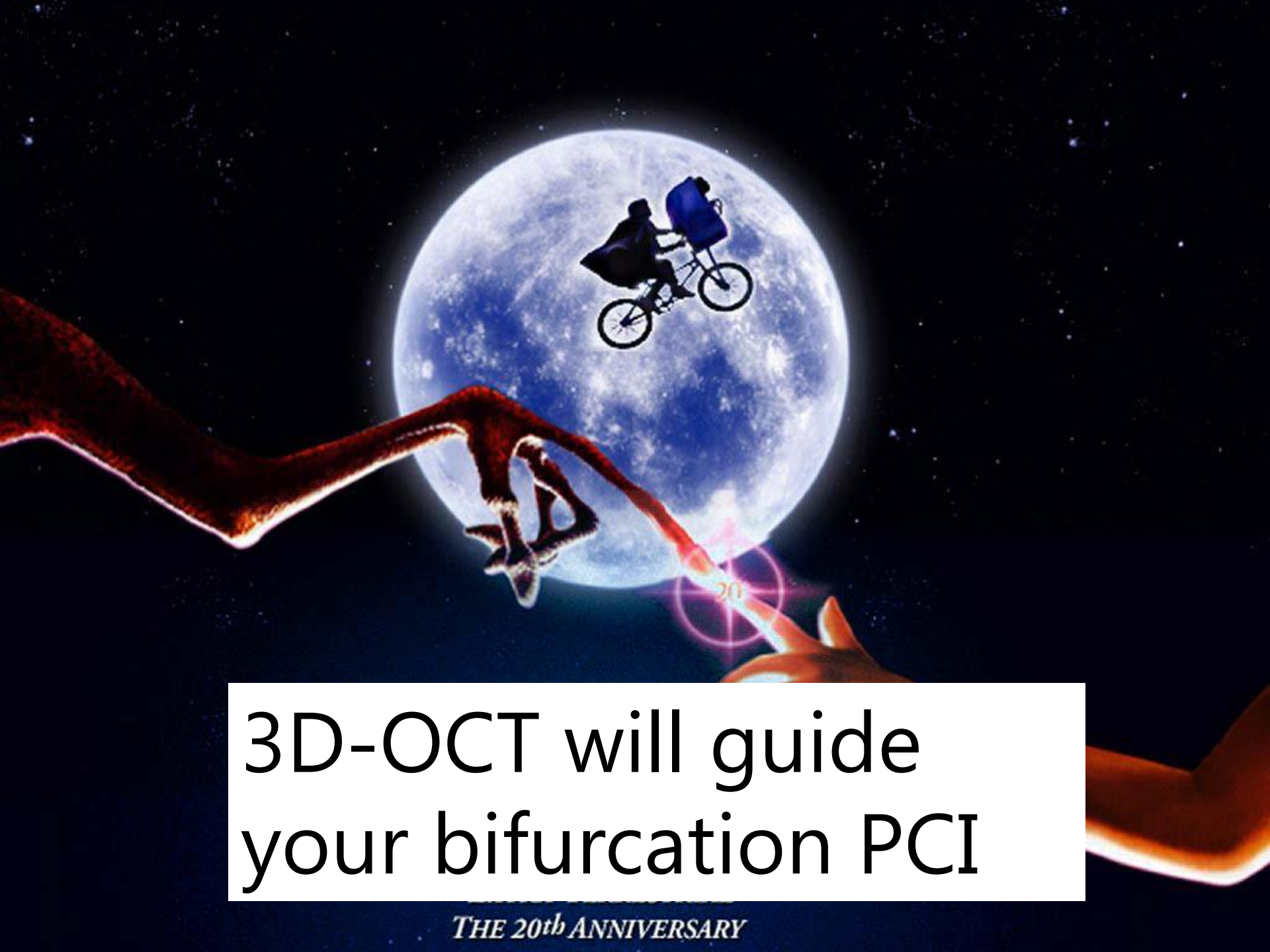
Optimal

Suboptimal

non Side-branch dilatation
- non SB treat –
- 200 cases(Xience 2: 2Link 1)

Outcome of 1 year angio FU and 3 year clinical FU
An exploratory study of OPTIS™ 3D OCT assessment

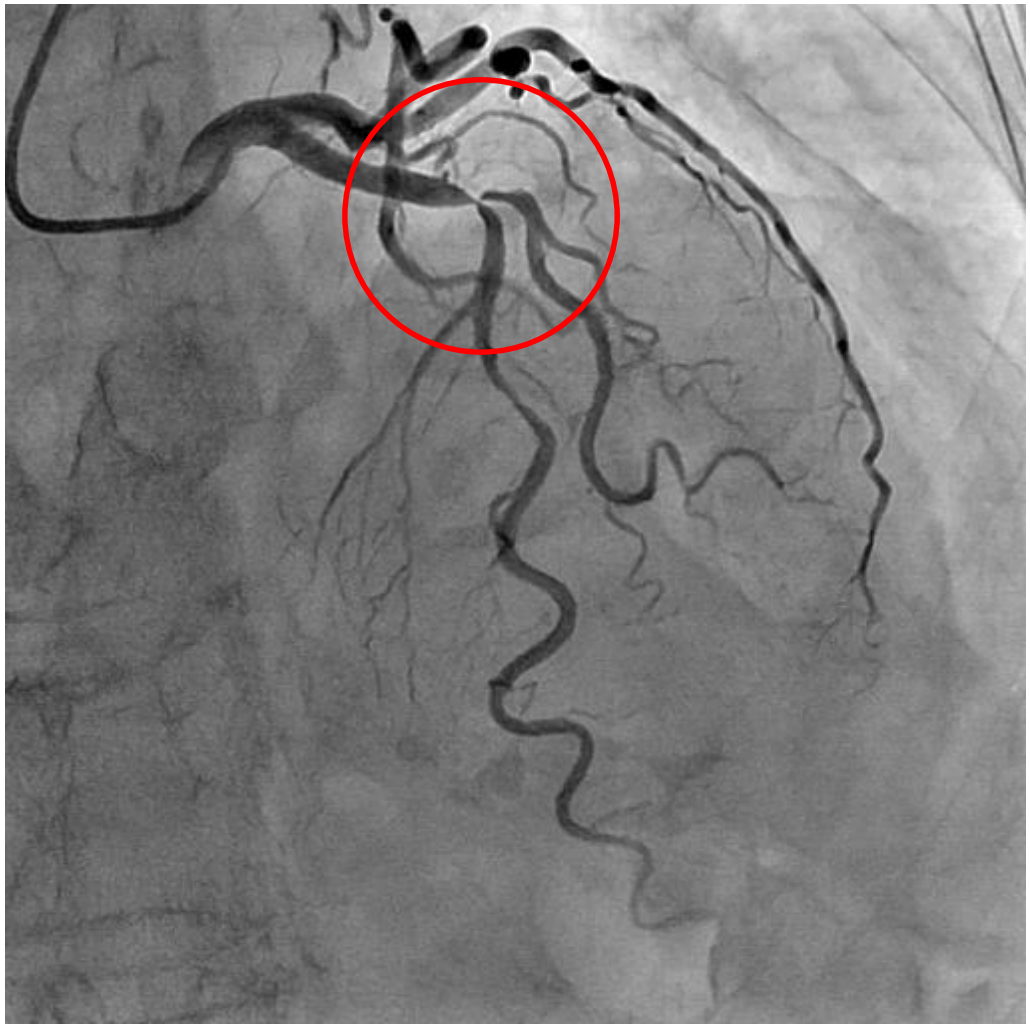
3D OCT investigators



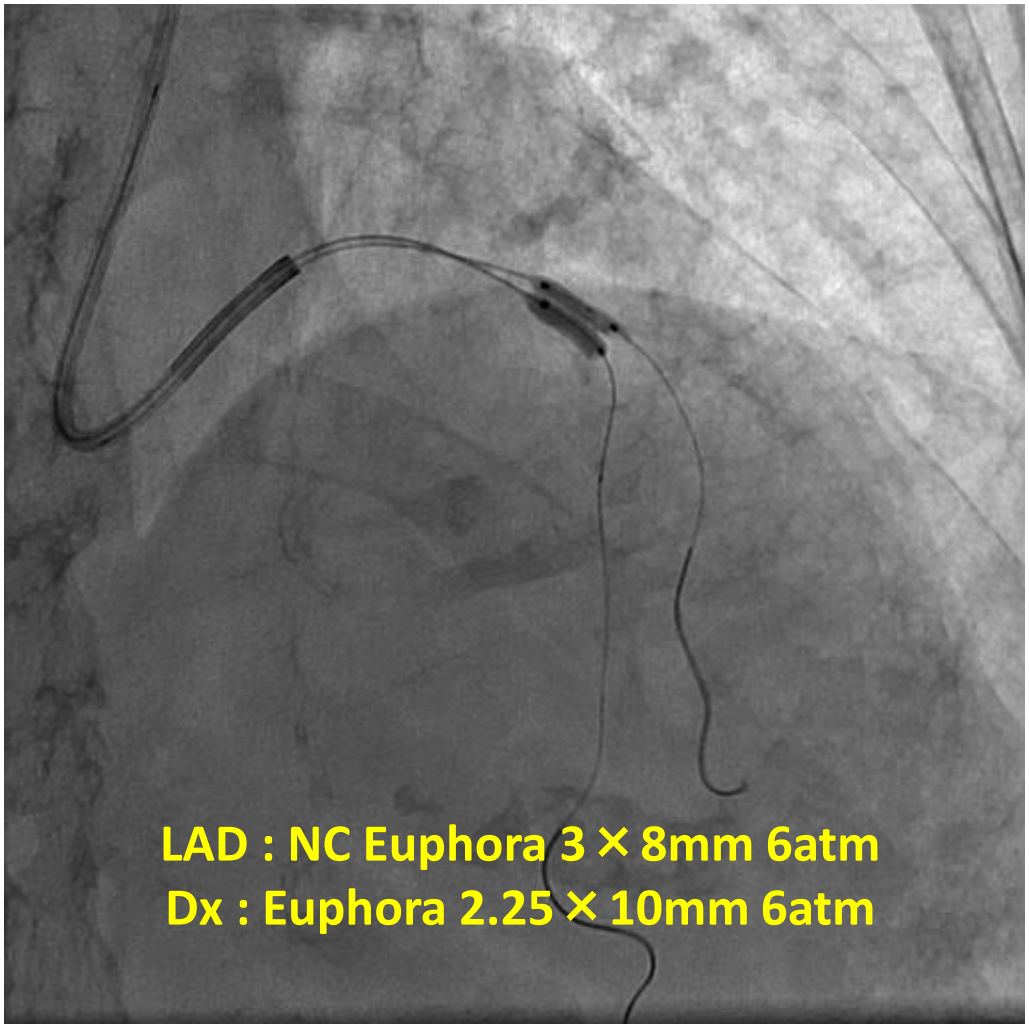
3D-OCT will guide your bifurcation PCI

Thank you for your kind attention!

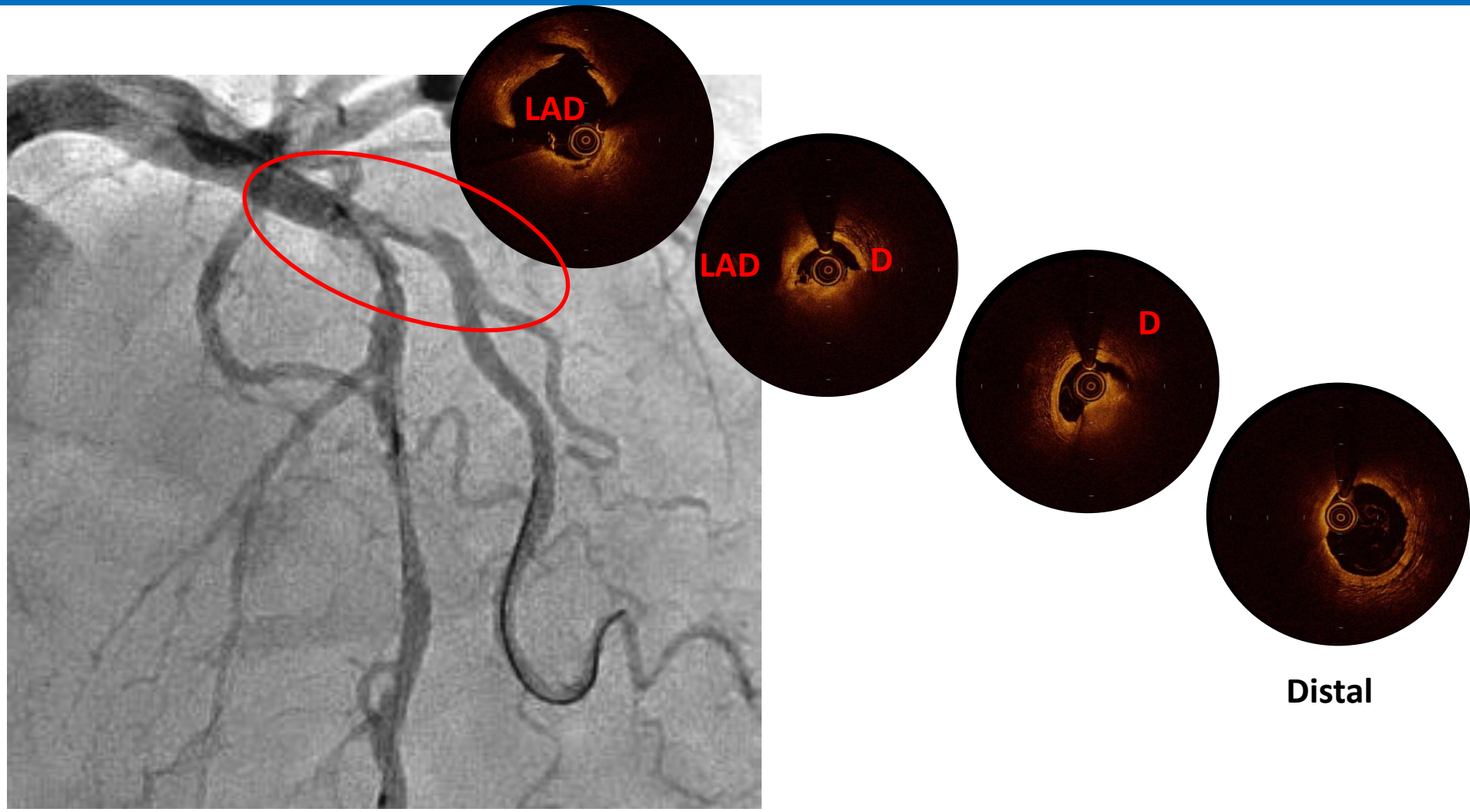
73-year-old female, Angina Pectoris case



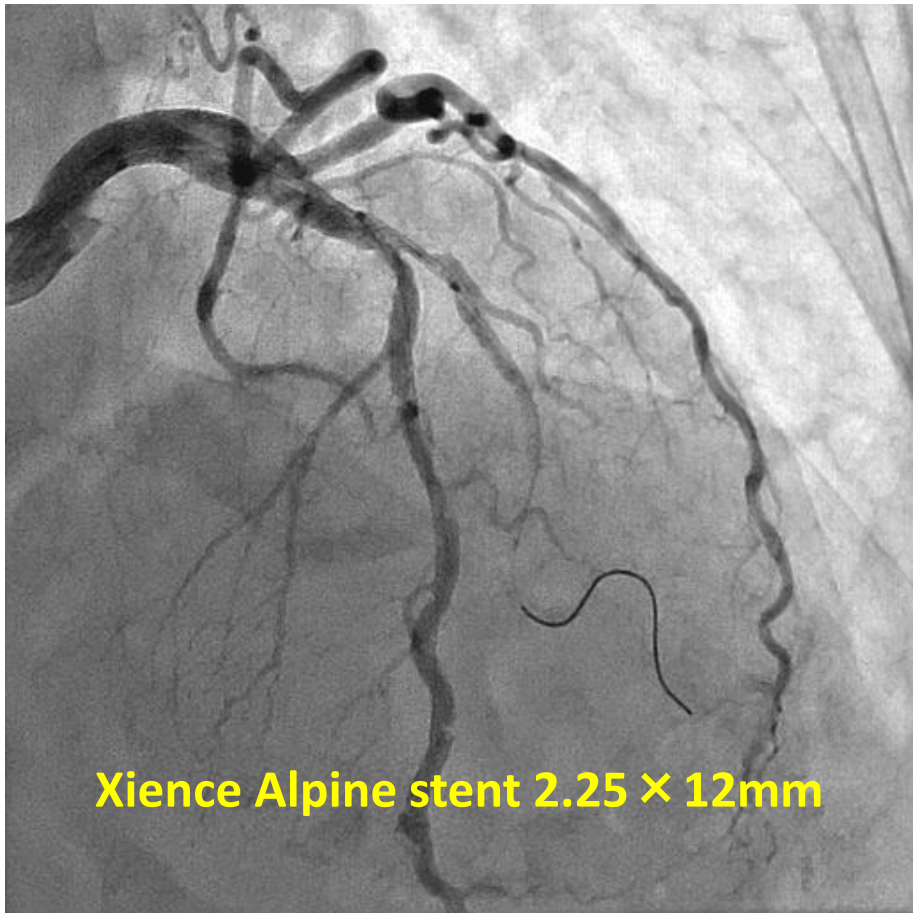
KBI

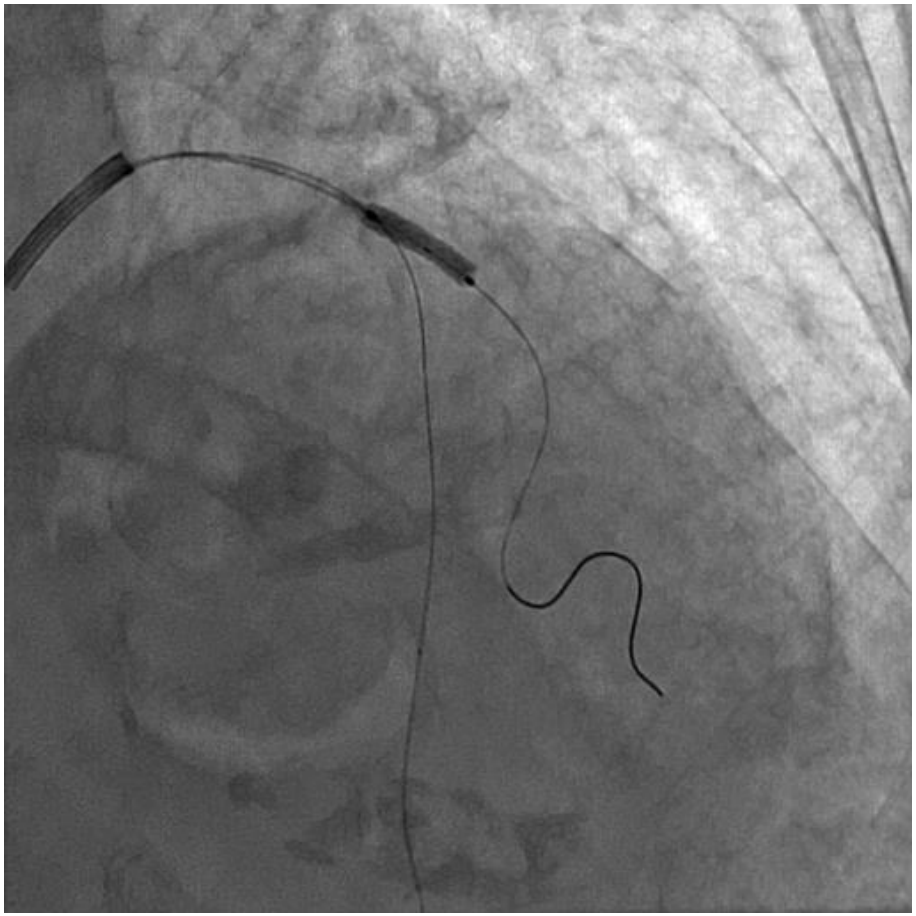


Post KBI

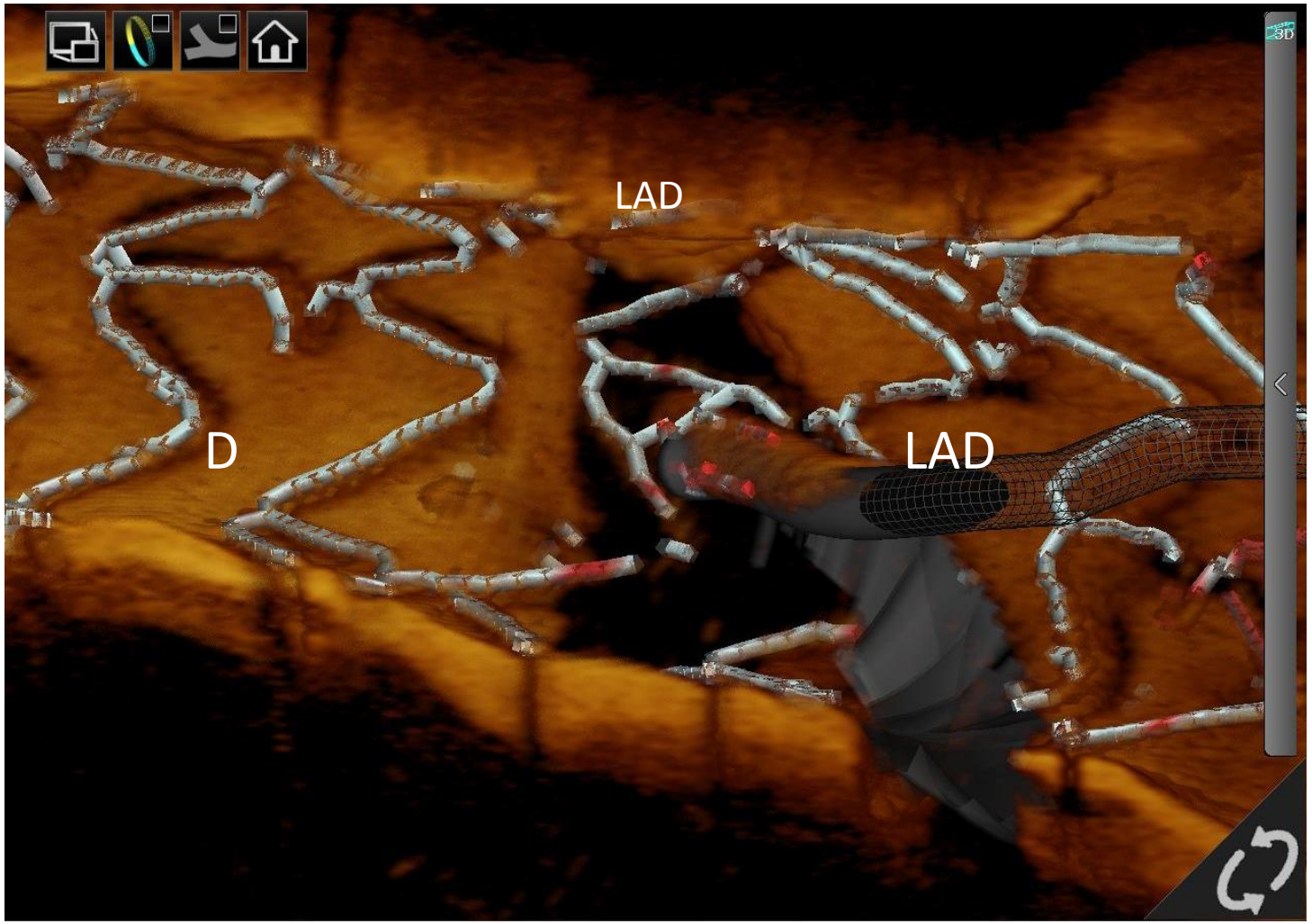


Dx stenting

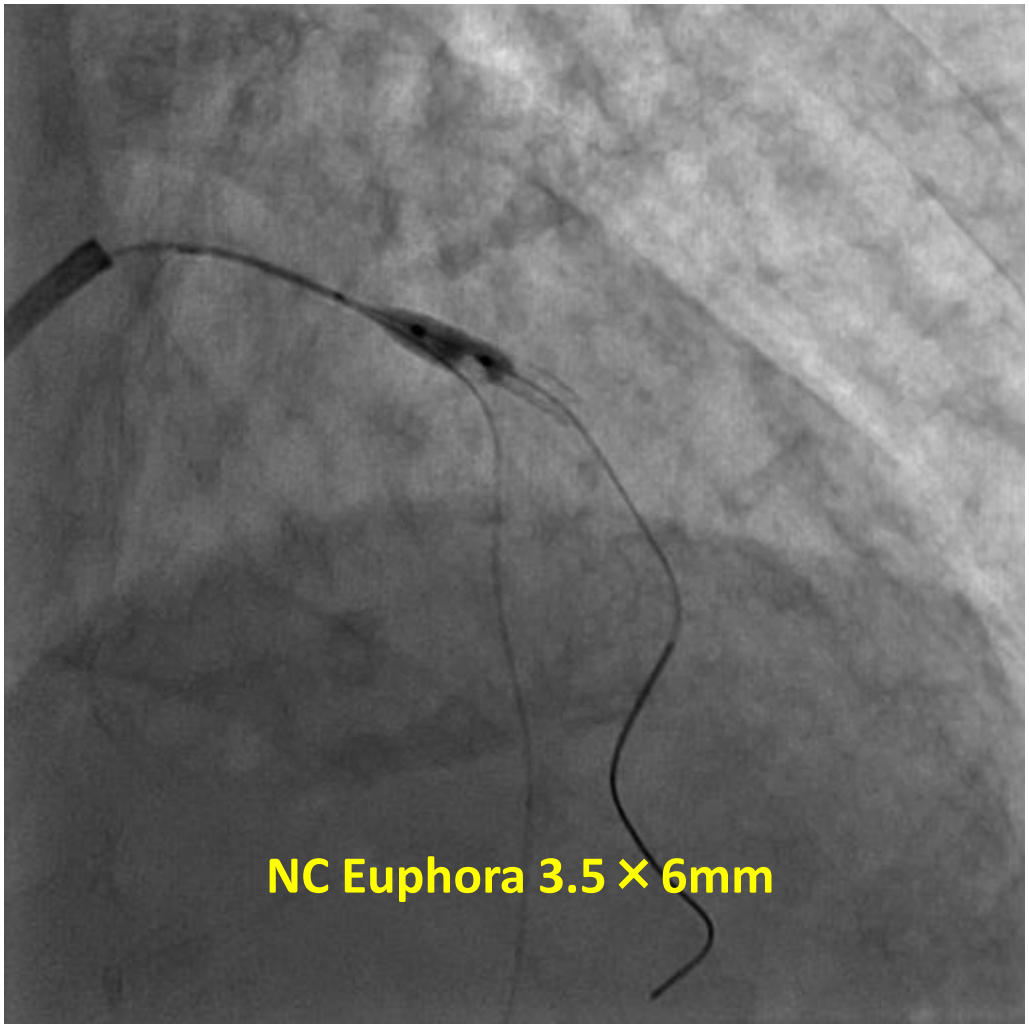


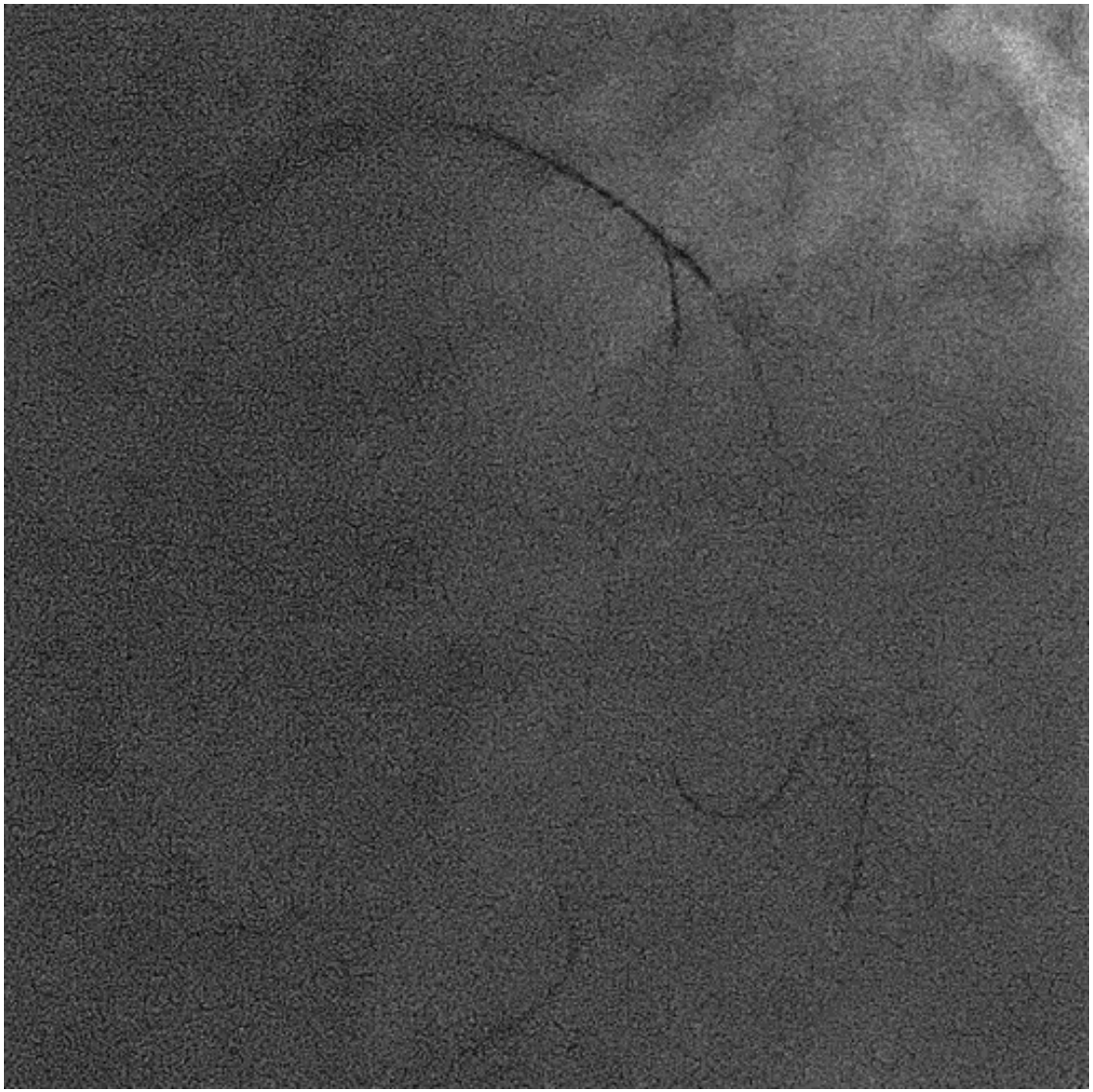


1st Re-cross after Dx stenting

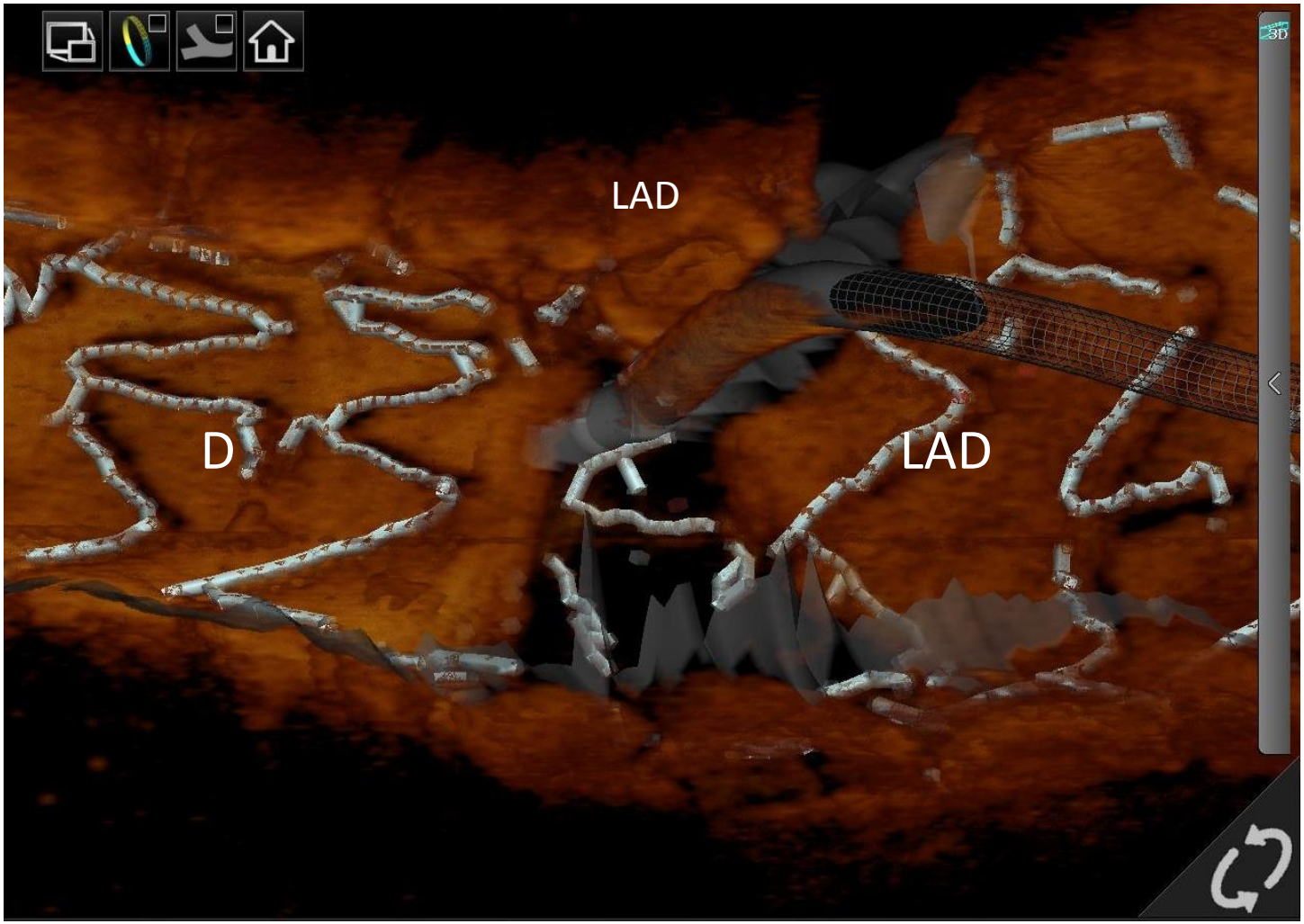


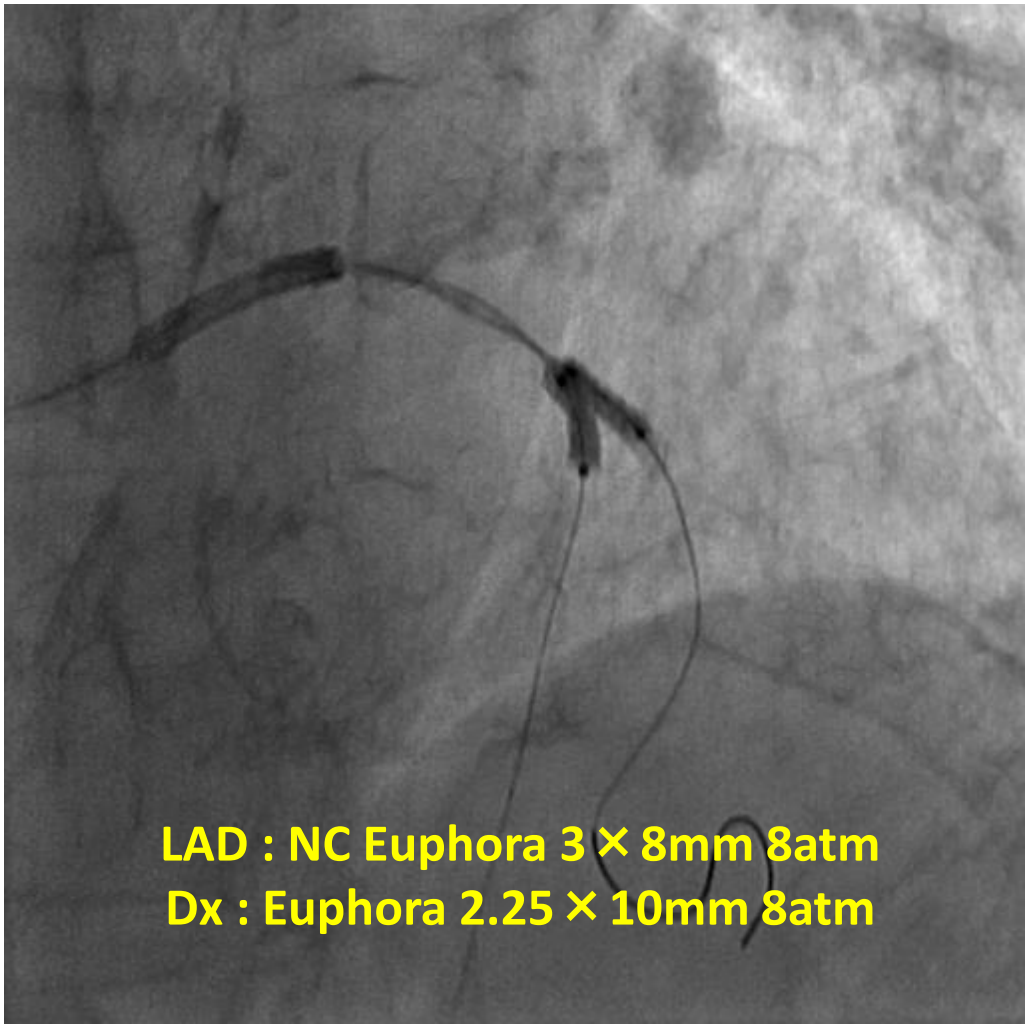
POT



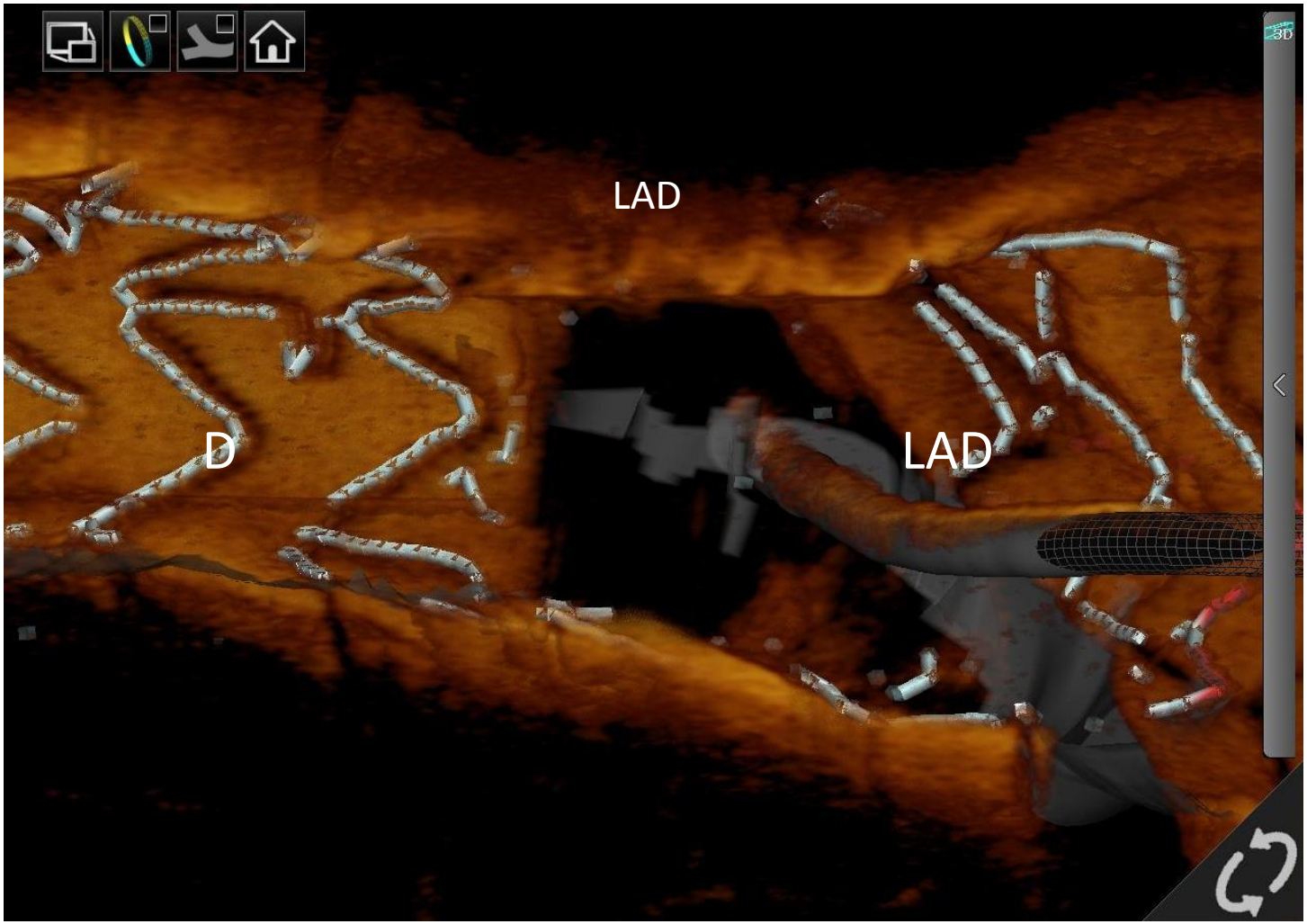


2nd Re-cross after Dx stenting

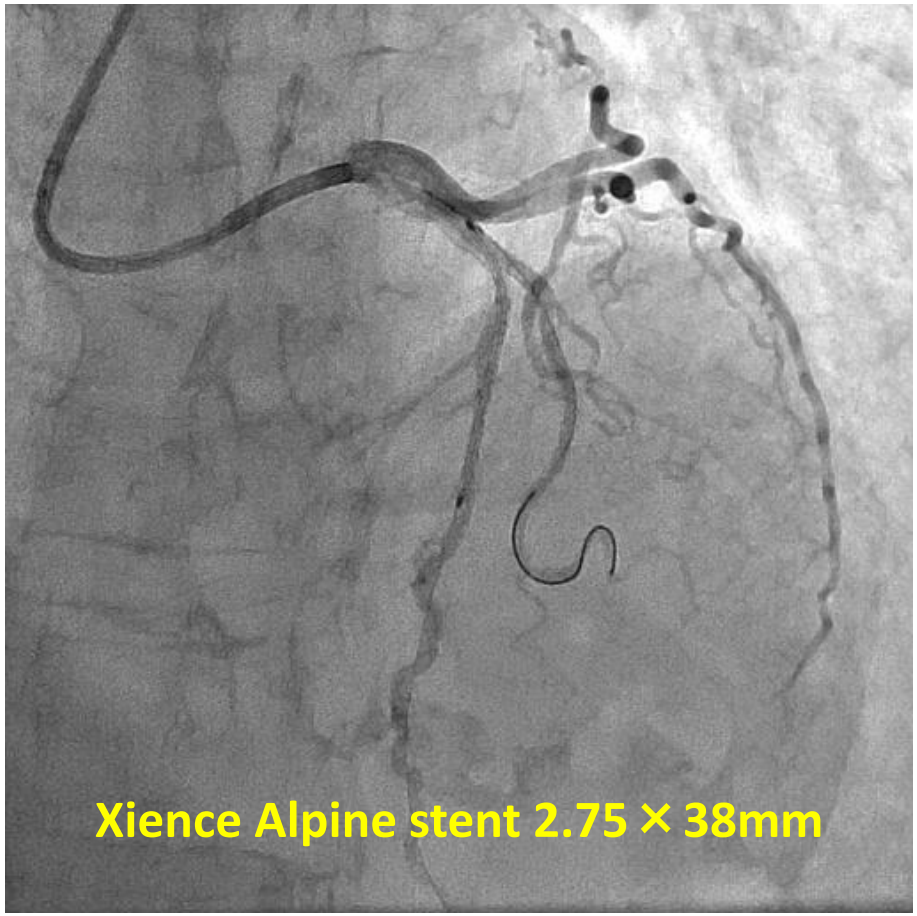


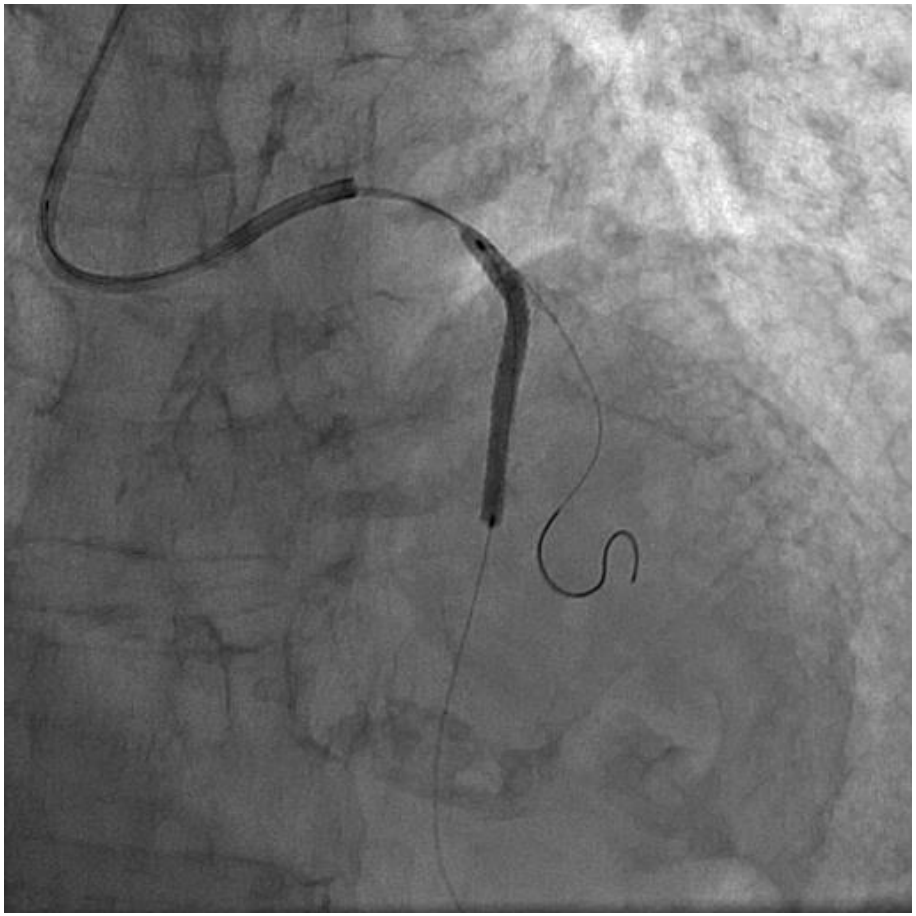

LAD : NC Euphora 3 × 8mm 8atm
Dx : Euphora 2.25 × 10mm 8atm

Post KBI

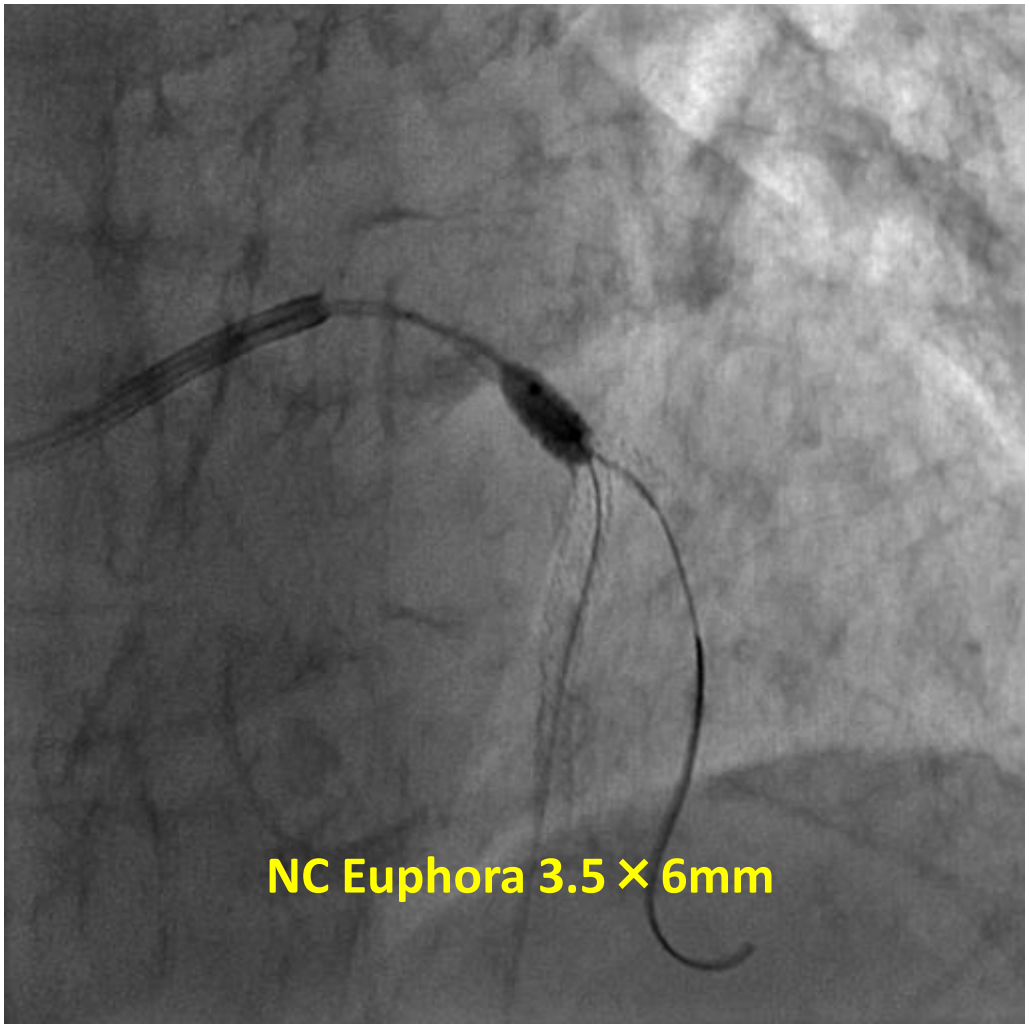


LAD stenting

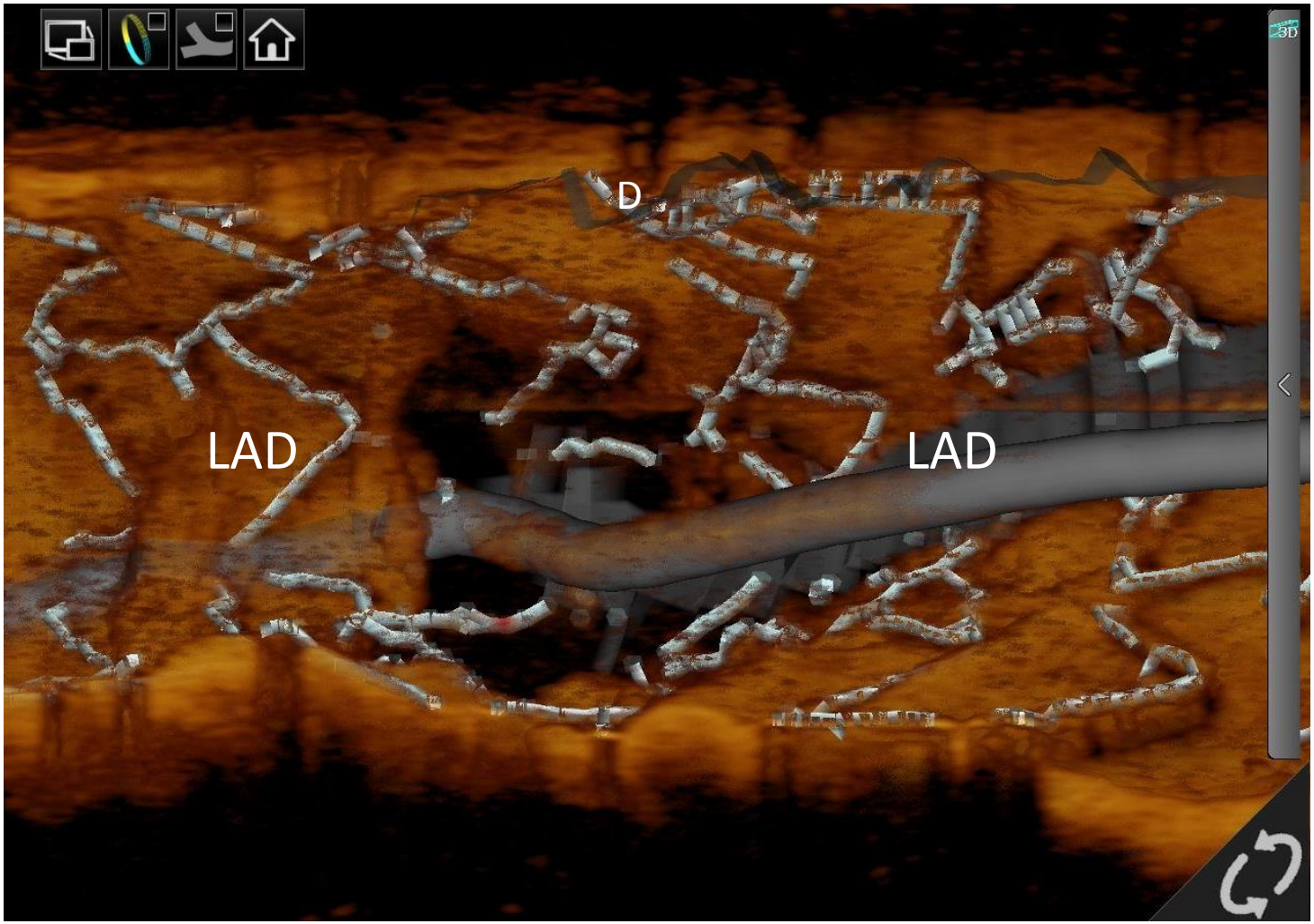


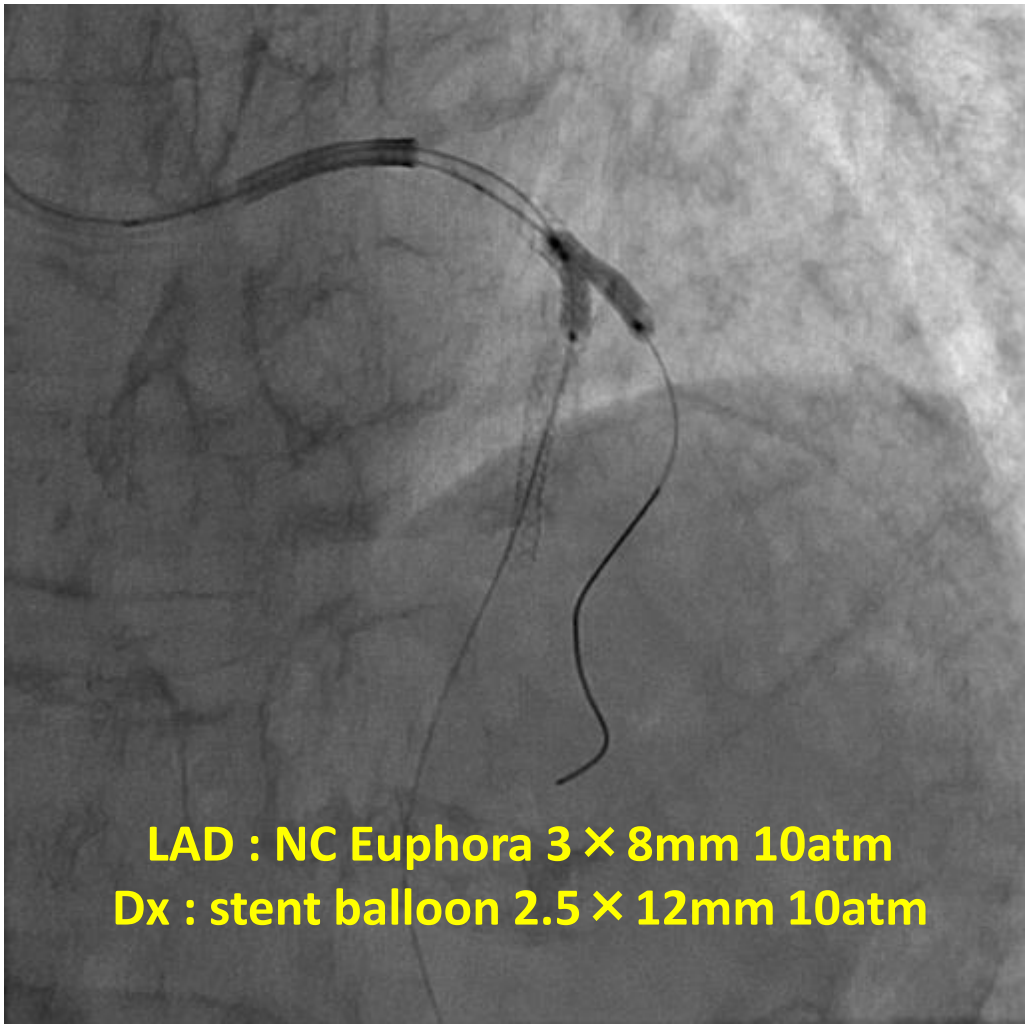


POT

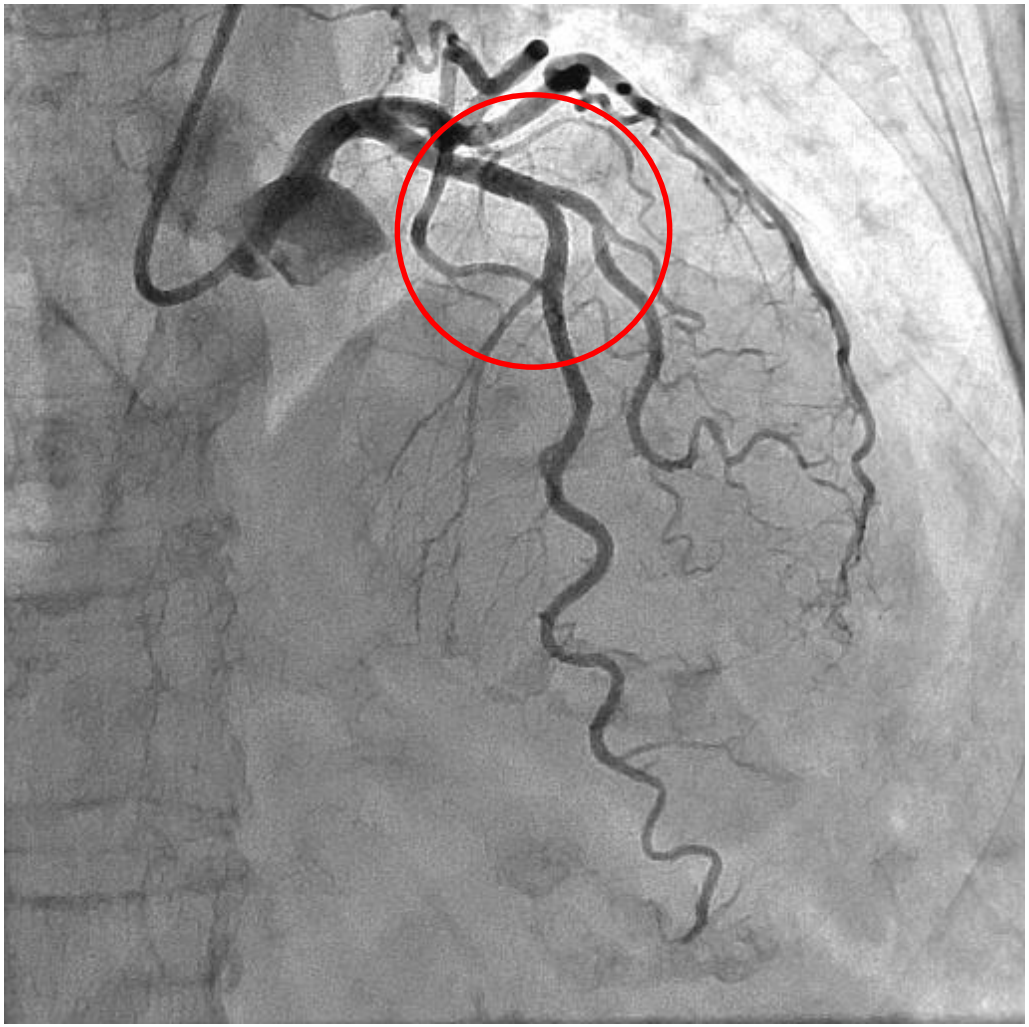


Re-cross after LAD stenting




LAD : NC Euphora 3 × 8mm 10atm
Dx : stent balloon 2.5 × 12mm 10atm

Final



Final (pullback from LAD)