Predictors of Side Branch Compomise in OCT Observations

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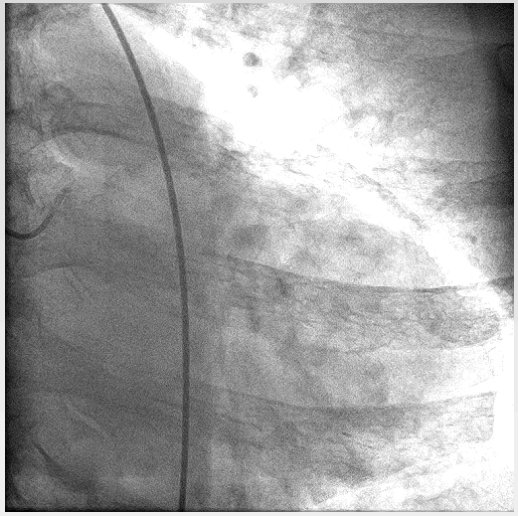
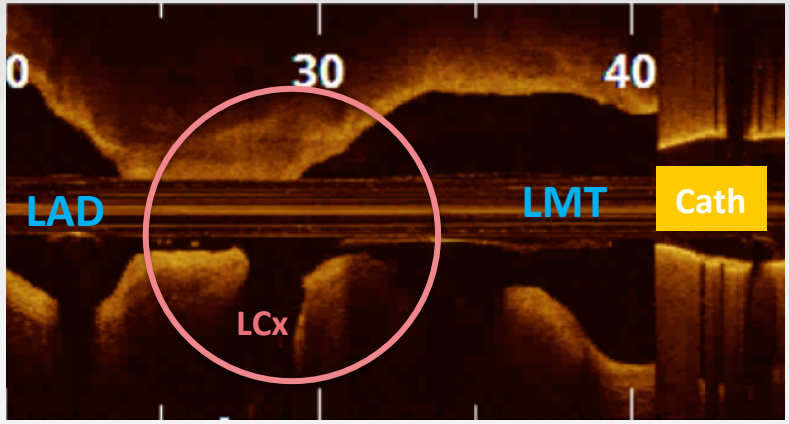
Longitudinal Reconstruction of OCT Images



FD-OCT

superior spatial resolution (10μm)
fast pullback (54mm/sec)

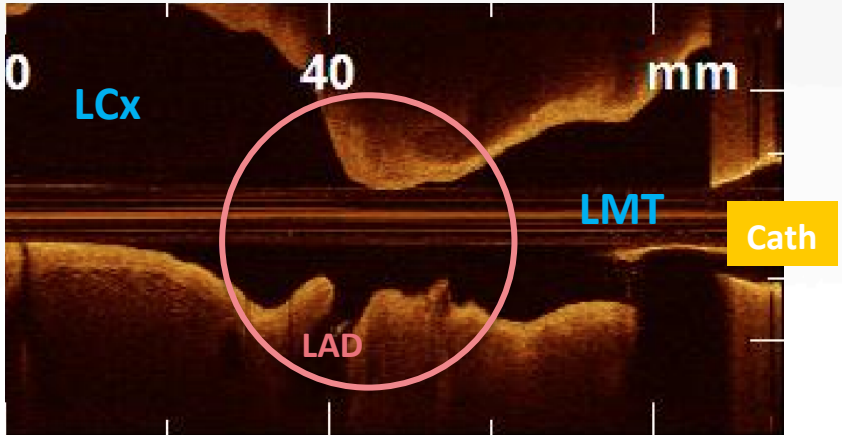
Pullback from LAD to LMT



OCT Characterization of Bifurcation Lesions

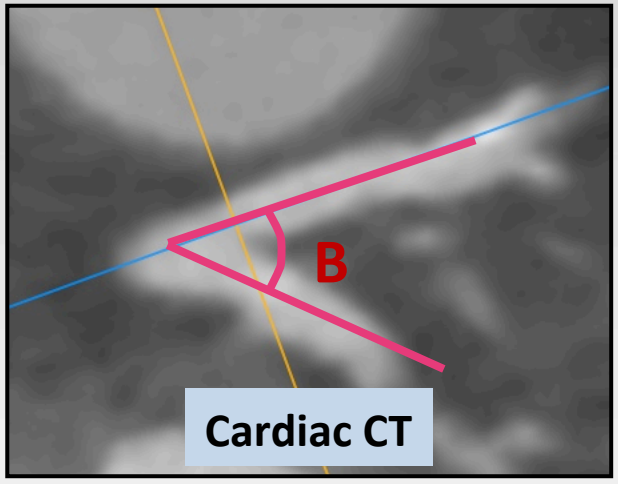
1) Plaque morphology
   - Distribution
   - Tissue character
2) Details of SB ostium
   - Diameter
   - Shape
   - Plaque burden
3) Carina shape
4) Bifurcation angle
5) Others

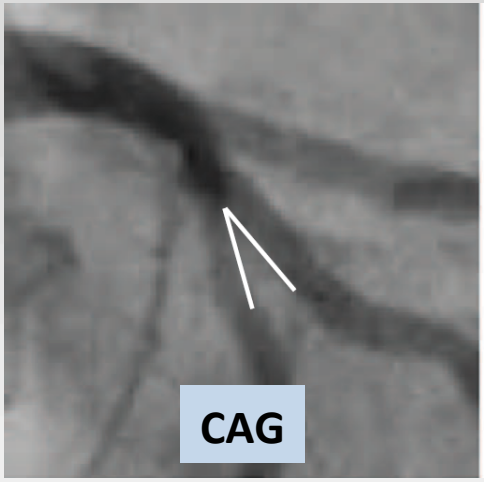
Pullback from LCx to LMT

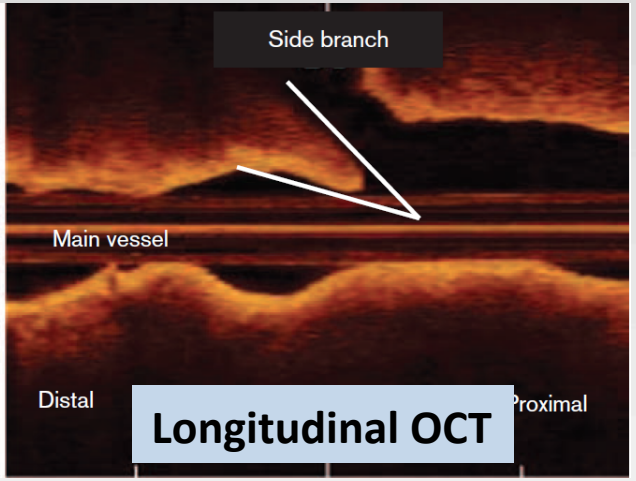


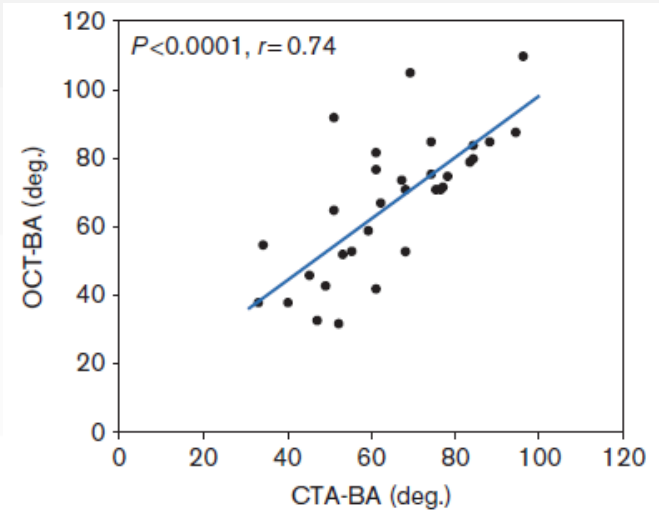
Varidation of Bifurcation Angle Measurement by OCT

Comparison with coronary CT angio.

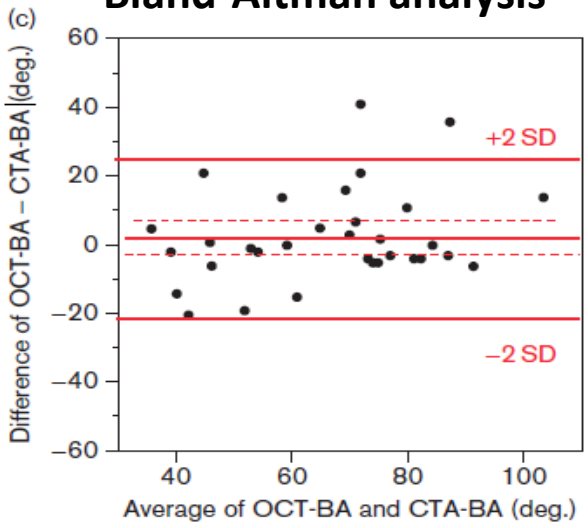






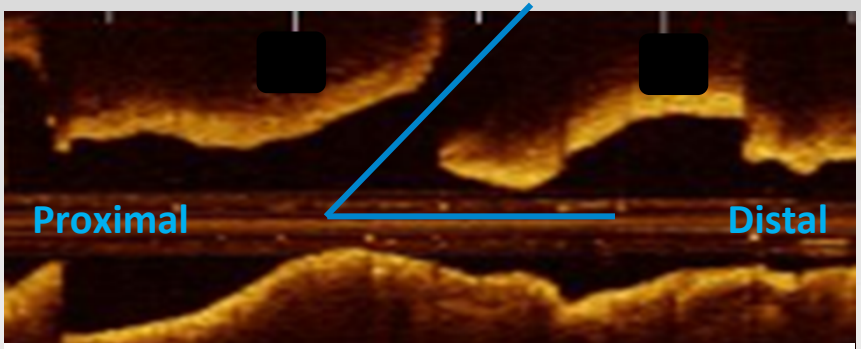


Bland-Altman analysis

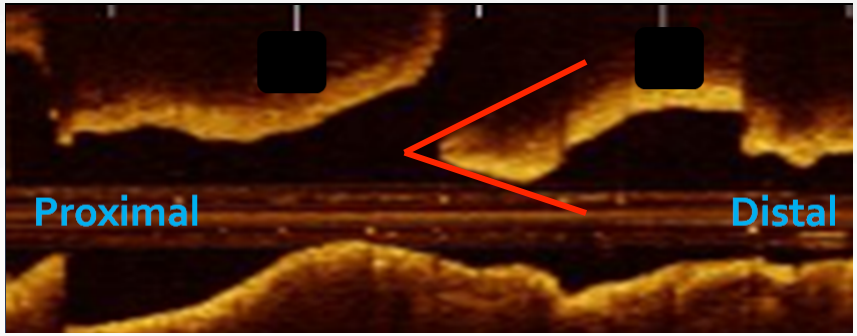


Watanabe, Uemura, et al.Coron Artery Dis. 2016 Dec;27(8):682-689.

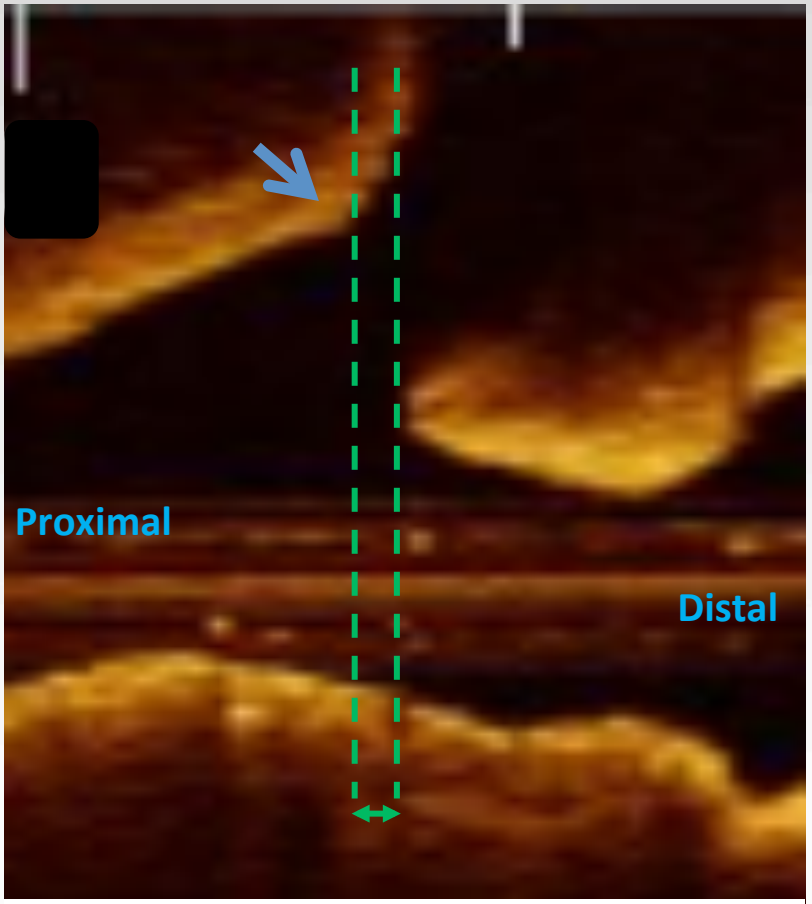
Planimetric Parameters of Bifurcation Lesion based on Longitudinal OCT Image



SB angle : side branch angle



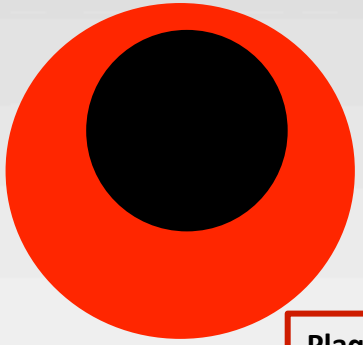
CT angle : carina tip angle



BP-CT length : length between proximal branching-point (BP) to carina tip (CT)

Plaque Distrubution at Carina Tip Level

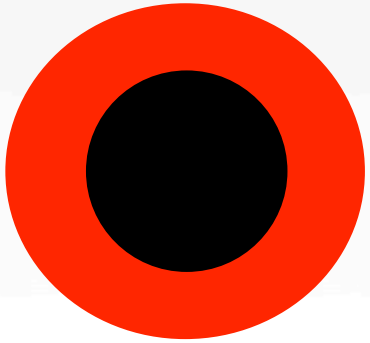
Theoretical Plaque Distribution



Type 1

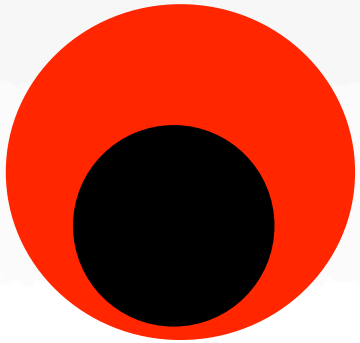
Plaque on opposite side to SB
Thin carina without plaque
(susceptible to carina shift)

Concentric plaque



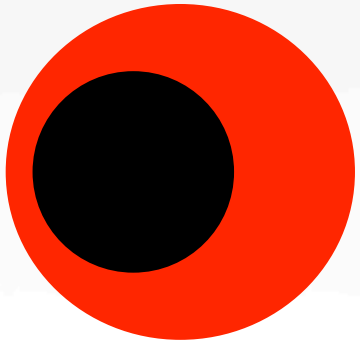
Type 2

Eccentric plaque



Type 2

Eccentric plaque



Type 2

Patient Background

Elective Cross-over Single Stent Implantation (49 patients, 52 lesions)
SB >2.0mm

Location of bifurcation	
LAD	**26 (50.0%)**
LCX	**10 (19.2%)**
RCA	**14 (26.9%)**
LMT	**2 (3.9%)**
Type of lesion (Medina classification)	
(1,1,0)	**9 (17.3%)**
(1,0,0)	**16 (30.8%)**
(0,1,0)	**27 (51.9%)**
Main branch	
Proximal ref. diameter, mm	**3.01 ± 0.52**
Distal ref. diameter, mm	**2.62 ± 0.58**
MLD, mm	**1.00 ± 0.22**
% stenosis, %	**59.8 ± 9.05**
Side branch	
Reference diameter, mm	**2.03 ± 0.38**

Watanabe, Uemura, et al. Coron Artery Dis. 2014;:321-9.

Quantitative Analysis of Baseline OCT Image

SB Compromise was defined as angiographic worsening of SB ostial stenosis (>75%).

	SB compromise (n=22)	Non SB compromise (n=30)	p Value
Lumen area mm^2			
proximal ref.	7.30±1.87	8.25±2.94	0.19
distal ref.	5.27±1.84	6.41±3.02	0.12
minimum 1.46±0.49	1.50±0.65	0.85	
proximal BP	4.23±1.49	6.04±3.25	<0.05
carina tip	3.07±1.27	4.37±2.93	0.06
Lesion length, mm	21.3±7.16	22.3±7.16	0.63
Plaque distribution at carina tip level			
Theoretical pattern (Plaque free carina)	17 (77.3%)	5 (16.7%)	<0.01
SB angle, °	60.3±24.3	69.5±16.4	0.11
CT angle, °	35.5±22.2	70.9±34.4	<0.001
BP-CT length, mm	1.3±0.67	2.4±0.88	<0.001

Watanabe, Uemura, et al. Coron Artery Dis. 2014;:321-9.

OCT Predictors of SB Compromise

	HR	95% CI	p Value
Lumen area at proximal BP	0.96	0.66-1.38	0.81
Theoretical plaque distribution at carina tip	8.53	1.21-59.9	<0.05
CT angle (≦51°)	10.5	1.17-94.4	<0.05
BP-CT length (≦ 1.75 mm)	19.2	2.27-162	<0.01

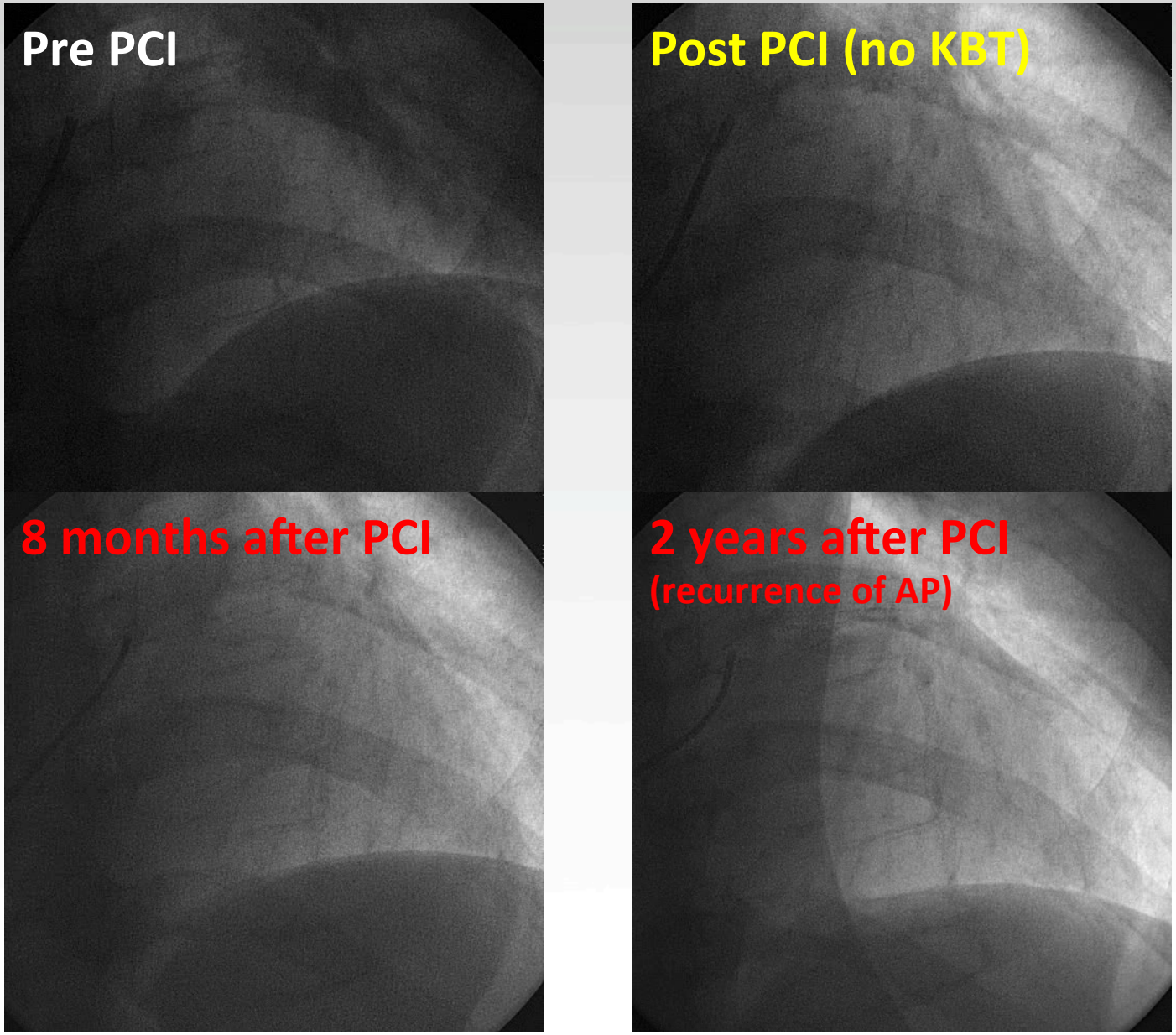
Watanabe, Uemura, et al. Coron Artery Dis. 2014;:321-9.

Prediction of SB Compromise based on Longitudinal OCT Parameters

	BP-CT length≦1.75mm	BP-CT length>1.75mm
CT angle≦51°	82.4% (14/17)	41.7% (5/12)
CT angle>51°	28.6% (2/7)	0% (0/16)

Watanabe, Uemura, et al. Coron Artery Dis. 2014;:321-9.

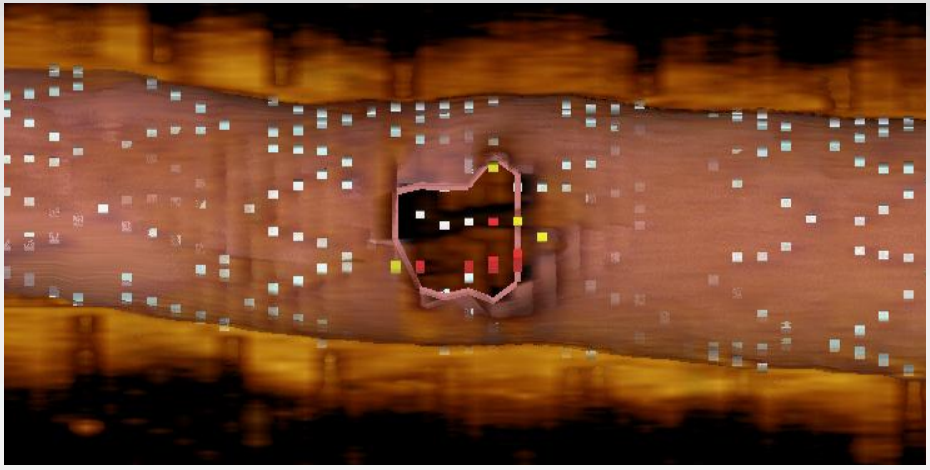
Serial Change of Jailed SB Ostium



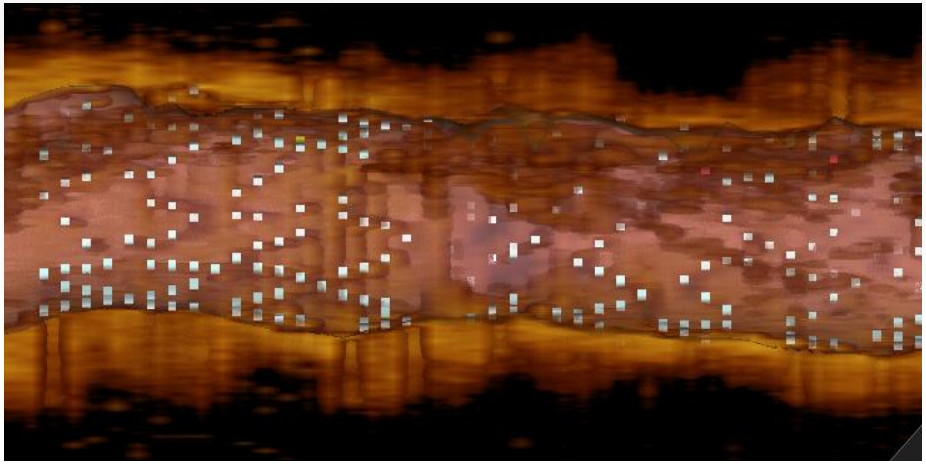
Jailed Side Branch Ostium after MV Stenting

3D-OCT Imaging

Just after stent implantation



2 years after PCI



Neointimal coverage of jailed side branches in coronary bifurcation lesions: an optical coherence tomography analysis

Teruyoshi Kume, Ryotaro Yamada, Koyama Terumasa, Tomoko Tamada, Koichiro Imai, Kenzo Fukuhara, Yutaka Goryo, Ai Kawamura, Okamoto Hiroshi, Yoji Neishi and Shiro Uemura

Coron Artery Dis. 2017 doi: 10.1097/MCA.0000000000000563.

Background

In addition to risk of late stent thromobosis, overhanging struts within SB ostium may be the risk of SB flow disturbance during long-term follow-up, by means of late tissue growth (neointimal proliferation or fibrin deposition) around struts.

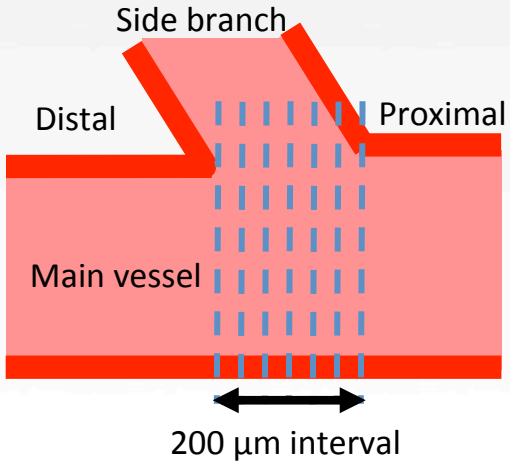
Purpose

To characterize the relationship between the jailing strut pattern within the SB ostium and the tissue coverage of the jailed SB ostium at the chronic phase.

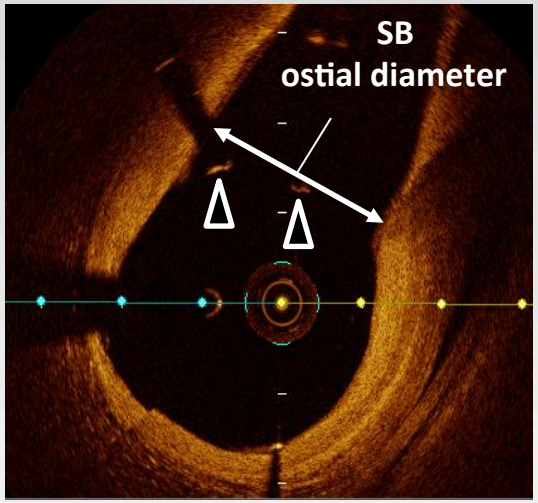
OCT Analysis of Side Branch Ostium

29 bifurcation lesions
in patients with stable AP

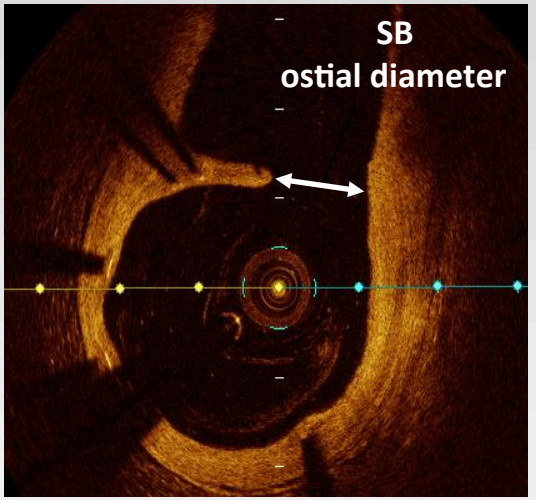
Serial OCT imaging
at stent implantation
8 months (mid-term)
18 months **(long-term)**



Baseline

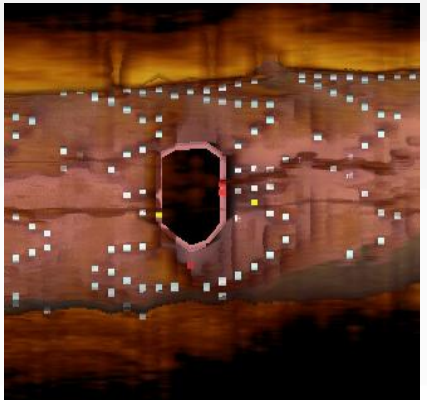


Follow-up



Link group

No-link group



Kume T, Uemura S, et al. Coron Artery Dis. 2017
doi: 10.1097/MCA.0000000000000563

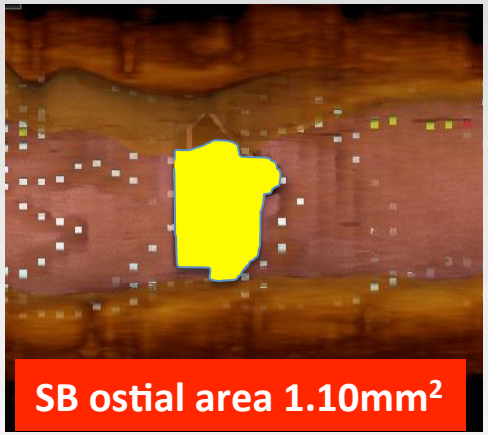
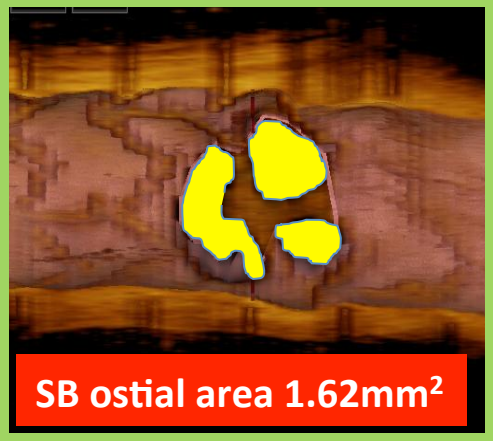
PCI Procedural Background

	Link group (n=11)	No-link group (n=18)	p value
Stents per lesion	1.2±0.4	1.2±0.4	0.803
Stent diameter (mm)	2.7±0.4	2.7±0.3	0.908
Total stent length (mm)	30.0±12.6	29.8±12.6	0.973
Stent with post-dilatation	5 (45)	7 (39)	1.000
Maximal balloon pressure (atm)	15.9±3.7	15.3±2.6	0.624
SB balloon inflation after MV stent implantation	0 (0)	6 (33)	0.058
Kissing Balloon Technique	0 (0)	3 (17)	0.268

Values are mean ± SD or n (%). SB: side branch

Kume T, Uemura S, et al. Coron Artery Dis. 2017
doi: 10.1097/MCA.0000000000000563

Serial Tissue Growth at SB Ostium

	Baseline	18-month F/U
No-link group		
Link group		

Kume T, Uemura S, et al. Coron Artery Dis. 2017
doi: 10.1097/MCA.0000000000000563

OCT Analysis

	Link group (n=11)	No-link group (n=18)	p value
Baseline			
Total number (dots) of struts within SB ostium	8.9±2.5	4.6±2.4	<0.001
SB ostial area (mm^2)	1.59±0.71	1.07±0.46	0.025
18-month Follow-up	30.0±12.6	29.8±12.6	0.973
SB ostial area free from neointima (mm^2)	1.13±0.58	0.98±0.54	0.485
SB ostial obstruction by neointima (%)	26.8±21.9	9.5±22.1	0.049

Overhanging strut with link is a risk for neointimal overgrowth at SB ostium(>18 months).

Late loss of SB ostial area (mm^2)	0.46±0.35	0.09±0.24	0.002

Values are mean ± SD or n (%). SB: side branch.

Kume T, Uemura S, et al. Coron Artery Dis. 2017
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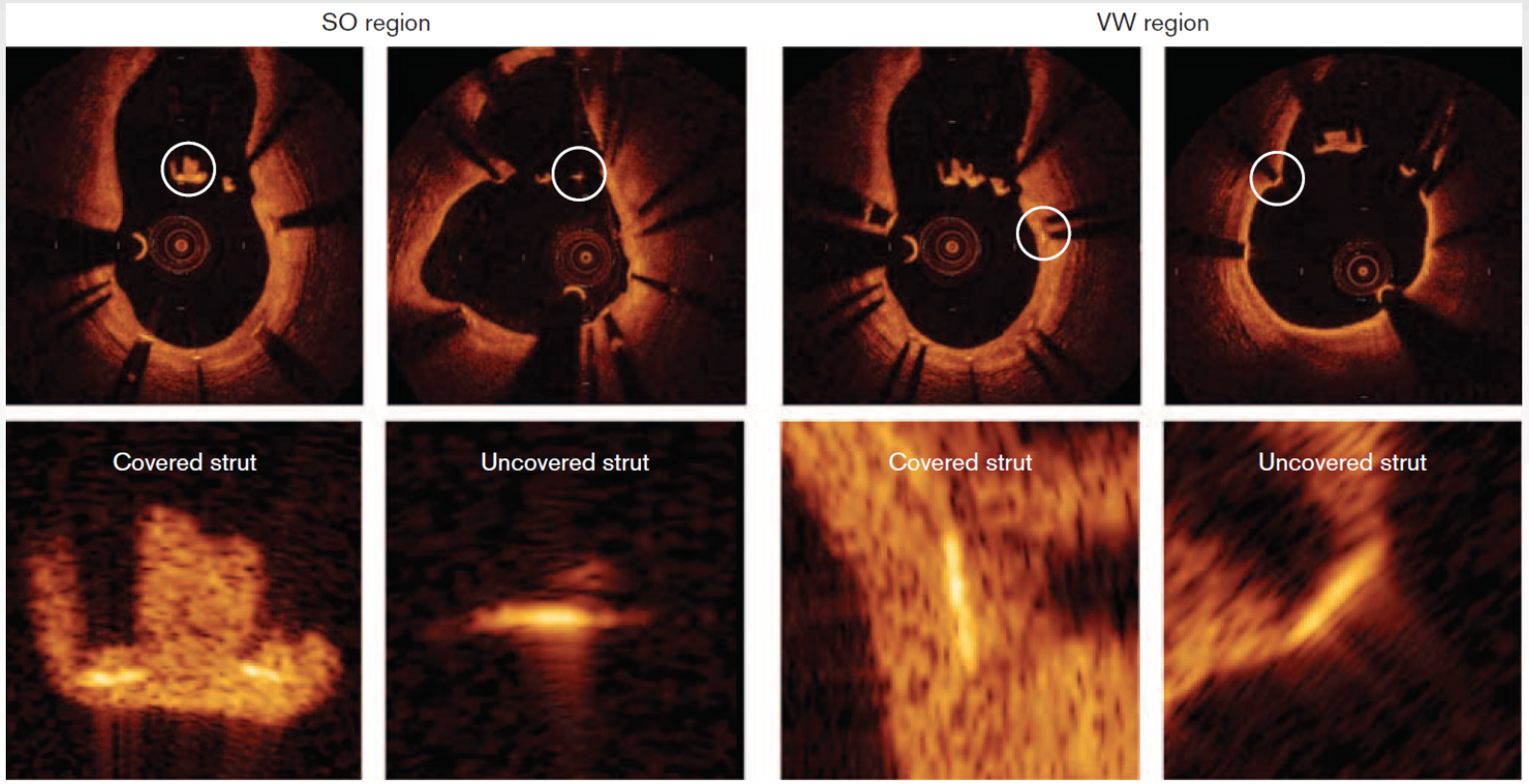
Impact of branching angle on neointimal coverage of drug-eluting stents implanted in bifurcation lesions

Makoto Watanabe[a], Shiro Uemura[b], Yoko Kita[a], Yu Sugawara[a], Yutaka Goryo[b], Tomoya Ueda[a], Tsunenari Soeda[a], Satoshi Okayama[a], Hiroyuki Okura[a], Teruyoshi Kume[b] and Yoshihiko Saito[a]

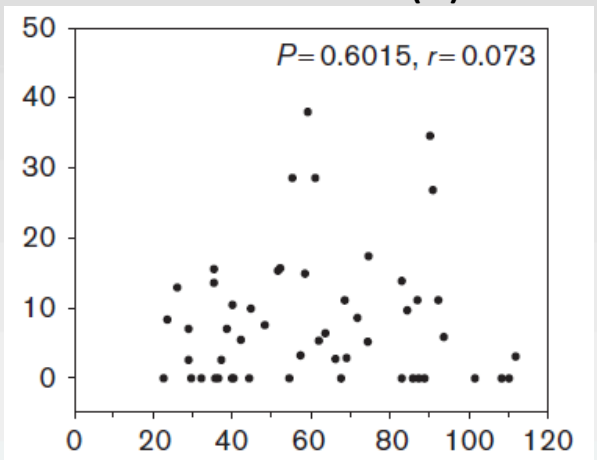
Coron Artery Dis. 2016 Dec;27(8):682-689.



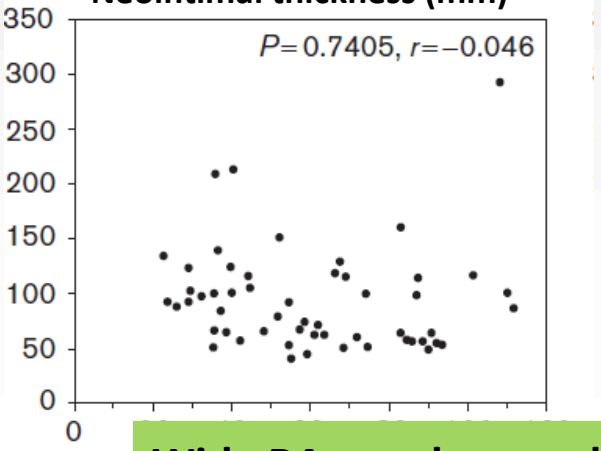
Bifurcation Angle and Tissue Coverage of DES at F/U

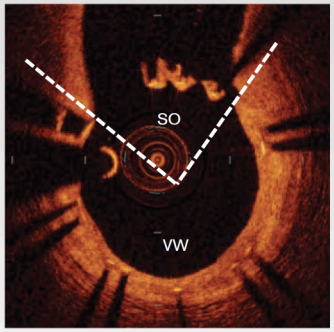
Struts attaching to vessel wall

Uncovered struts (%)



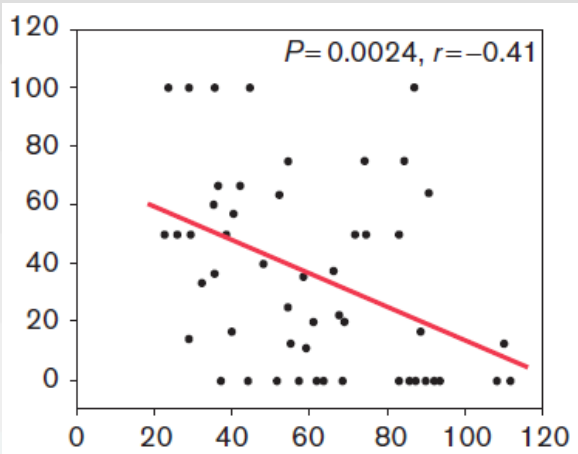
Neointimal thickness (mm)



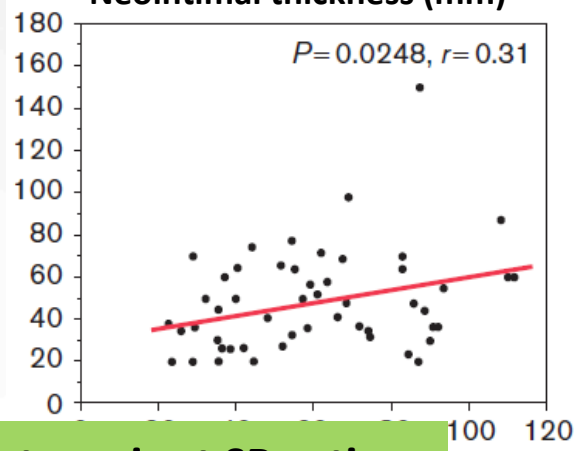


Struts jailing SB ostium

Uncovered struts (%)



Neointimal thickness (mm)



Wide BA may be an additional risk for late restenosis at SB ostium

Watanabe M, Uemura S, et al.Coron Artery Dis. 2016;27(8):682-689.

Take Home Message

1. Evaluation of bifurcation lesions with longitudinal OCT enables us to predict SB compromise.

2. Narrower BA (CT angle) and shorter BP-CT length were the independent predictors for SB ostial compromise after cross-over single stenting.

3. Overhanging strut with link within SB ostium may be risk of late decrease in SB ostial area (>18 months). KBT may be useful for the prevention of late SB complication though removing jailing struts.

4. Wider BA was accompanied with enhanced tissue growth in overhanging struts, which might lead to flow disturbance in SB during long-term follow-up.

Thank you for your attention.