

Left Main & Coronary Bifurcation Summit

Kissing balloon inflation in single- or two- stent bifurcation stenting

Yoshinobu Murasato MD, PhD

**Dept. of Cardiovascular Medicine,
New Yukuhashi Hospital**

murasato@shinyukuhashihospital.or.jp



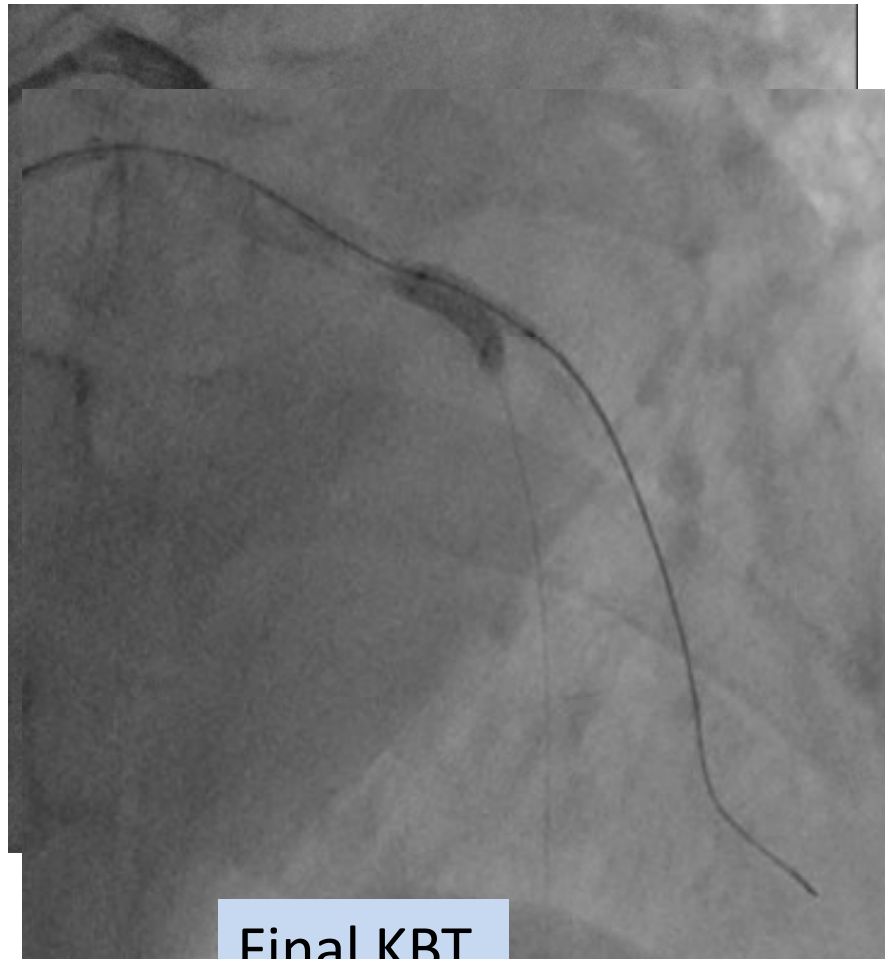
TCTAP 2011, April 27-29, Seoul

What is the role of kissing balloon inflation in the bifurcation intervention?

- To keep the access route to the SB
- To prevent SB narrowing and restenosis
- To make a bigger lumen in the proximal MV
- To assure the stent apposition
- To correct the stent deformation

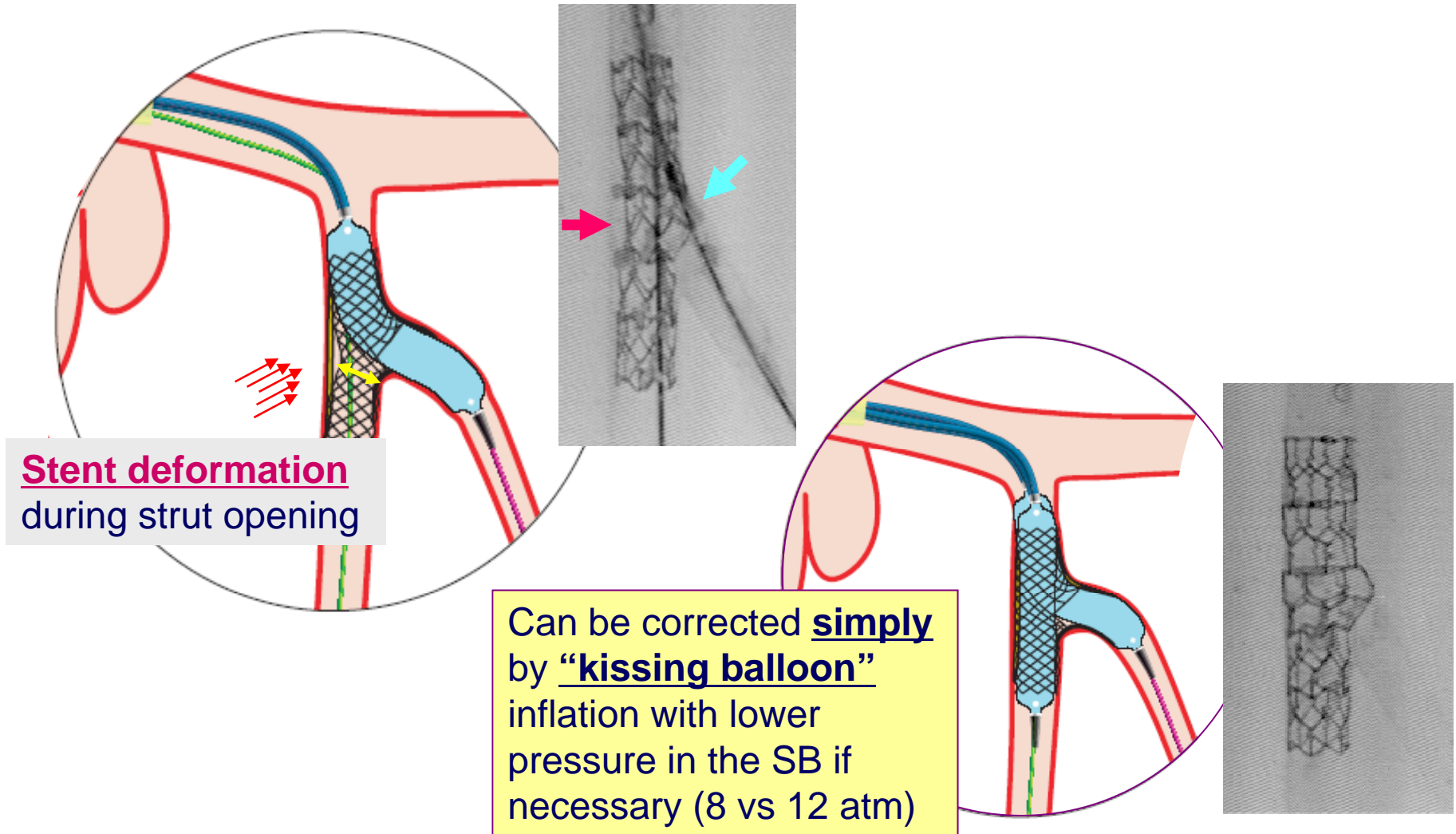


Keeping the access route to the SB



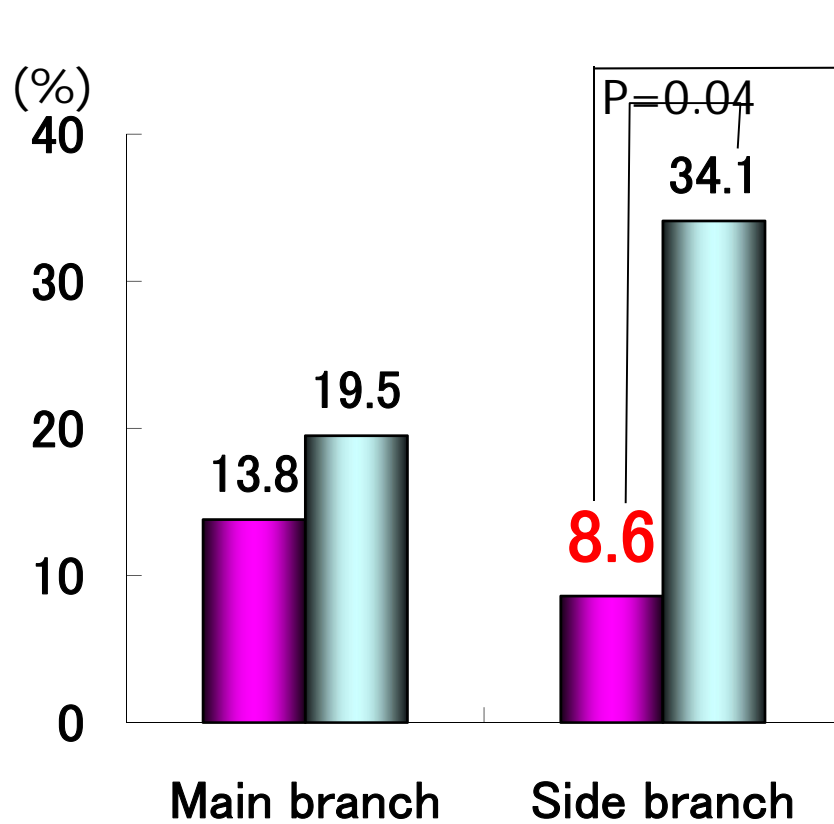
Correction of stent deformation

Lefevre T, Albiero R, 2nd European Bifurcation Club, 2006

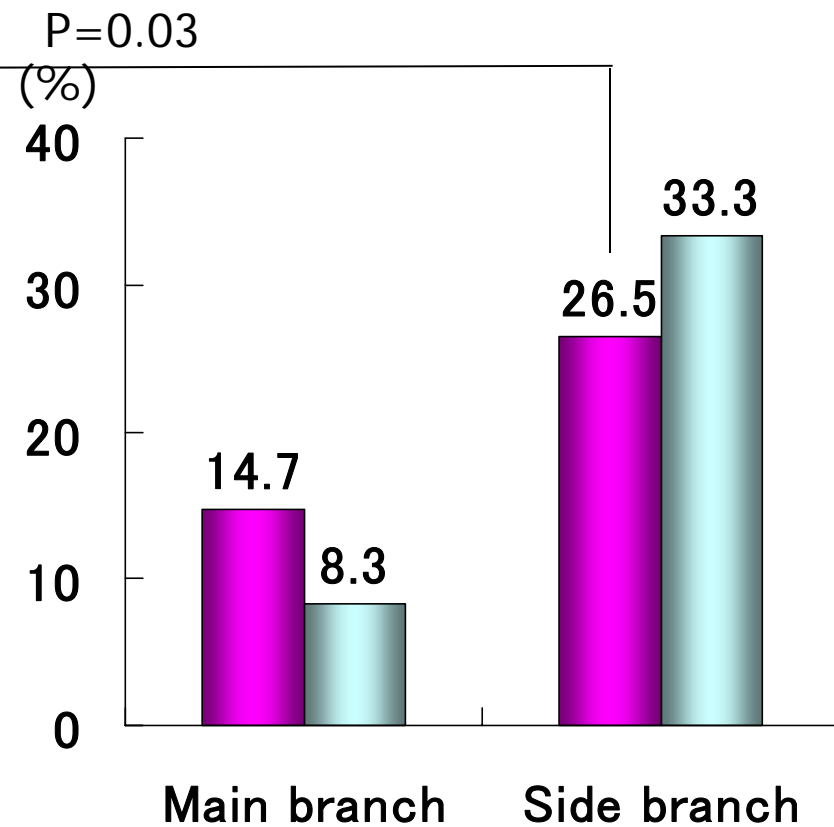


Effect of KBT on restenosis in 2-stent technique

Crush stent



T-stent

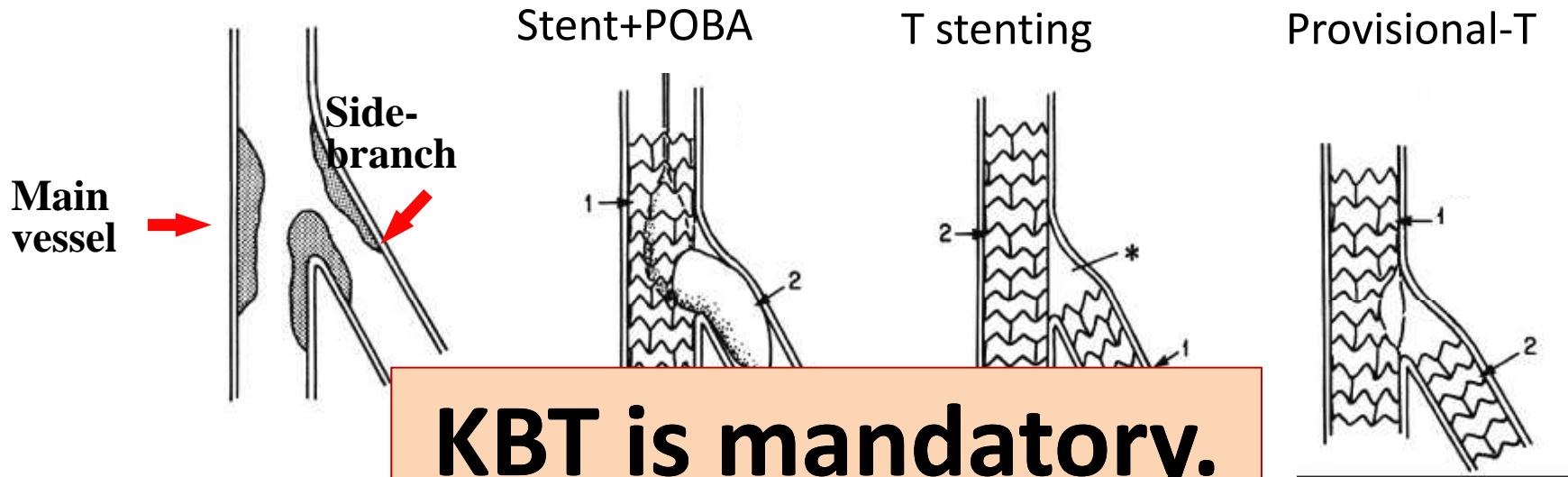


Final KBT group
No final KBT group

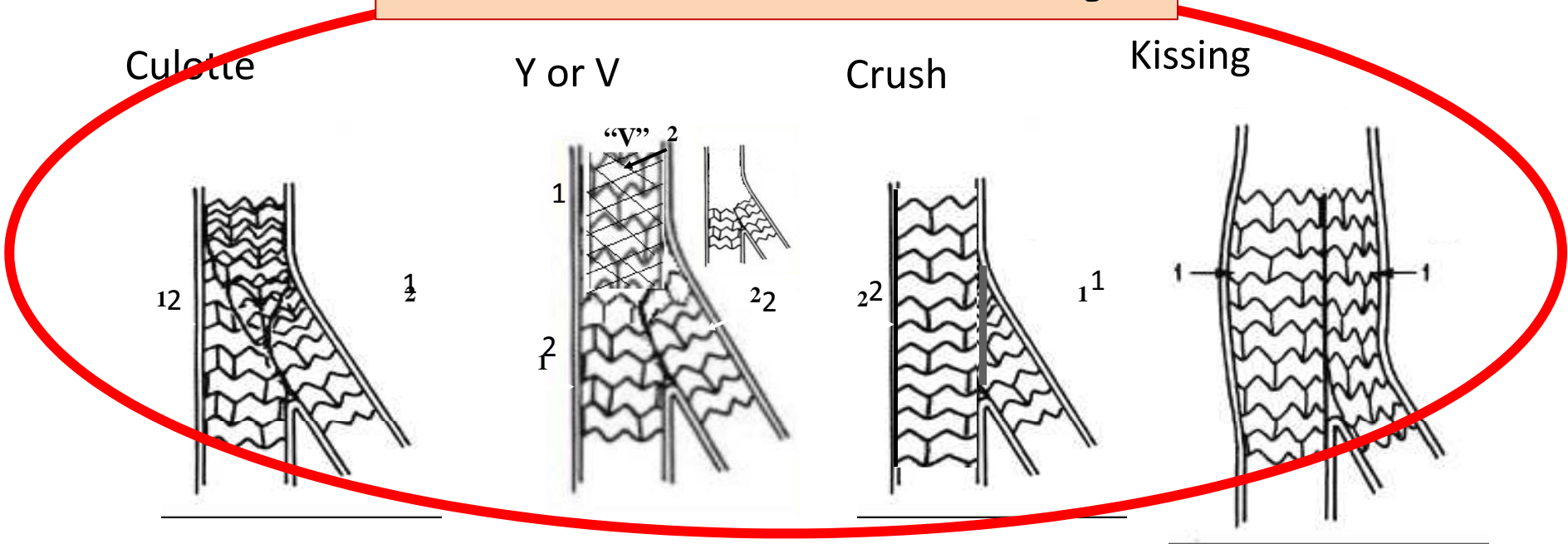
Culotte stenting: Predictors of binary restenosis

Variable	Odds ratio (95% CI)	P-value
Proximal main vessel		
Reference vessel diameter decrease by 1 mm	4.55 (0.17–123.36)	0.37
Baseline stenosis increase by 10%	0.91 (0.67–1.23)	0.54
Distal main vessel		
Reference vessel diameter decrease by 1 mm	0.10 (0.00–3.17)	0.19
Baseline stenosis increase by 10%	1.47 (1.03–2.09)	0.03
Side branch vessel		
Reference vessel diameter decrease by 1 mm	31.83 (1.71–592.77)	0.02
Baseline stenosis increase by 10%	0.97 (0.82–1.15)	0.75
Kissing balloon post-dilatation	0.37 (0.13–1.10)	0.07

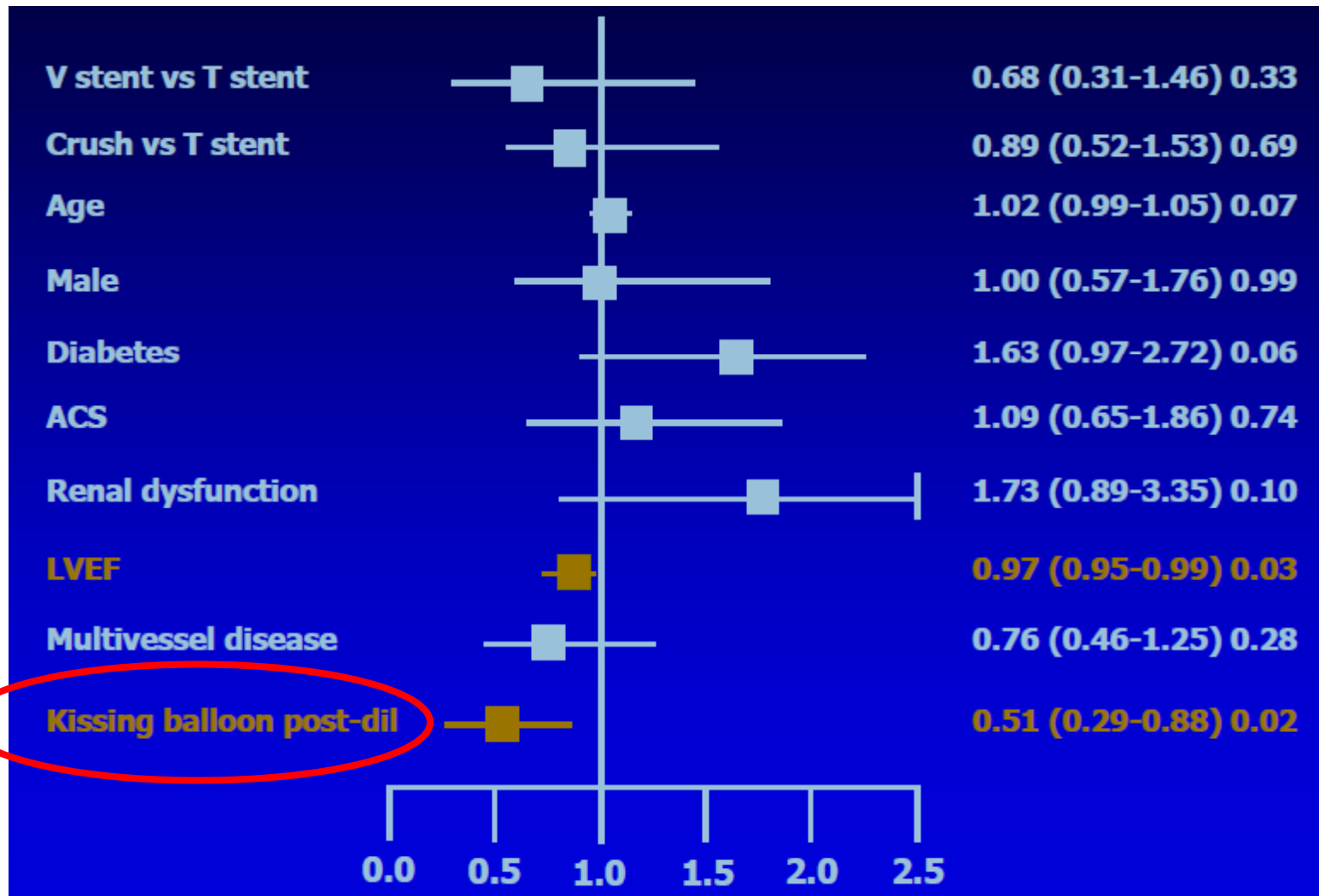
Various Techniques for Stenting Bifurcation Lesions



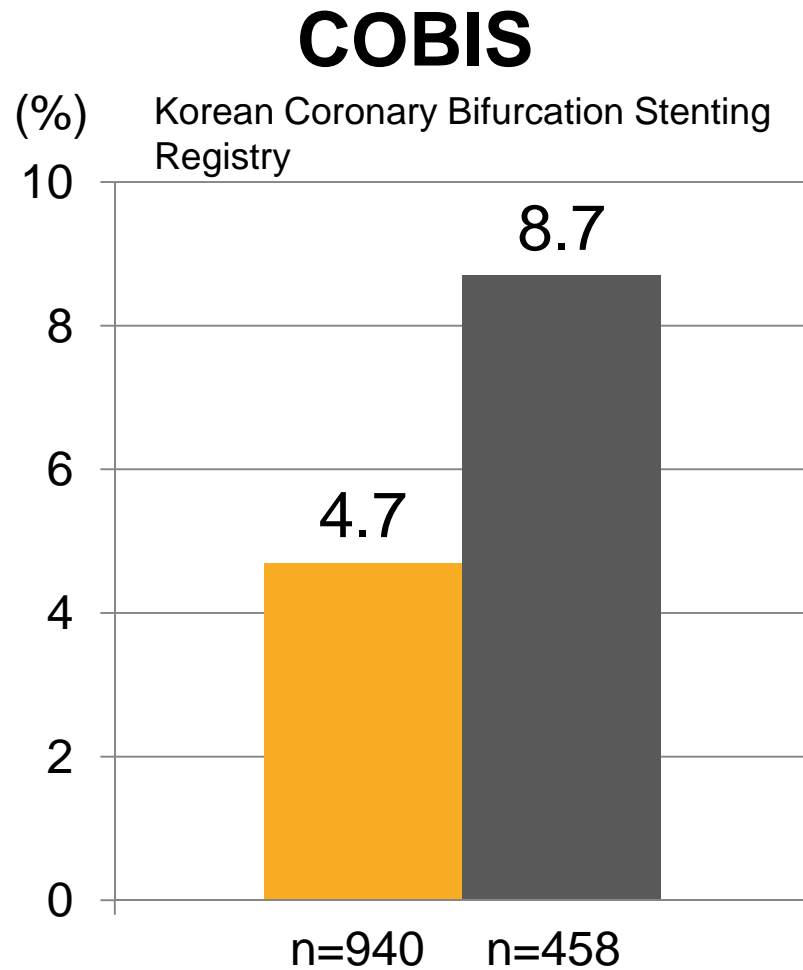
KBT is mandatory.



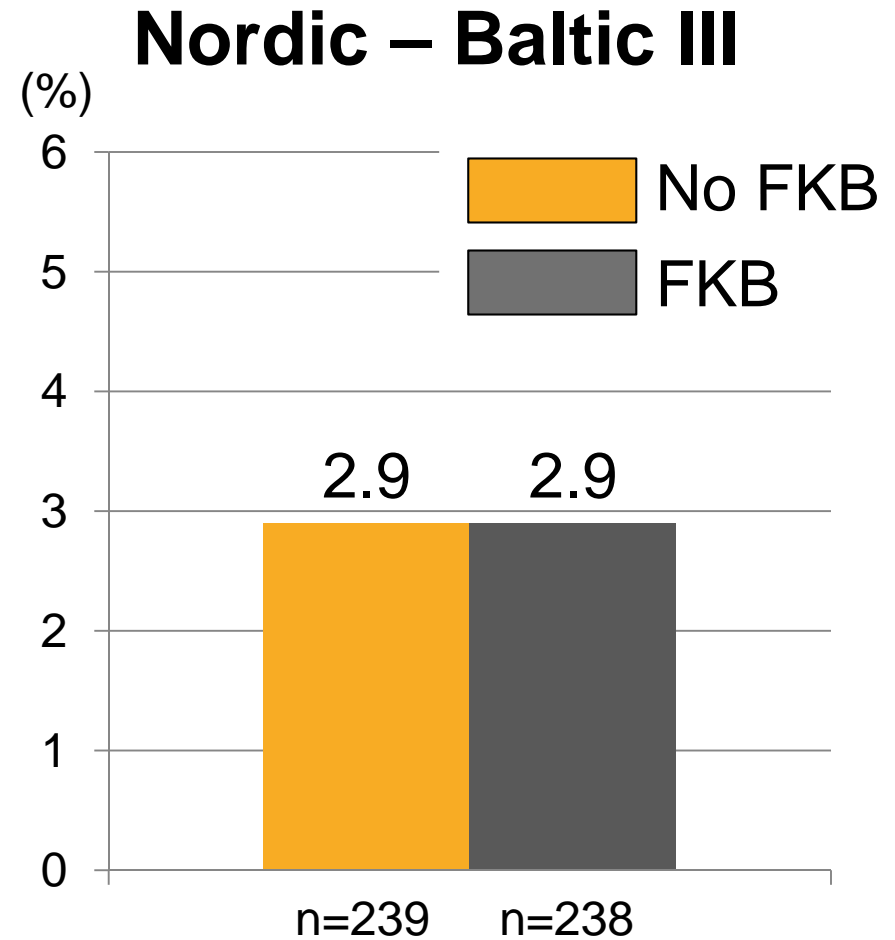
2Y clinical outcome of GISE survey on unprotected LMCA



Ineffectiveness of FKB on the MACE in 1-stent strategy



Gwon HC, ACC 2009



Niemela M, Circulation. 2011; 123: 79

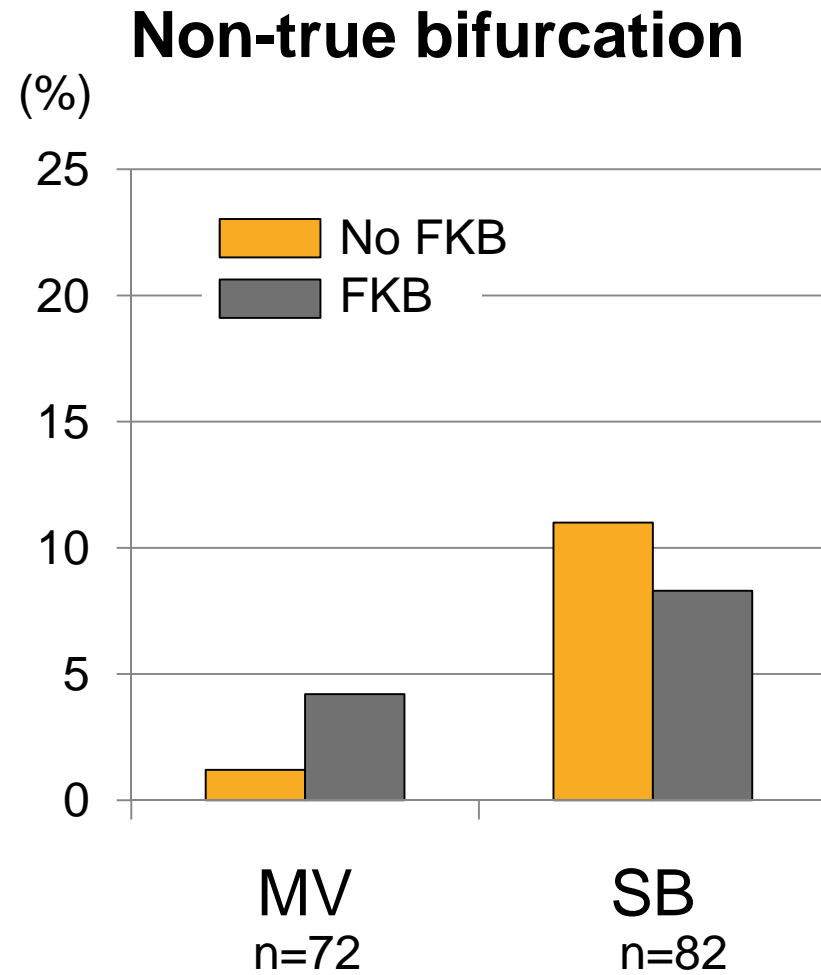
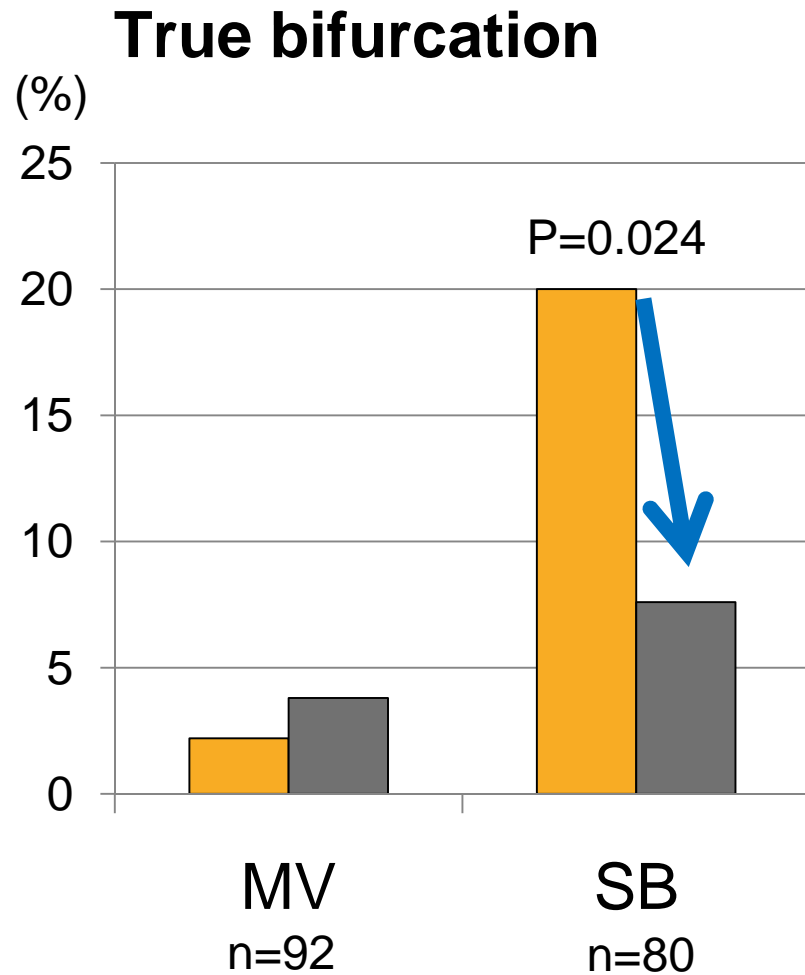
Does kissing balloon inflation always have a good performance?



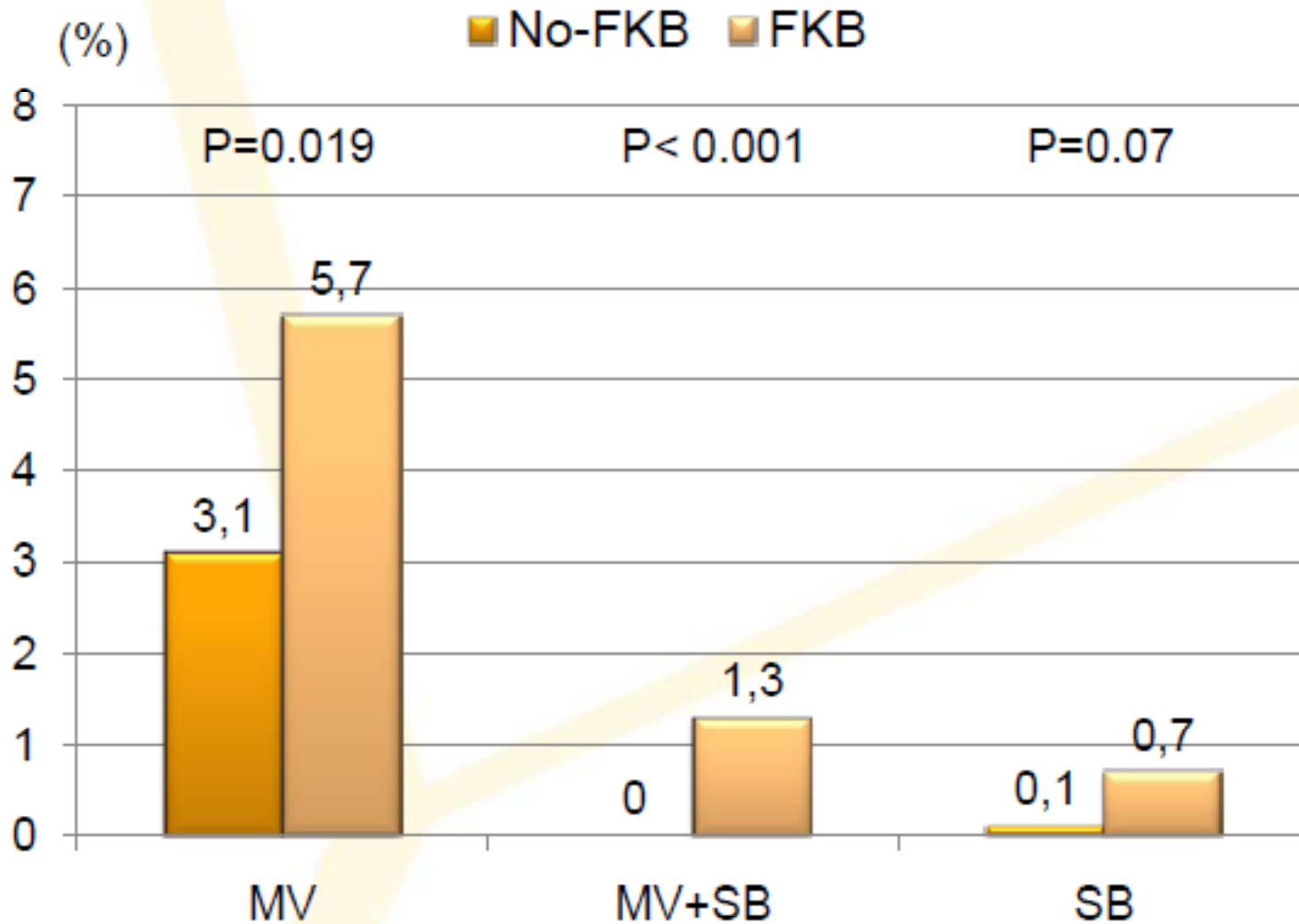
If good, what's the best kissing technique?

Nordic – Baltic III

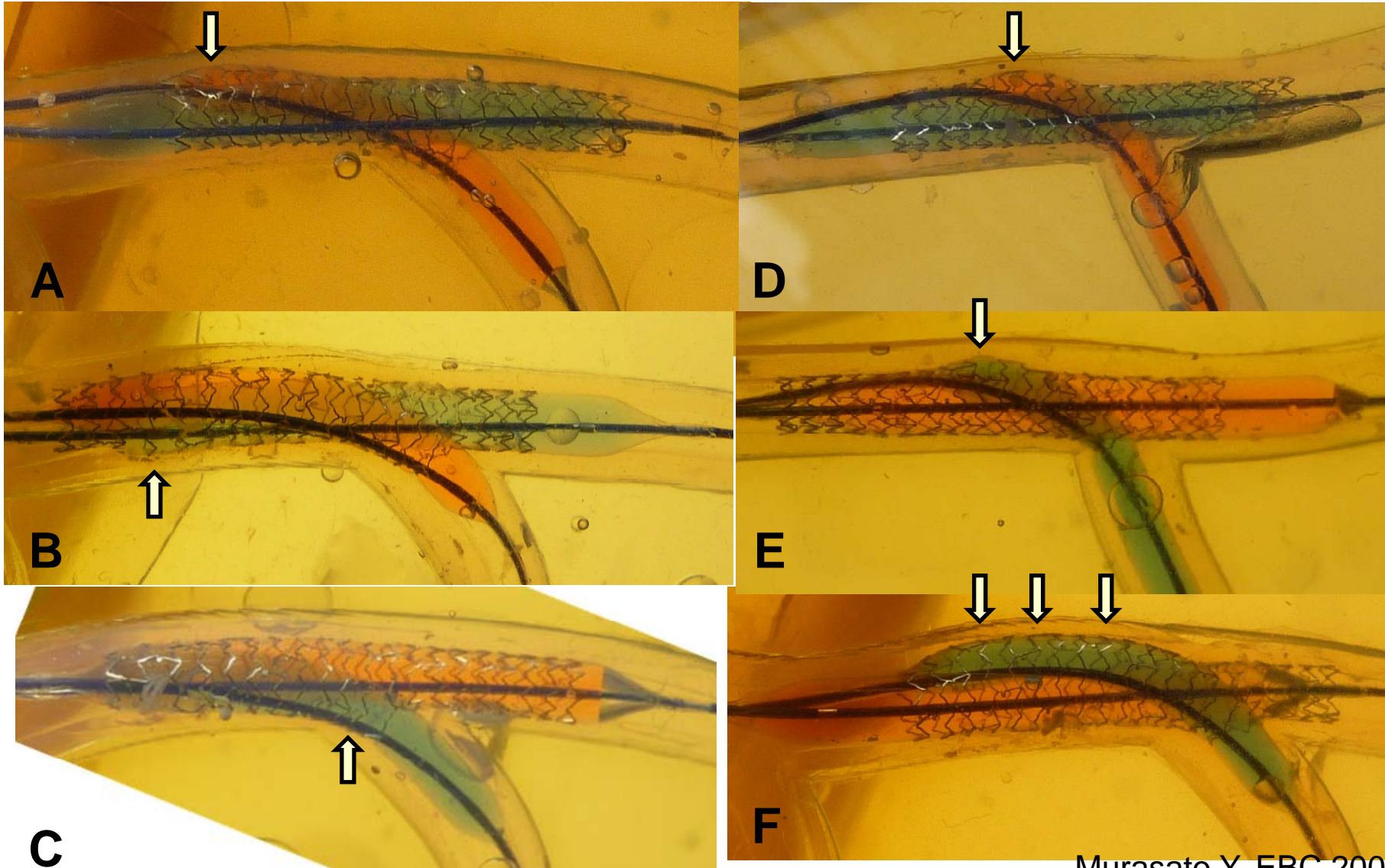
Angiographic restenosis in 8mo follow-up



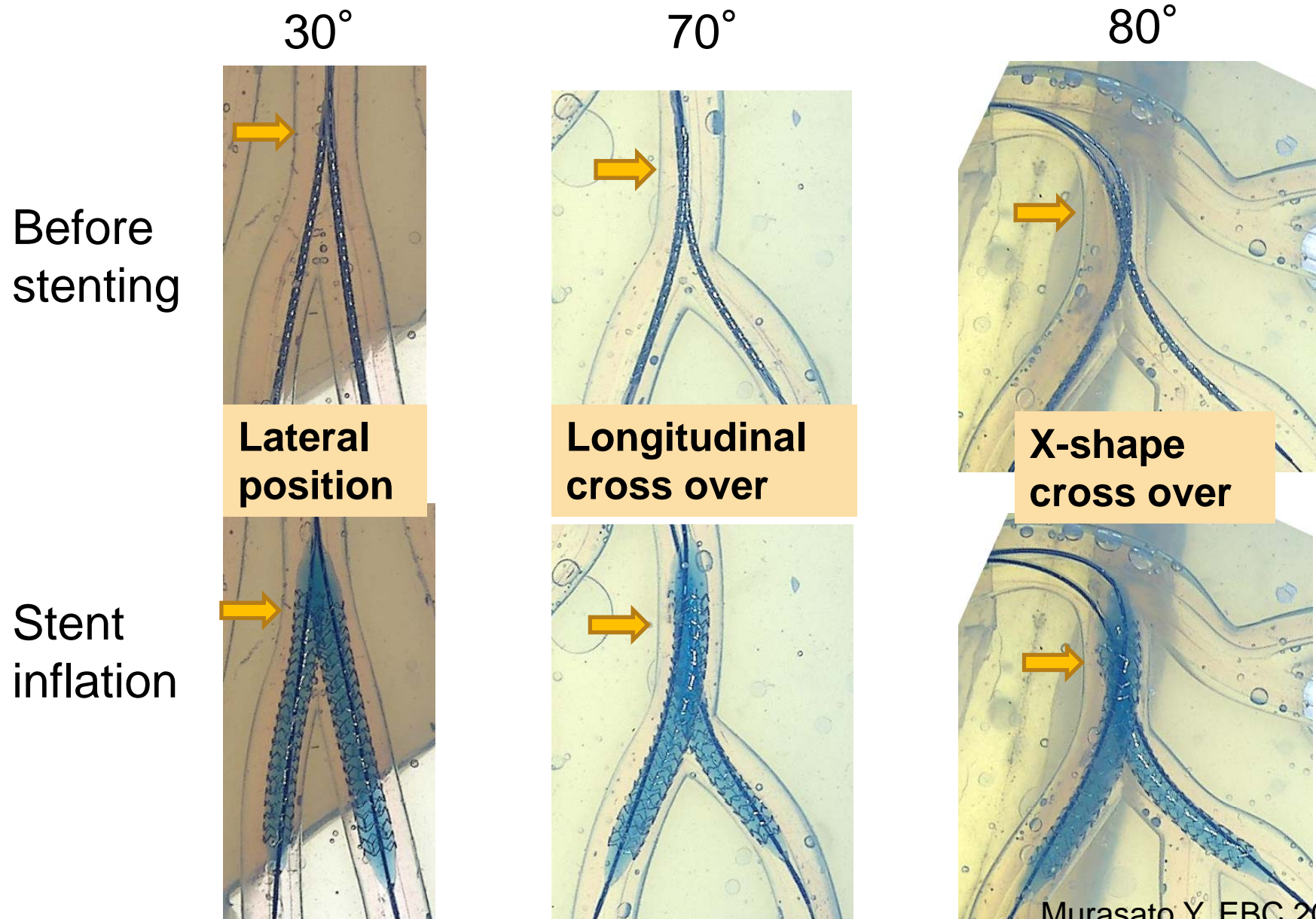
COBIS: Location of TLR



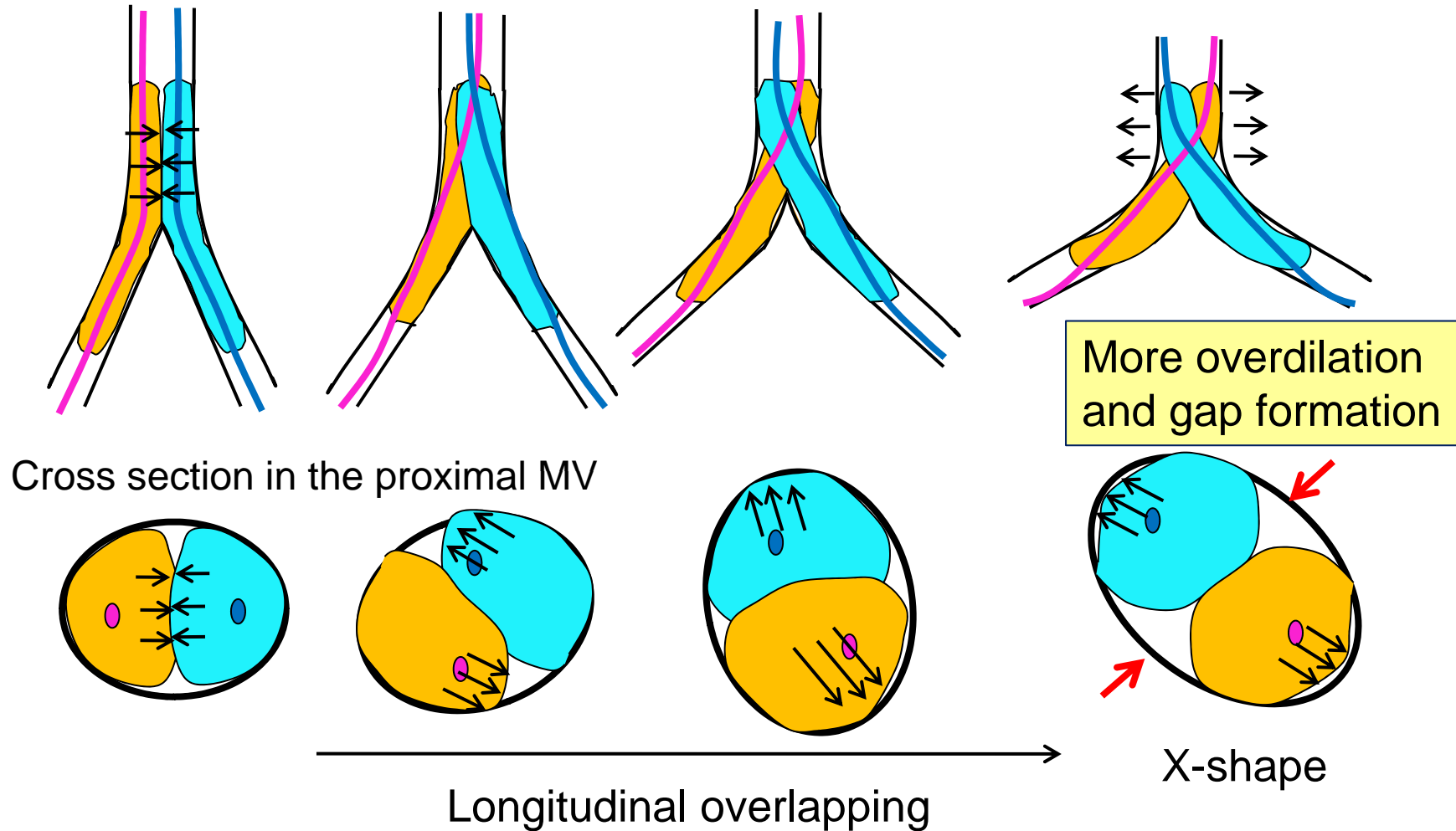
Various configurations of the proximal MV stent which are dependent on the operator's decision.



Effect of bifurcation angle on stent overlapping style

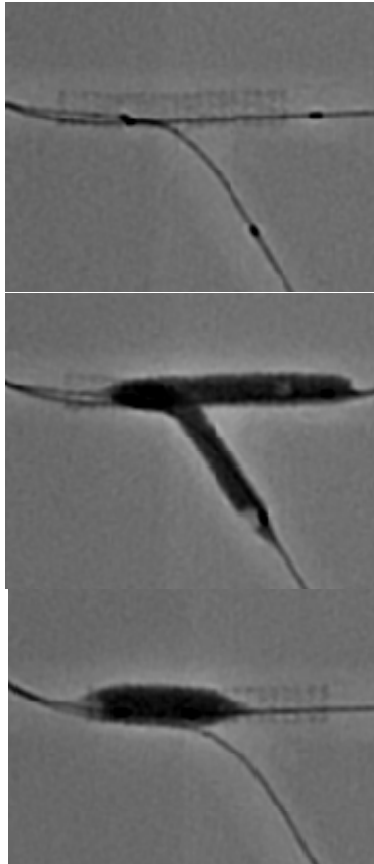


Relationship between bifurcation angle and vessel dilation in the proximal MV



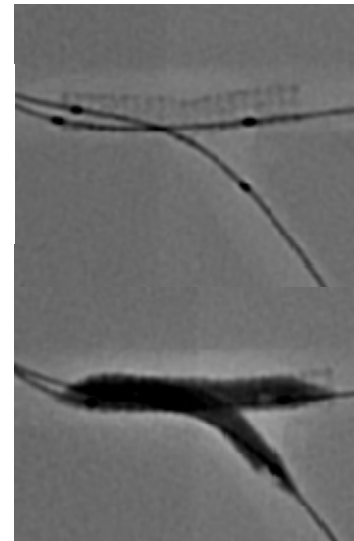
Two overlapping styles in KBT

Minimal overlapping + Proximal large ballooning



- ML Vision 3.5/28, 14atm
- SB Ryujin 3.0/20, 12atm
- KBT (6atm)
MV Ryujin 3.5/20
SB Ryujin 3.0/20
- prox MV
Quantum Maverick II
4.5/8, 12atm

Long overlapping

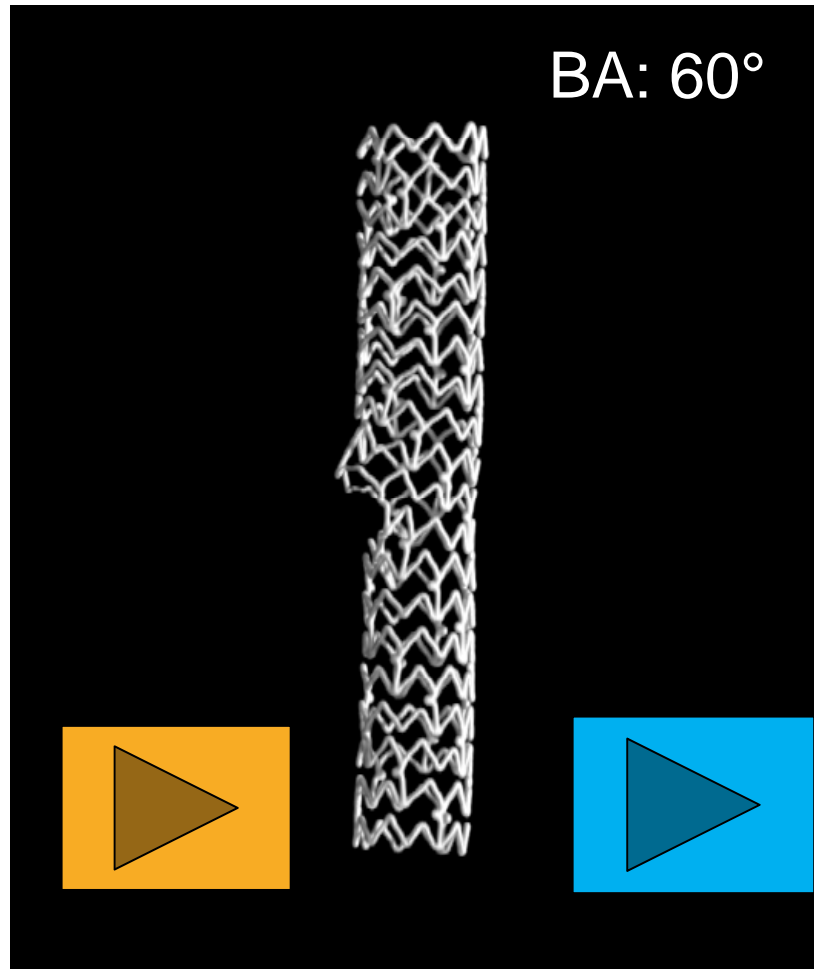


- ML Vision 3.5/28, 14atm
- SB Ryujin 3.0/20, 12atm
- KBT (6atm)
MV Ryujin 3.5/20
SB Ryujin 3.0/20

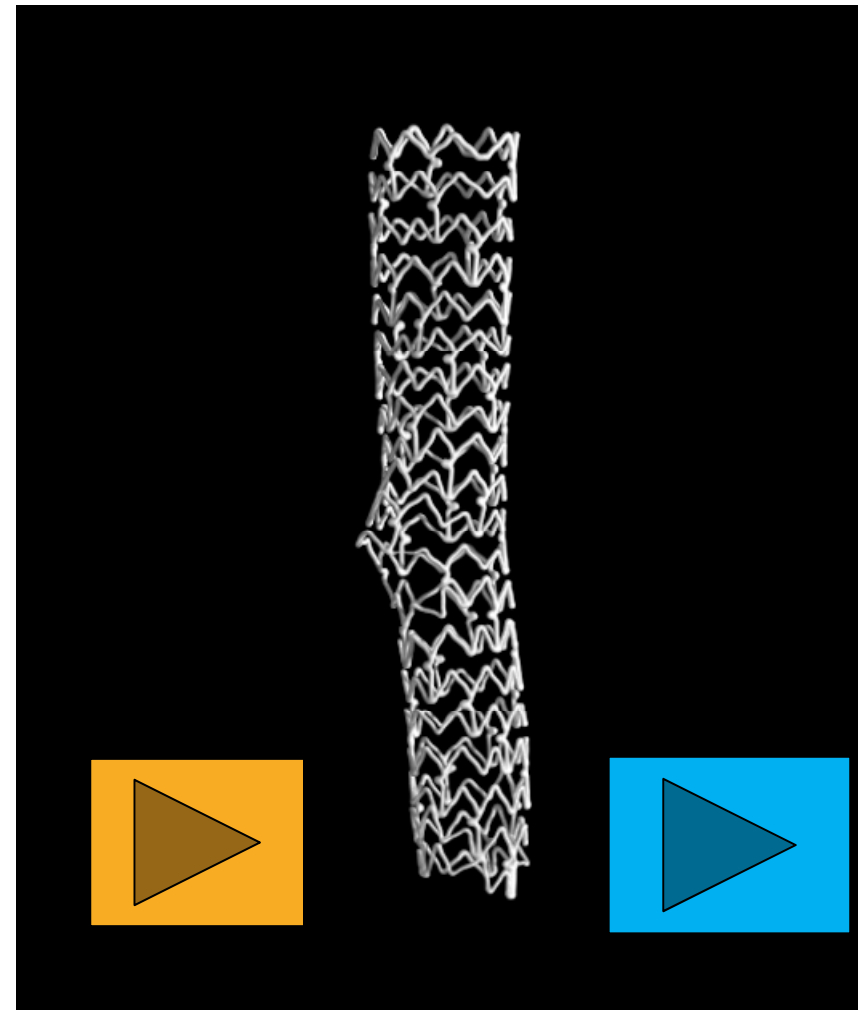
Mitsudo's law

$$3.5^2 + 3.0^2 = 4.6^2$$

Minimal overlapping +
Proximal large ballooning

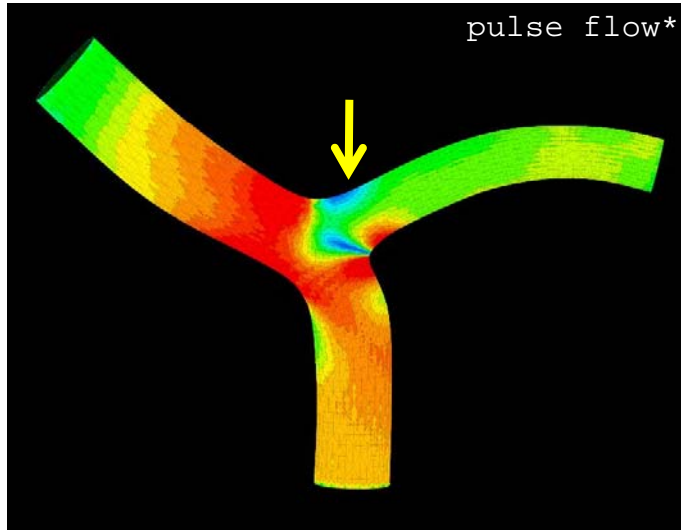


Long overlapping

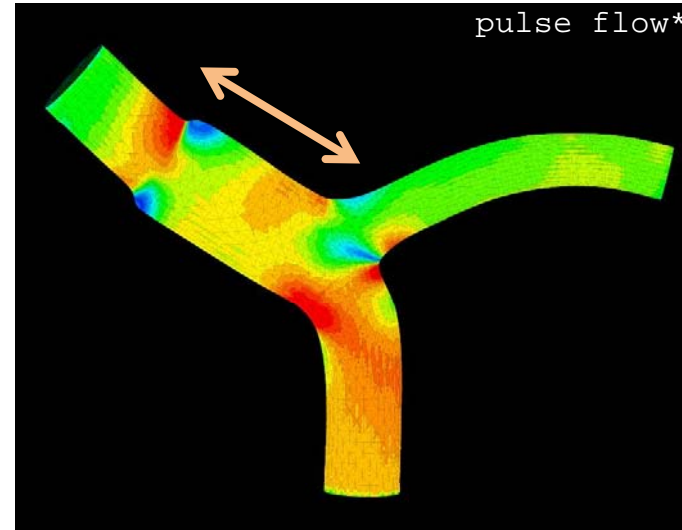


Wall Shear Stress

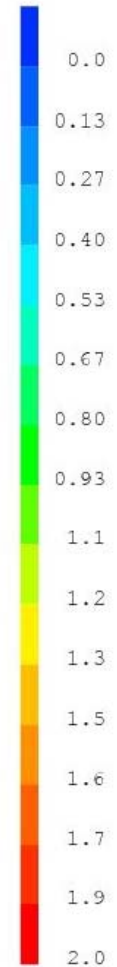
Optimal dilation



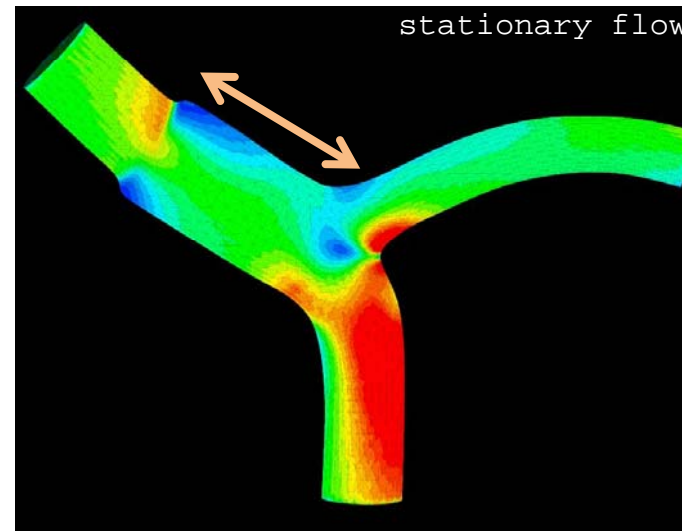
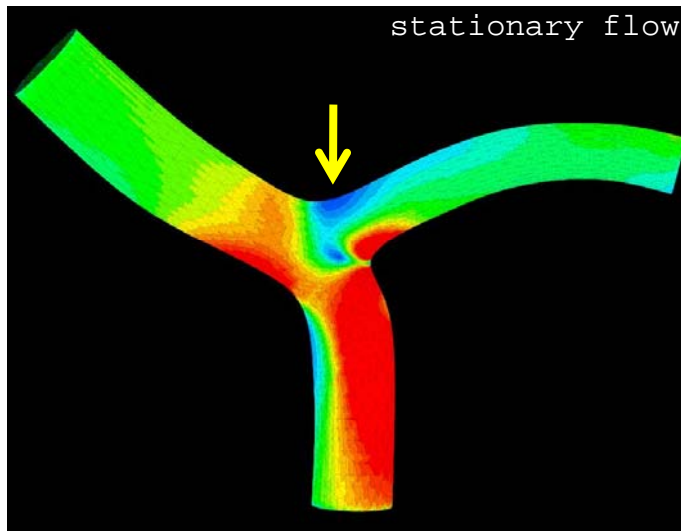
Proximal over-dilation



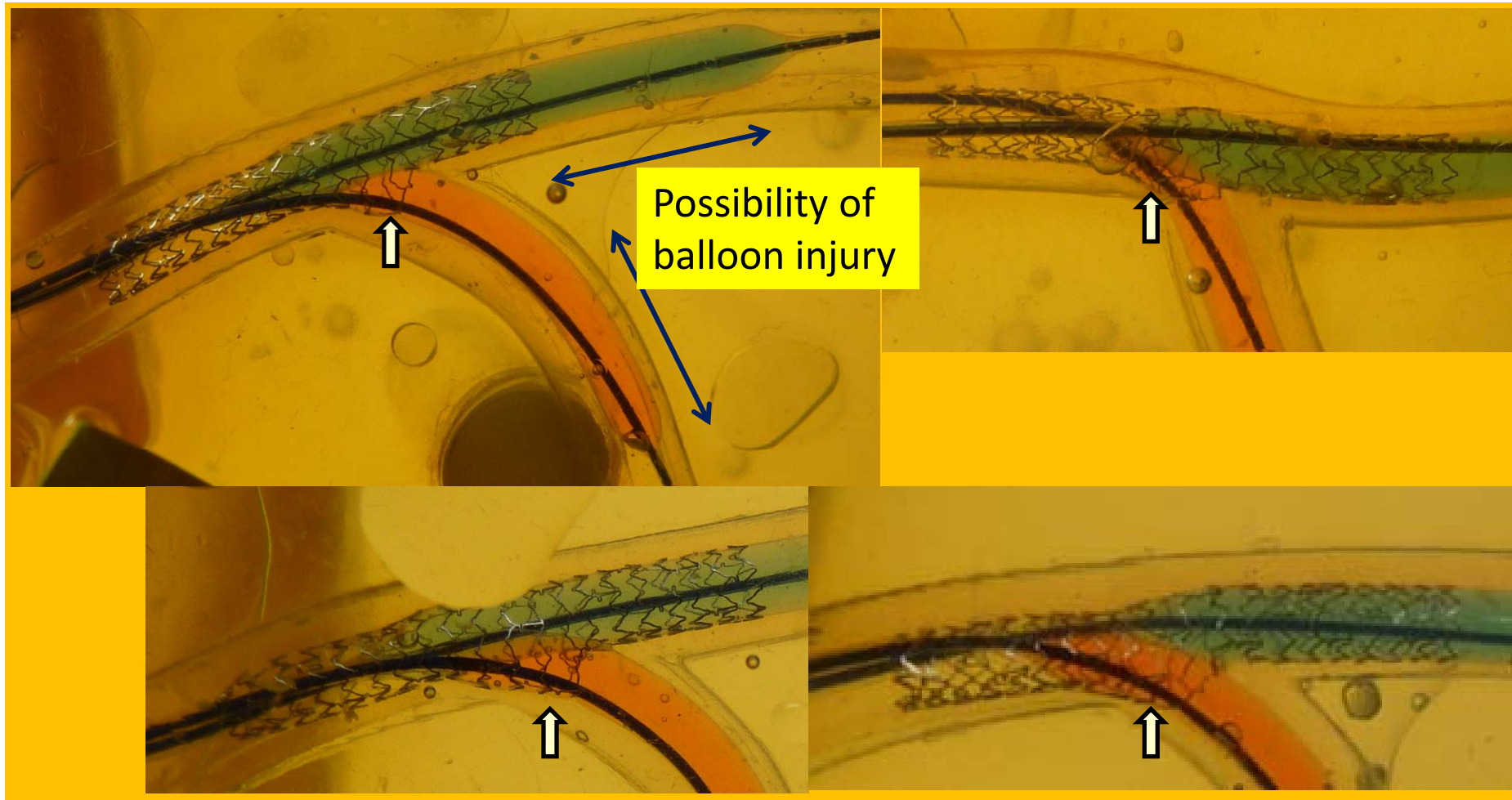
VAL - ISO
> 3.41E-03
< 1.05E+01



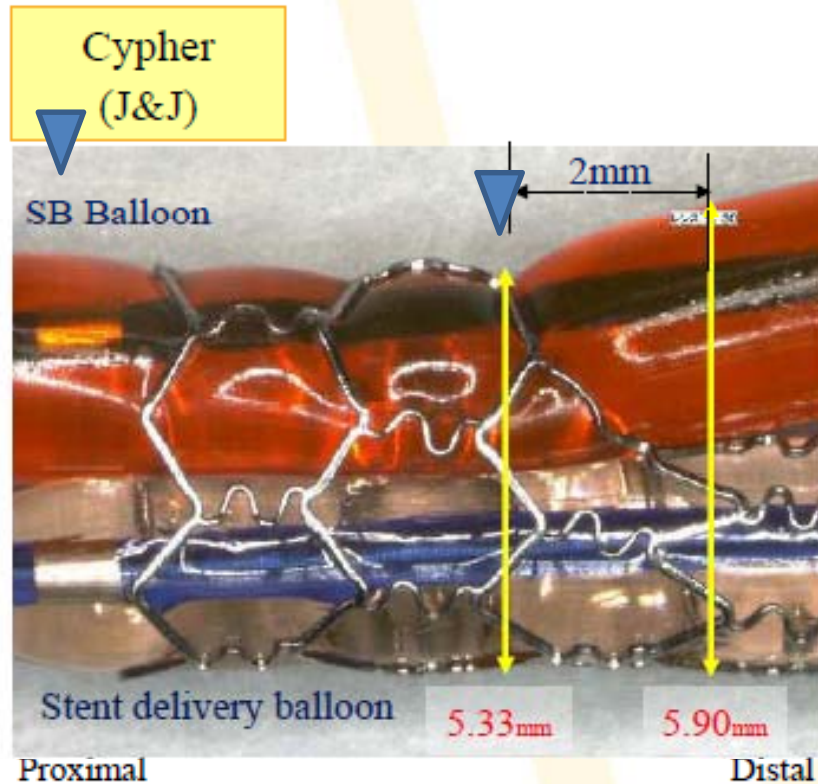
* Velocity prior to parabolic inflow 0 m/s



Optimal result for the bifurcation is obtained by minimal overlapping.

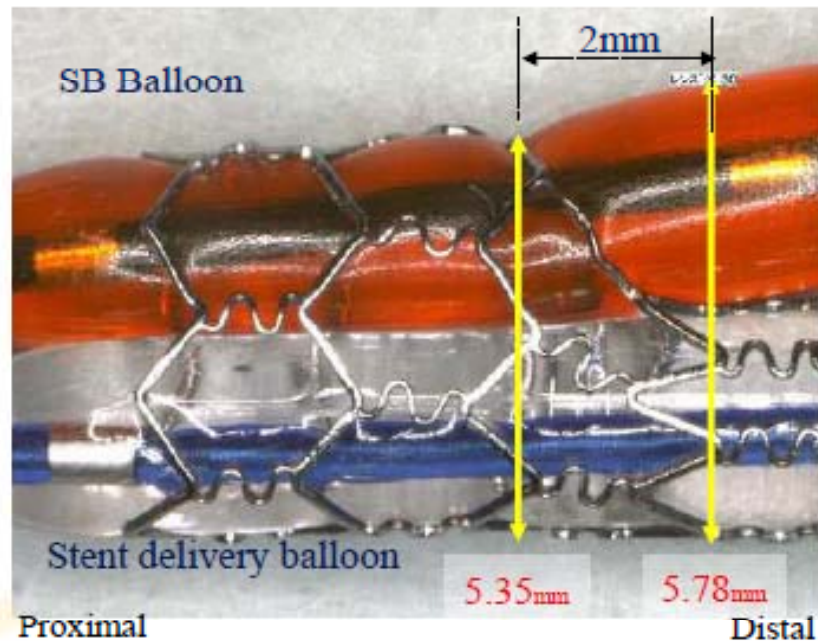


Semi-compliant vs. Non-compliant balloon



Semi-Compliant Balloon
(Ryujin Plus, Terumo)

Risk of edge dissection

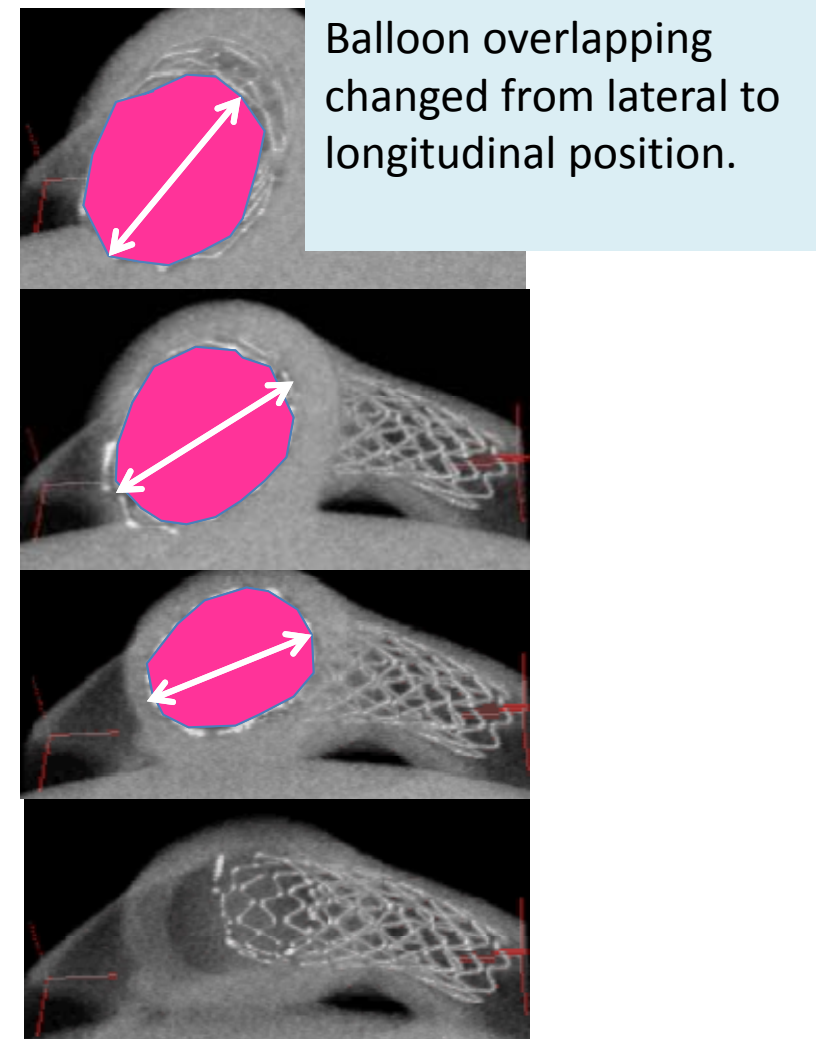
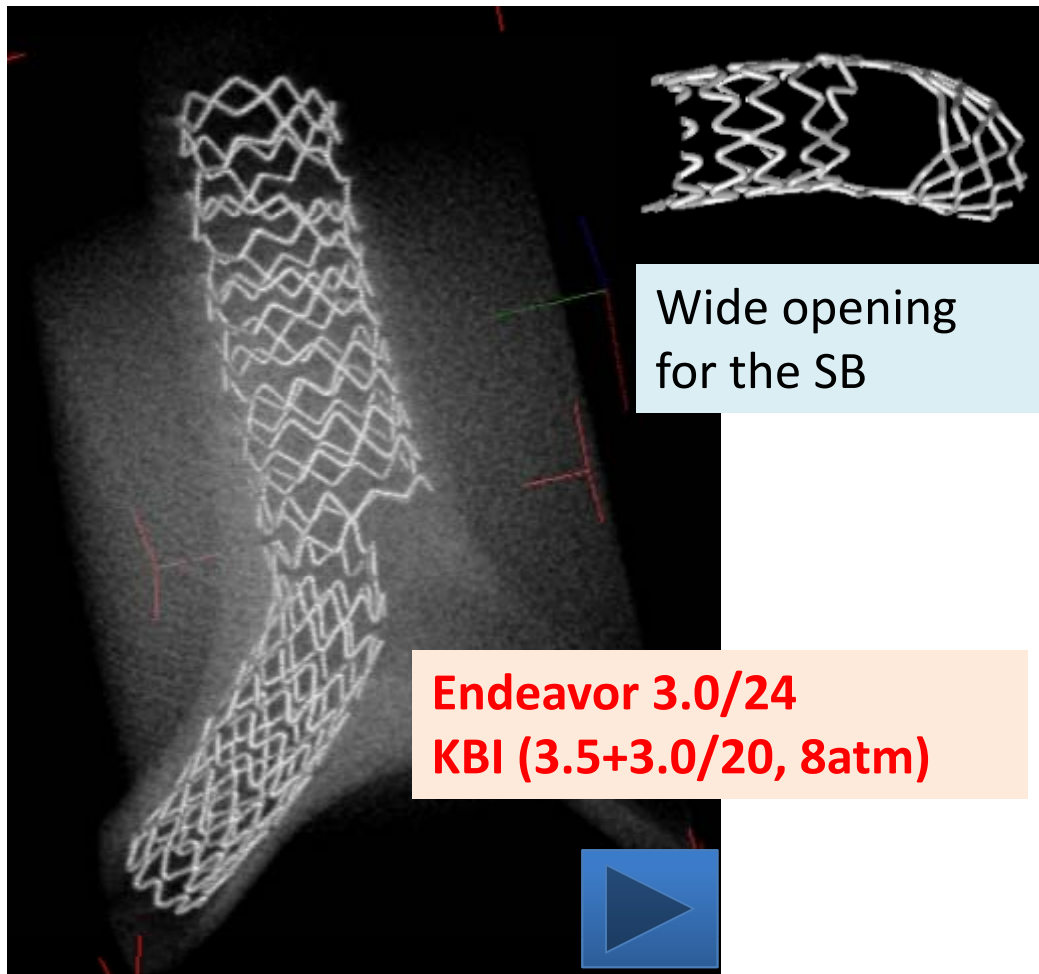


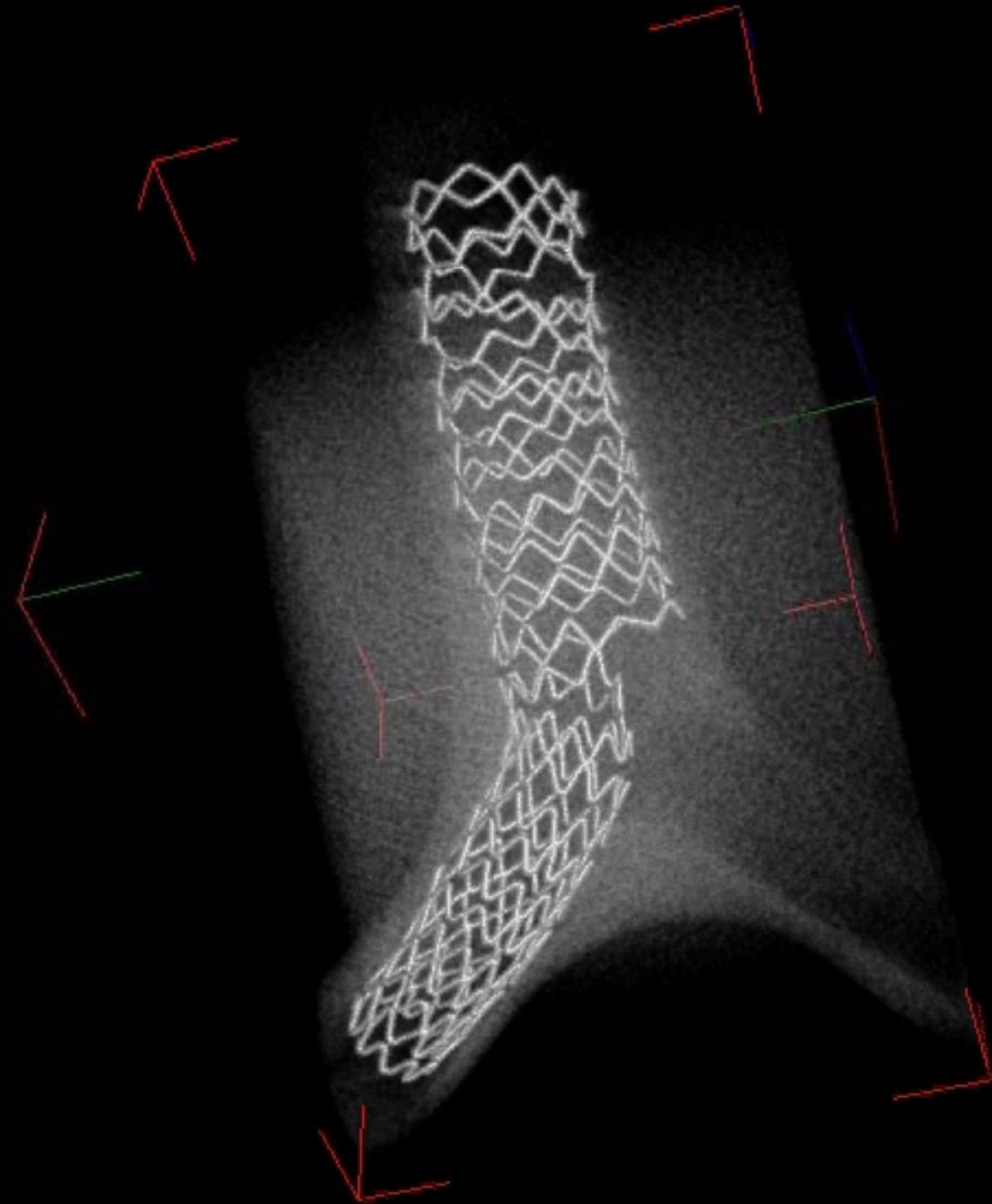
Non-Compliant Balloon
(Hiryu, Terumo)

2-link stent

Y-shape, long overlapping KBI

Cross sectional view

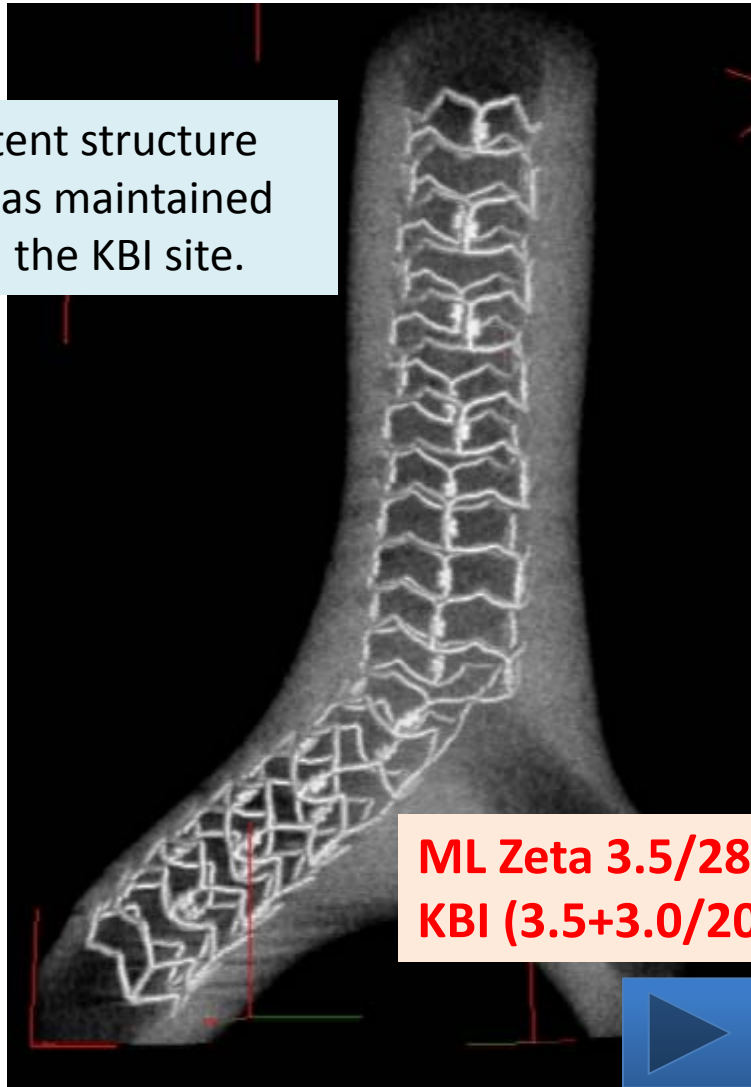




3-link stent

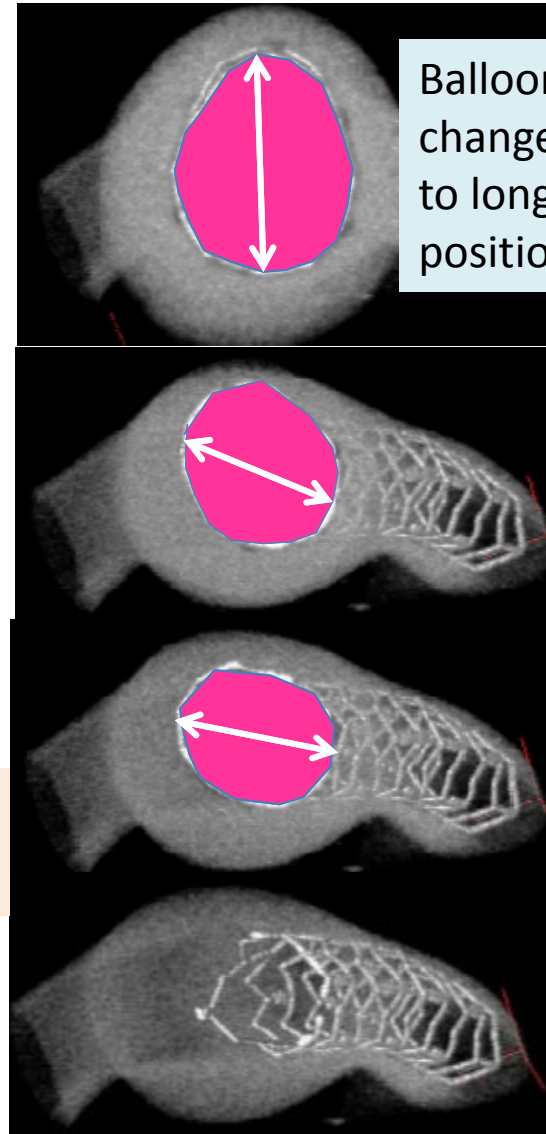
Y-shape, long overlapping KBI

Stent structure was maintained in the KBI site.



ML Zeta 3.5/28
KBI (3.5+3.0/20, 8atm)

Cross sectional view



Balloon overlapping changed from lateral to longitudinal position.



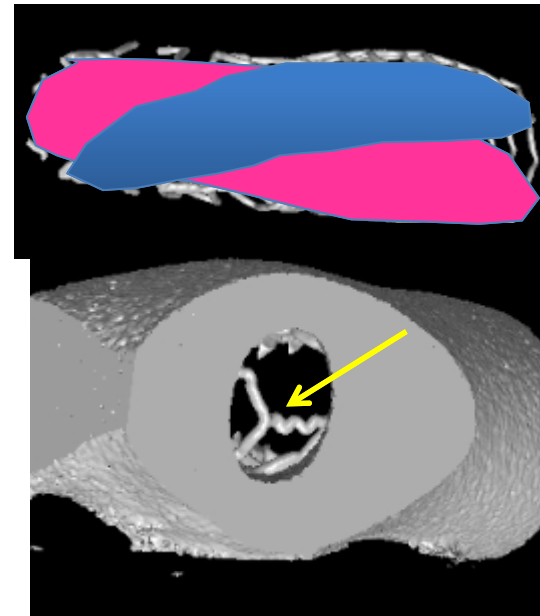
3-link stent

Y-shape, long overlapping KBI



ML Zeta 3.5/28
KBT (3.5+3.0/20, 8atm)

SB orifice



When the vertical link was in the SB ostium, the jailed strut remained at the site where the SB balloon crossed over the MV balloon.

Polymer injury of DES after bifurcation stenting



SB ostium after “crush” and “kissing” with large balloons and multiple inflations at 20 atm



Ormiston J, AP summit 2005

Does polymer injury limit the efficacy of DES?

Deformation of stent and polymer damage after KB inflation

Guérin P. Circ Cardiovasc Interv, 2010, 3, 120

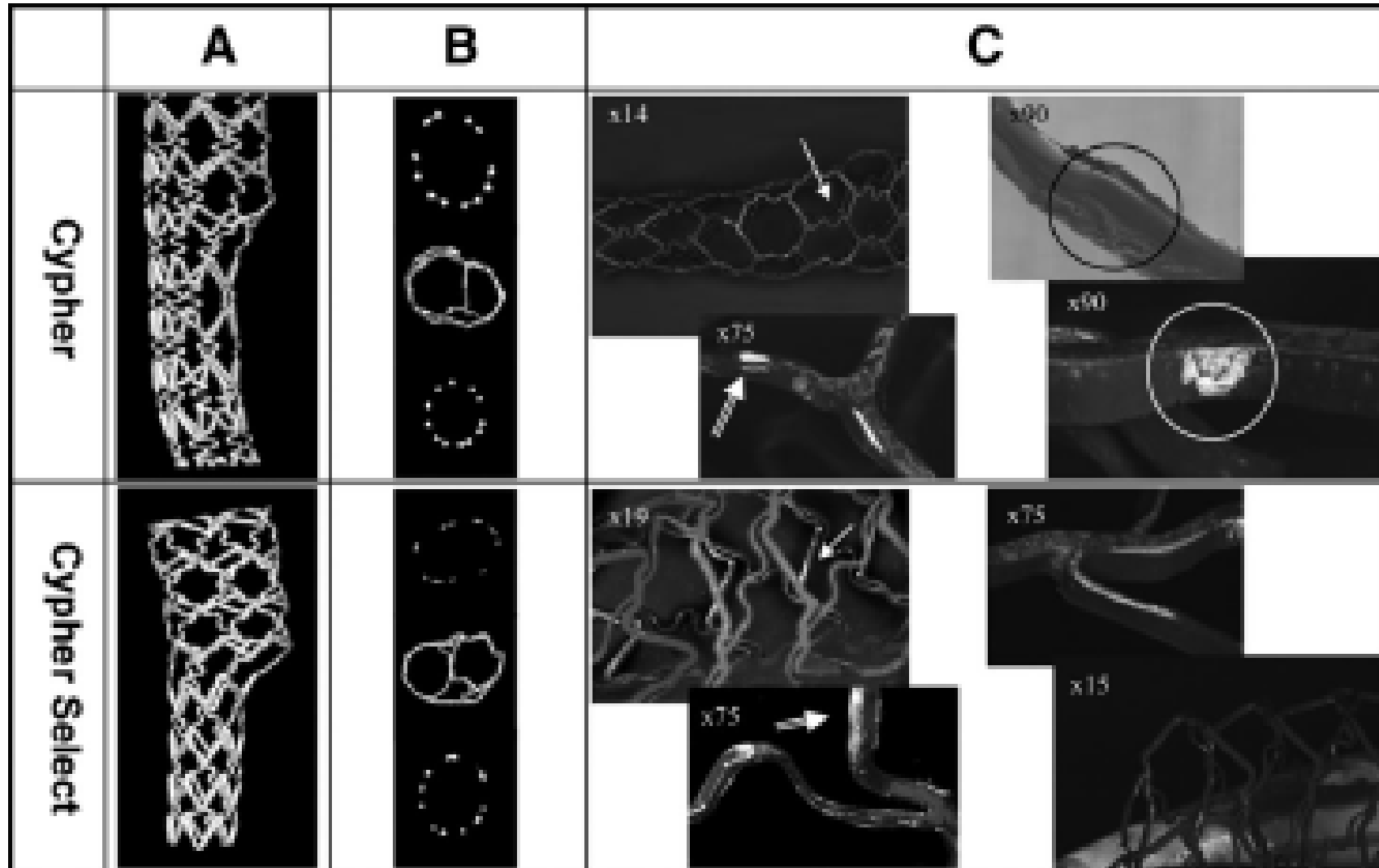


Table. Geometric Analysis of DES Deformation After Kissing Postdilatation

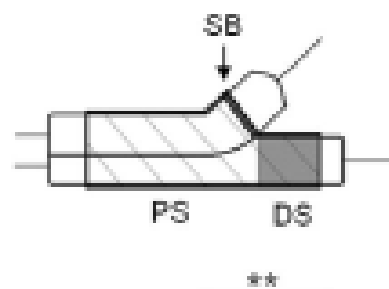
	A	Eccentricity, PS	Enlargement, % PS vs DS	PS Metal/Artery Ratio (Normal*/Kissing), %	Drug Delivery/Surface Ratio (Normal*/Kissing), $\mu\text{g}/\text{mm}^2$
Cypher	0.72 ± 0.01	0.78 ± 0.01	31 ± 2	12.7/8.8	1.4/1.0
Cypher Select	0.66 ± 0.03	0.73 ± 0.01	24 ± 3	13.5/10.2	1.4/1.1
Endeavour	0.72 ± 0.01	0.75 ± 0.03	30 ± 3	19.0/13.3	1.6/1.1
Taxus Express	0.69 ± 0.02	0.75 ± 0.00	28 ± 3	20.5/14.7	1.0/0.7
Taxus Liberté	0.72 ± 0.04	0.75 ± 0.02	30 ± 4	17.9/12.5	1.0/0.7

Data are presented as mean \pm SD. The calculated value of the constant (A) and geometric parameters for each type of DES are shown.
*Normal value of DES declared by the manufacturer at nominal diameter.

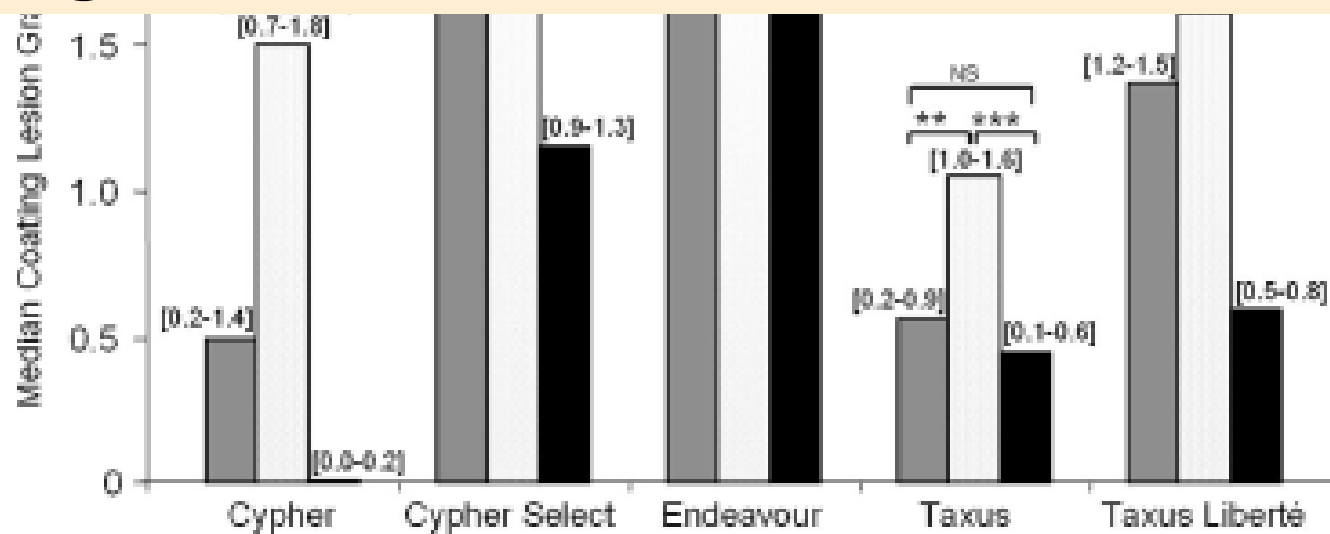
- KB inflation caused **oval-shaped dilation with the eccentricity value of 0.75** and **30% enlargement was obtained compared to distal site.**
- In the KB inflation site, metal / artery ratio was decreased as well as drug delivery / surface ratio.

Polymer lesion after KBI

Guérin P. Circ Cardiovasc Interv, 2010, 3, 120



The improvement in expansion and access abilities may result in the increase in polymer damage as reversed results.



Take home messages

- FKB is necessary for the 2-stent technique in order to complete the stent apposition and obtain enough luminal area.
- However, FKB after the 1-stent technique does not always assure good long-term results.
- Asymmetrical overdilation of proximal MV induced by FKB may lead to frequent restenosis.
 - Dissection in proximal edge and SB ostium
 - Polymer damage
 - Rheological disadvantage
- Optimal FKB is obtained in the following fashion.
 - Minimal overlapping
 - Gentle kiss
 - If necessary, use a short large balloon for the proximal MV



**Be a good kisser!
Thank you for your attention.**