Essential from Bench Testing Parallel session

EBC XIII, PORTO

Olivier Darremont

Stent and Thrombus in bifurcation: mechanistic insights from in-vitro models

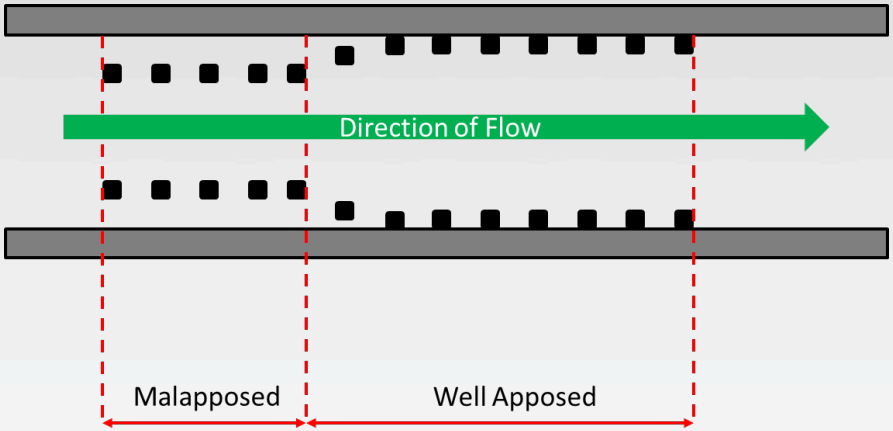
Nicolas Foin, MSc, PhD; Jaryl Ng, BEng; Shengjie Lu, PhD;
Valeria Paradies, MD; Ang Hui Ying, PhD; Carlo Di Mario, MD, PhD;
Philip E. Wong, MD; Michael Joner, MD;

National Heart Research Institute Singapore;
Duke-NUS Graduate Medical School;
Philips Healthcare;
Careggi Hospital, Florence
Deutsche Heart Centrum, Munich

XIII European Bifurcation Club meeting - Porto, Portugal - 13th & 14th October 2017

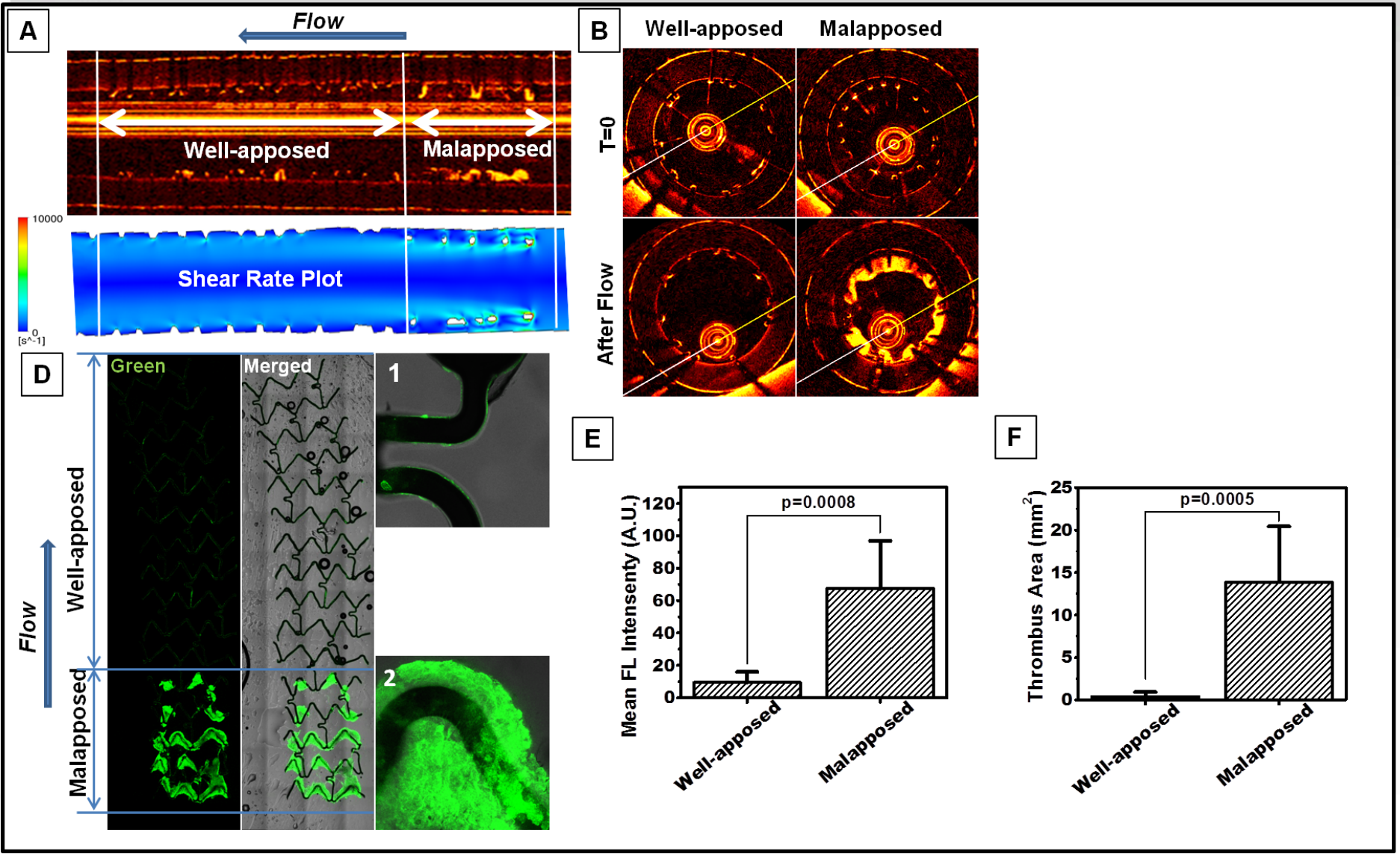
Question : do **malapposed stent struts** affect **platelet aggregation** more than **well apposed** segment **?**

Method: In-vitro ISA model



- Drug Eluting Stents (n=6) were deployed with partial under-expansion in their proximal segment in silicon vessel models (3.0mm size).
- The models were imaged, then flushed and perfused with porcine blood through a flow loop at 200ml/min for 4 minutes.
- Stents were extracted and immunostained with anti-platelet CD61 Antibody. Platelets and thrombus area was imaged and quantified from confocal immunofluorescence microscopy.

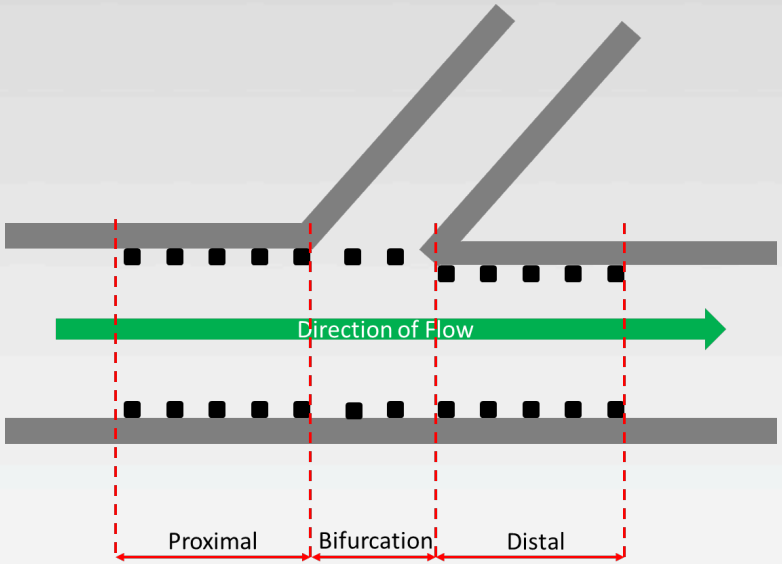
Impact of malapposition on thrombus formation: in-vitro mechanistic insights



- Significantly more thrombus observed in the malapposed stent segment compared with well-apposed segment (total samples n=6).

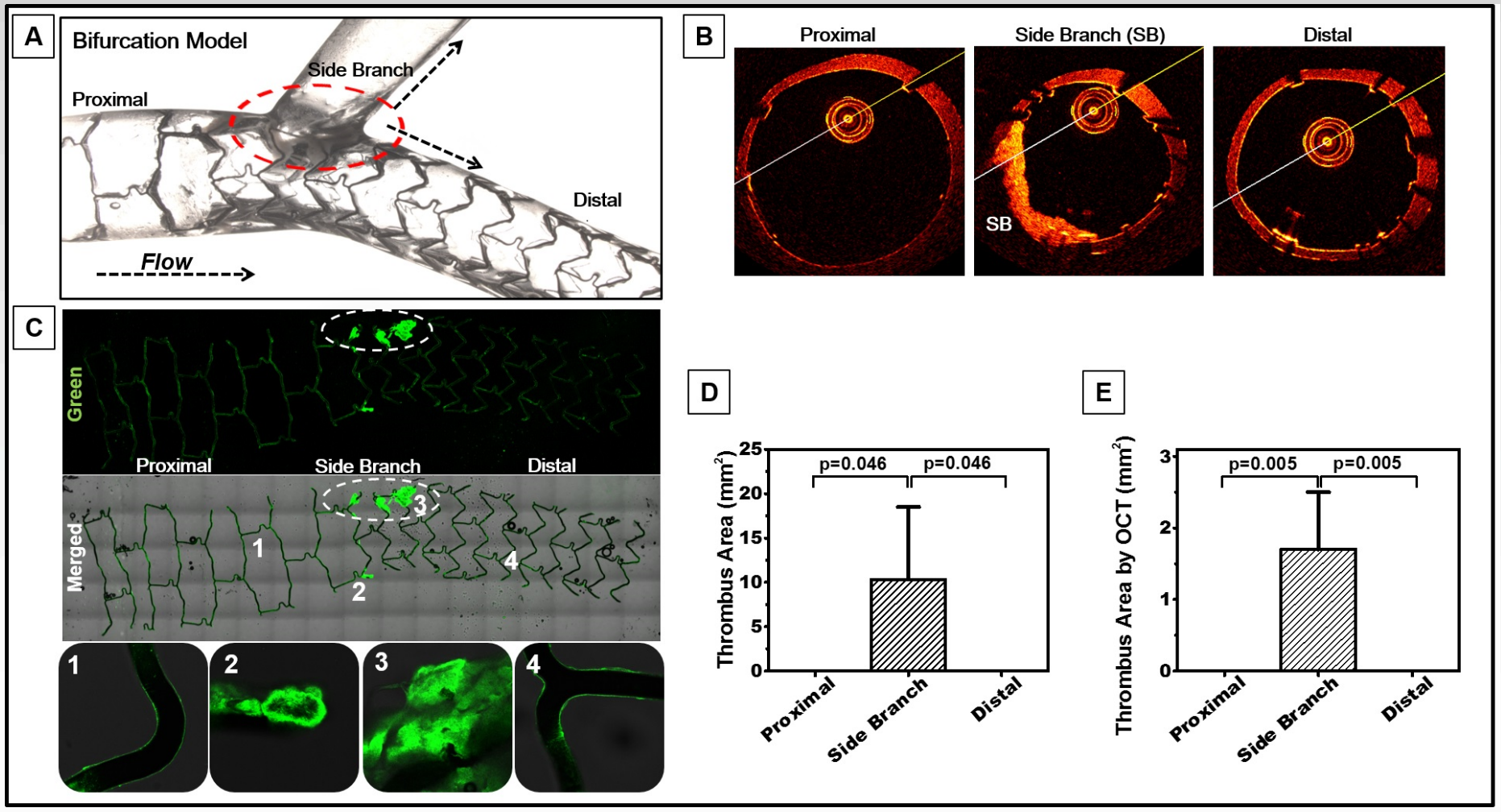
Ng J, Lu S, Joner M, Foin N. 2016

Method: In-vitro bifurcation model



- Metallic DES were deployed with a provisional technique across the main branch in coronary bifurcation silicone vessel models (LM and LAD/D models).
- The bifurcation models were perfused with porcine blood through a flow loop at 200ml/min for 4 minutes.
- Stents were extracted and immunostained with anti-platelet CD61 Antibody. Platelets and thrombus area were imaged and quantified from confocal immunofluorescence microscopy.

Clot formation in Bifurcation stenting models :



- Immunofluorescence and imaging analysis show evidence of clot at the bifurcation (jailing strut) compared to proximal and distal regions. (avg of n=4 exps)

Hemodynamic evaluation of bifurcation stenting techniques using absolute coronary flow simulator

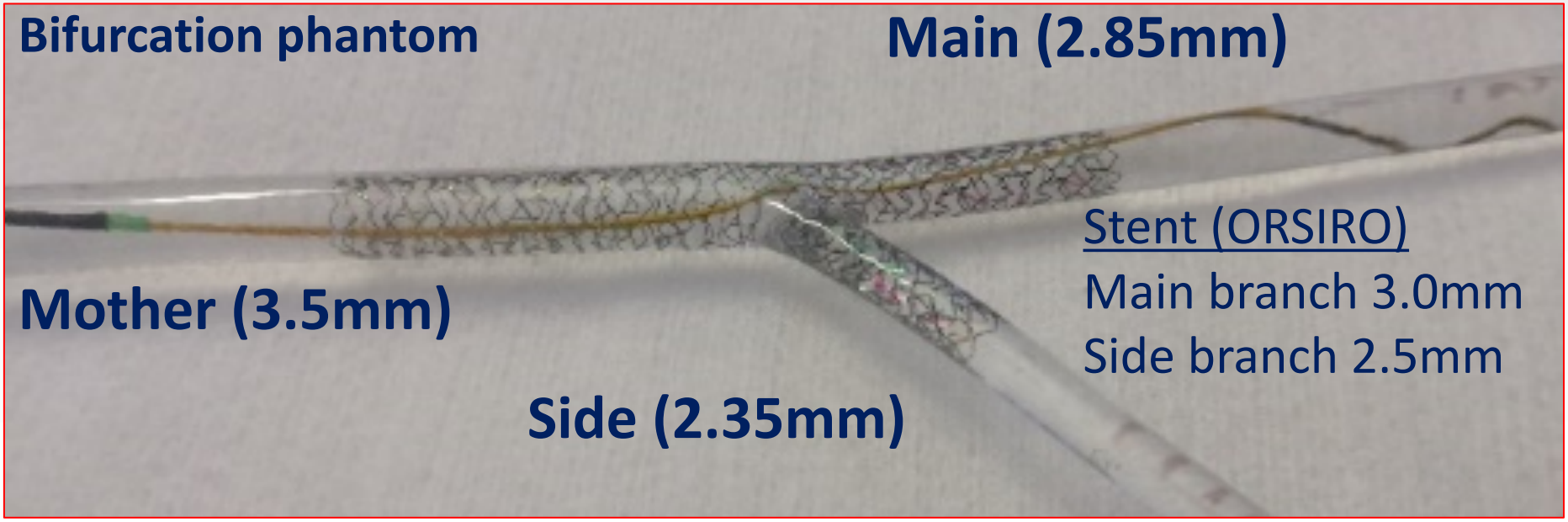
Satoshi Mogi, Omar Alansari, Fabien Picard, Julien Adjedj

Olivier Varenne

Paris Descartes University, Cochin hospital

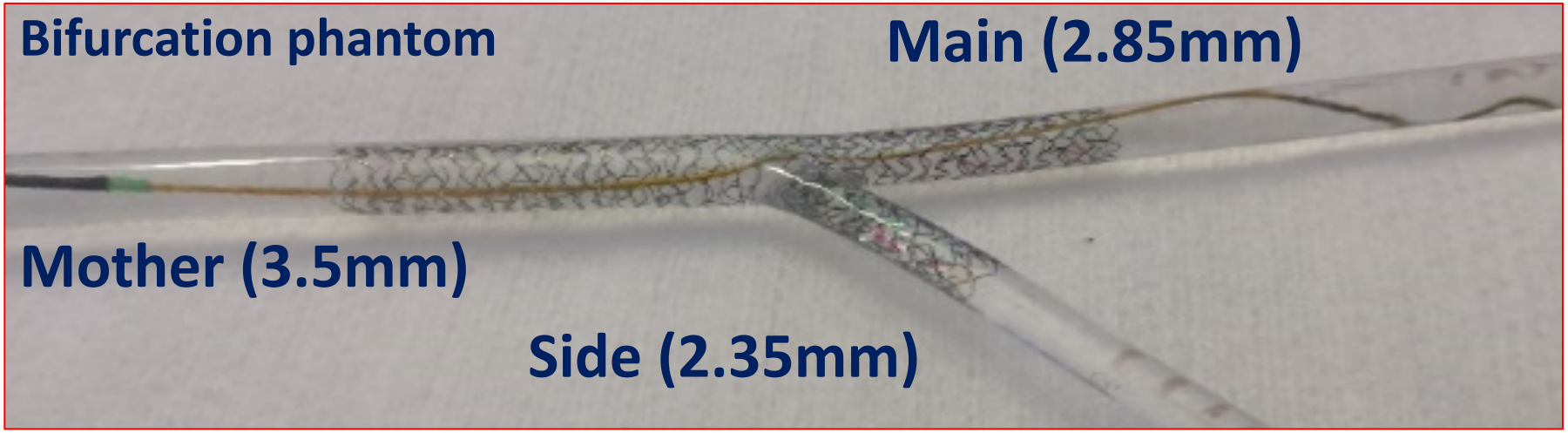
Study outline

- The SB stenting should not jeopardized coronary flow.
- The difference of branch flow depends on stenting technique is little known.
- **Reversed String (RS)** VS. **T And Protrusion (TAP)**



Results

Flow (mL/min)	Baseline	Reverse String N=8	TAP N=8	P value
Mother Branch	172 ± 30	173 ± 40	172 ± 40	0.70
Main Branch	118 ± 20	137 ± 50	116 ± 10	0.34
Side Branch	80 ± 20	88 ± 30	96 ± 20	0.55



TWIns
Tokyo Women's Medical University – Waseda University
Joint Institution for Advanced Biomedical Sciences

Oct 13, 2017

EBC 2017

Bench simulation session

3 times kissing balloon technique

Kiyotaka Iwasaki[1,2], Ph.D
Yutaka Hikichi[3], MD, Ph.D

[1]Cooperative Major in Advanced Biomedical Sciences, Graduate School of Advanced Science and Engineering, Waseda University
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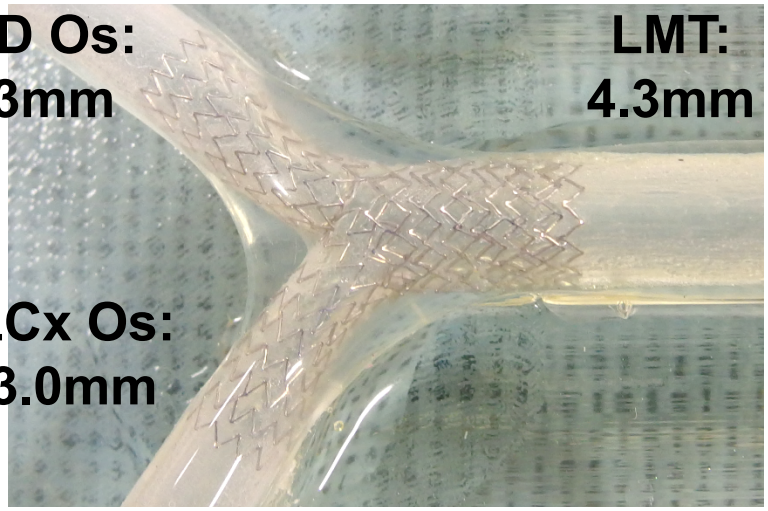
[3]Faculty of Medicine, Saga University

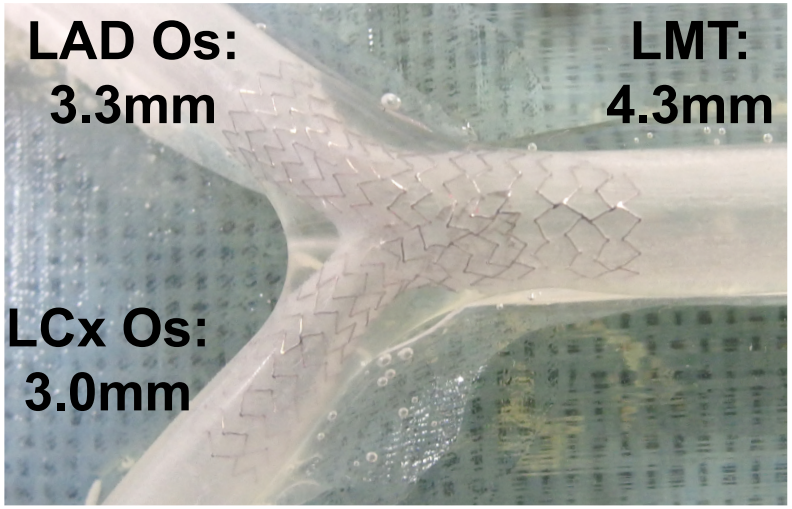
Two-stenting Procedures

Culottes



(1) LAD: Synergy 4/20 mm
5 atm ×1 time
(2) LAD Distal Optimization: Emerge 3.5/20 mm
6 atm (3.46 mm)×3 times
(3) POT
(4) KBT ×3 times
(5) LCx: Synergy 4/20 mm
5 atm ×1 time
(6) LCx Distal Optimization: Emerge 3/20 mm
8 atm (3.11 mm) ×3 times
(7) POT
(8) KBT ×3 times

DK-Crush



(1) LCx: Synergy 3/20 mm
11 atm ×3 times
(2) Crush: NC Emerge 4/15 mm
16 atm (4.14 mm) ×1 times
(3) KBT ×3 times
(5) LAD: Synergy 4/20 mm
5 atm ×1 time
(6) LAD Distal Optimization: Emerge 3.5/20
6 atm (3.46 mm) ×3 times
(7) POT
(8) KBT ×3 times

Kiyotaka Iwasaki, TWIns, Waseda University

Maximization of DES performance in bifurcation lesion

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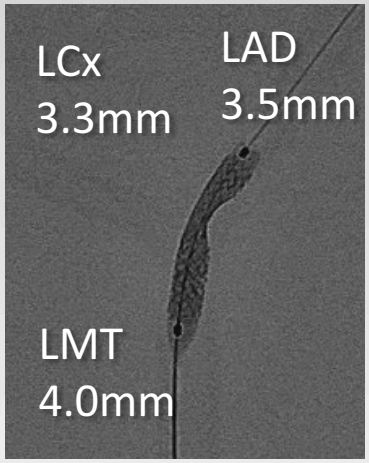
Saga, Japan

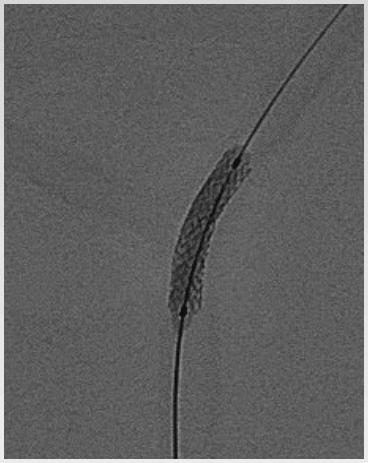
Kiyotaka Iwasaki, Ph.D
Waseda University, TWIns
Tokyo, Japan

XIII European Bifurcation Club meeting - Porto, Portugal - 13th & 14th October 2017

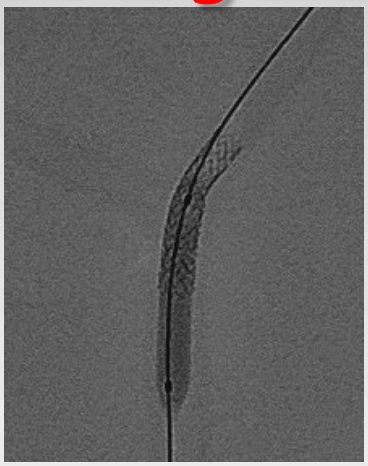
Culotte stenting for LM Bifurcation



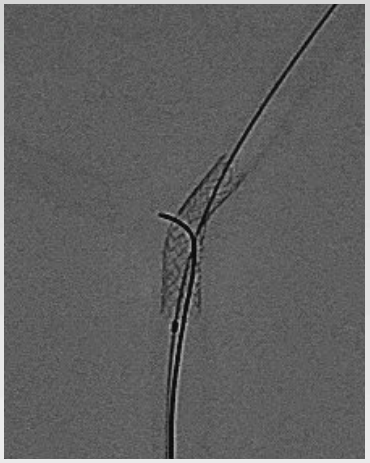
MV stent 4.0
5atm



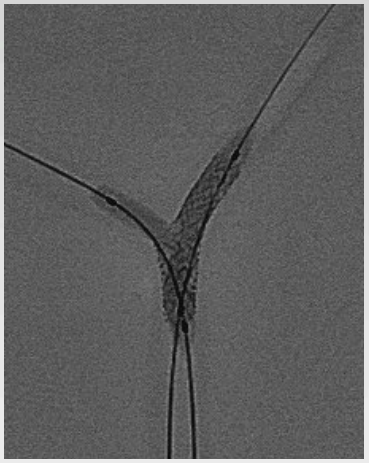
post inflation 3.5
6atm × 3t



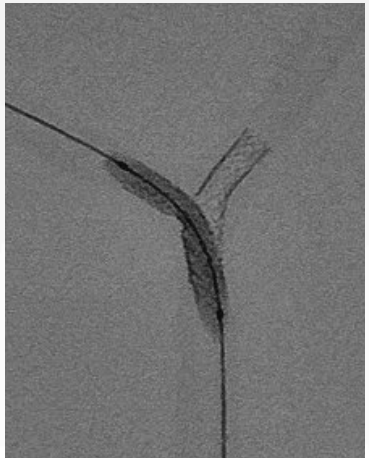
1st POT 4.0
12atm



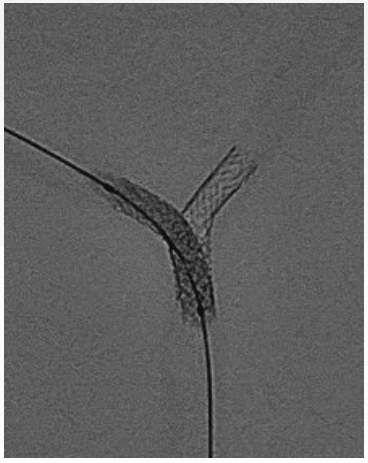
GW recrossing
distal



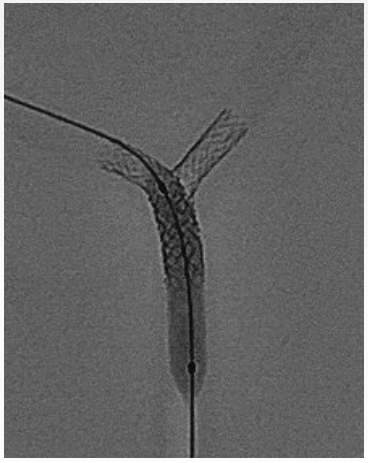
1st KBI
S/C3.5+S/C 3.0
6atm+8atm × 3t



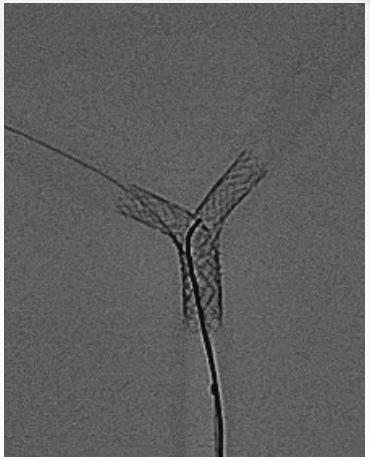
SB stenting
4.0mm 5atm



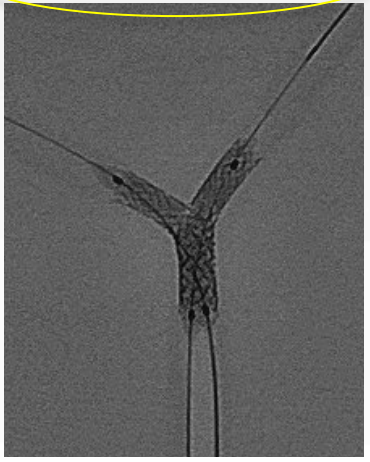
post inflation 3.0mm
8atm × 3t



2nd POT 4.0
12atm

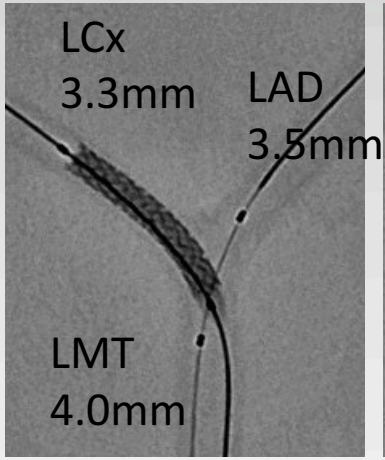


2nd GW recrossing
distal

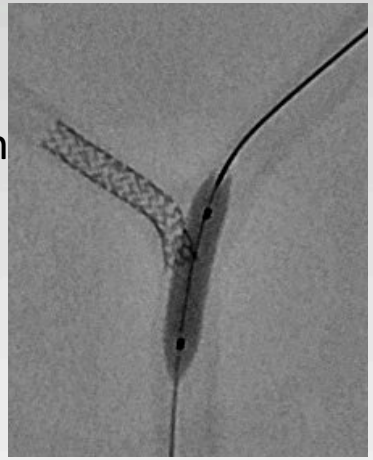


2nd KBI
S/C3.5+N/C 3.0
6atm+8atm × 3t

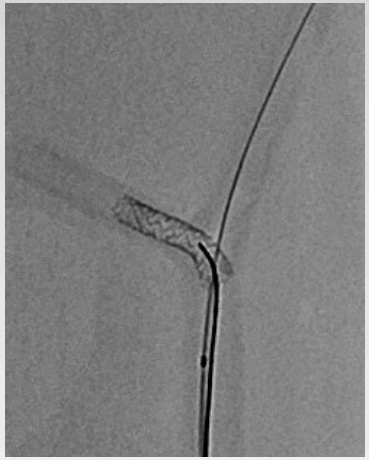
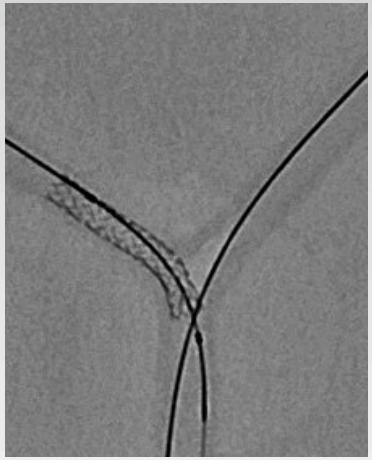
DK-Crush stenting for LM Bifurcation



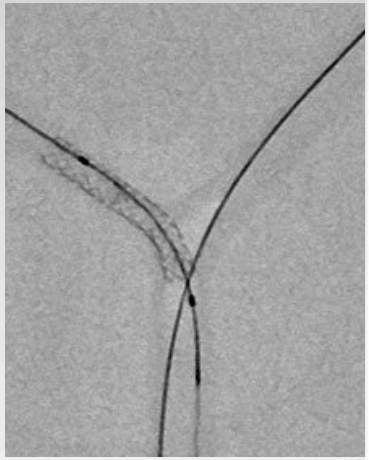
SB stent 3.0
11atm × 3t



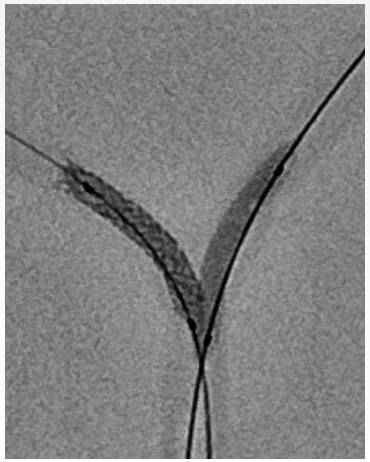
1st Crush N/C 4.0
16atm

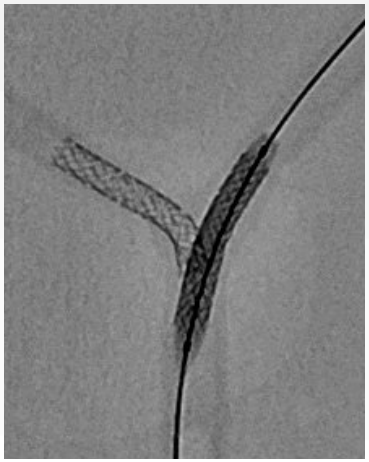
SB GW recrossing LAO & AP
recrossing point: center



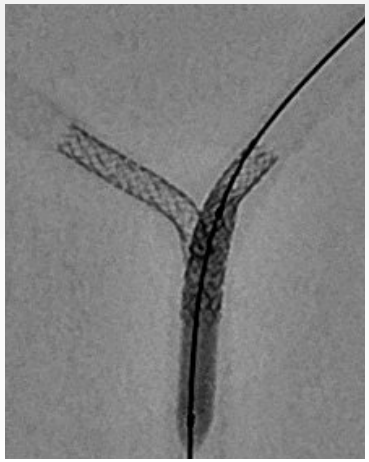
SB S/C 2.5
6atm



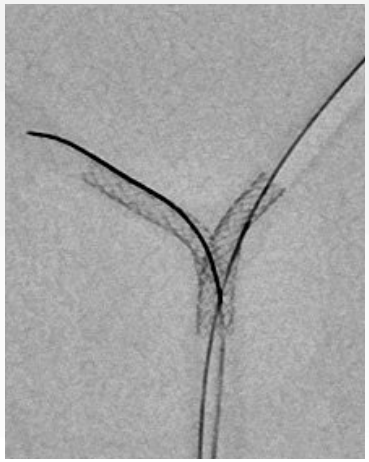
1st KBI
S/C 3.5+N/C 3.0
6atm+12atm × 3t



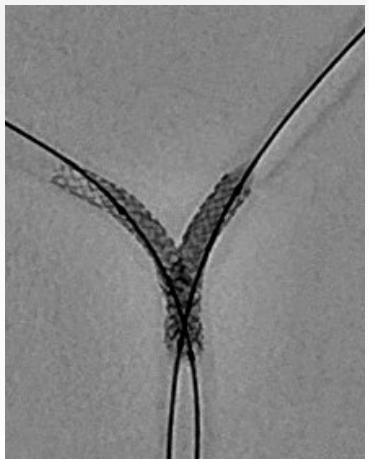
MV stenting 4.0
5atm



POT S/C 4.0
12atm

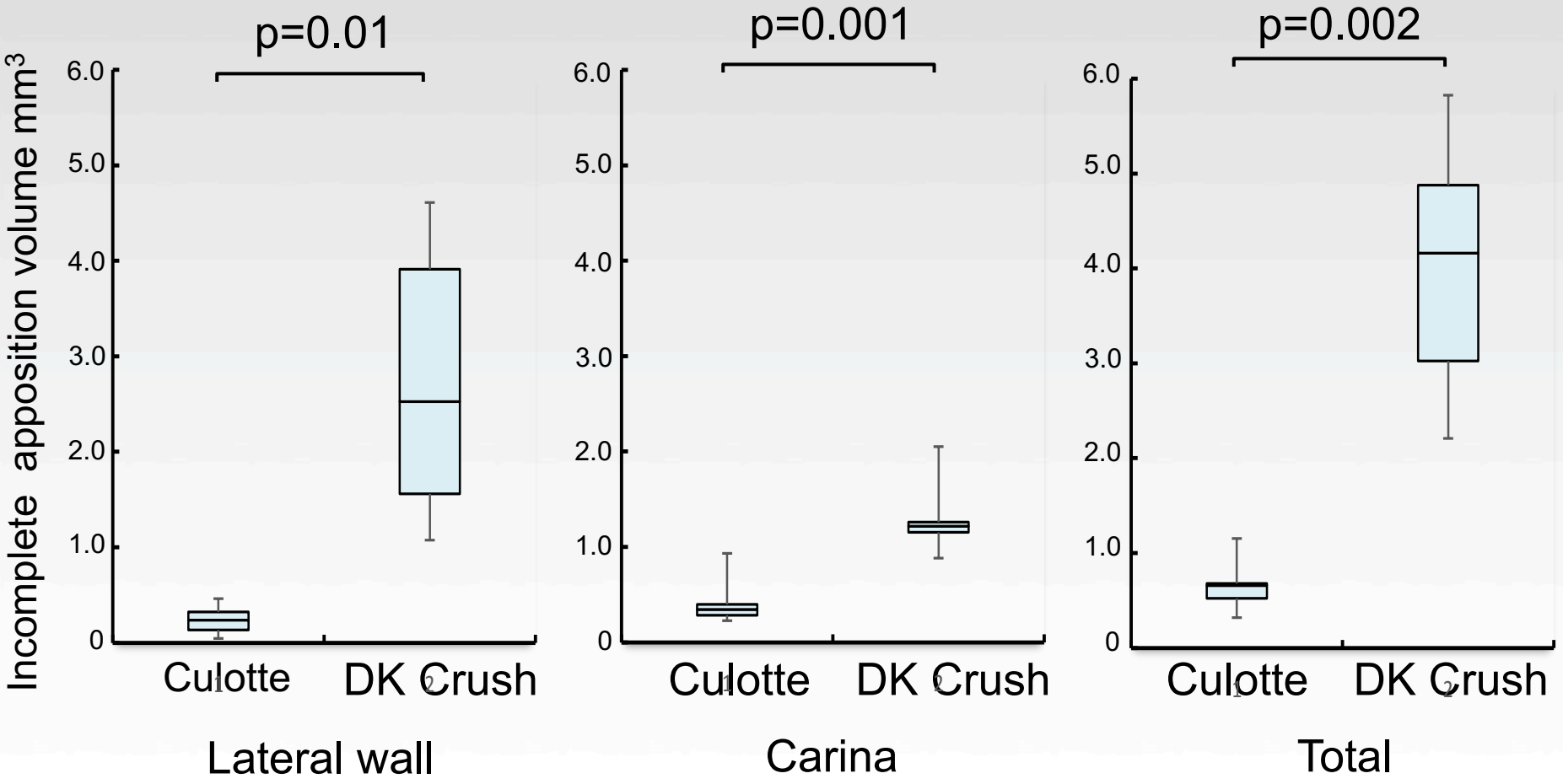


2nd GW recrossing
distal



2nd KBI
S/C3.5+N/C 3.0
6atm+12atm × 3t

Comparison of Incomplete Stent Apposition Volume Between Culottes and DK-Crush



Fate of Suboptimal Side Branch Guide Wiring

Yoshinobu Murasato, MD, PhD
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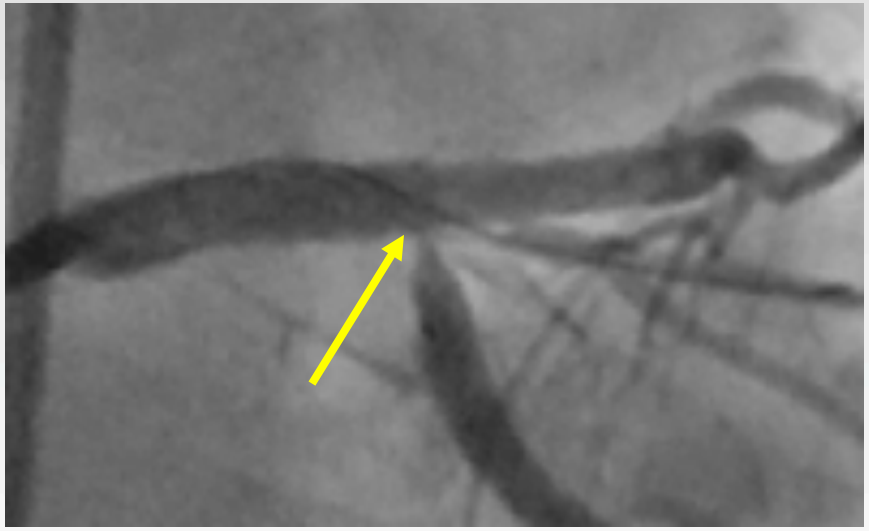
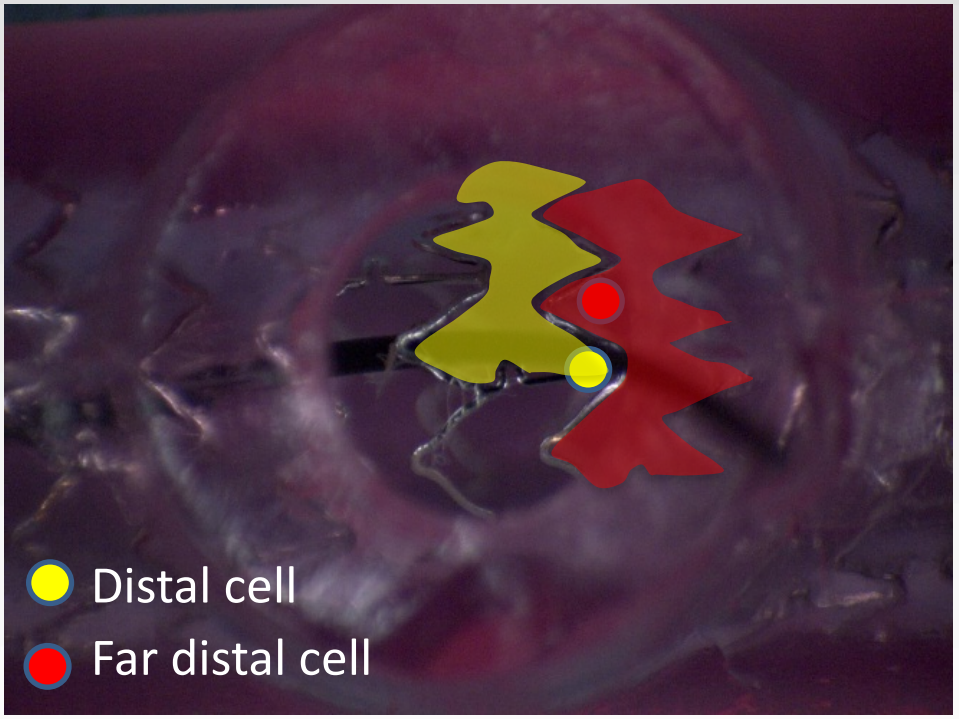
Kyushu Medical Center, Fukuoka, Japan

Art is a kind of reproduce of the fractal of the nature.

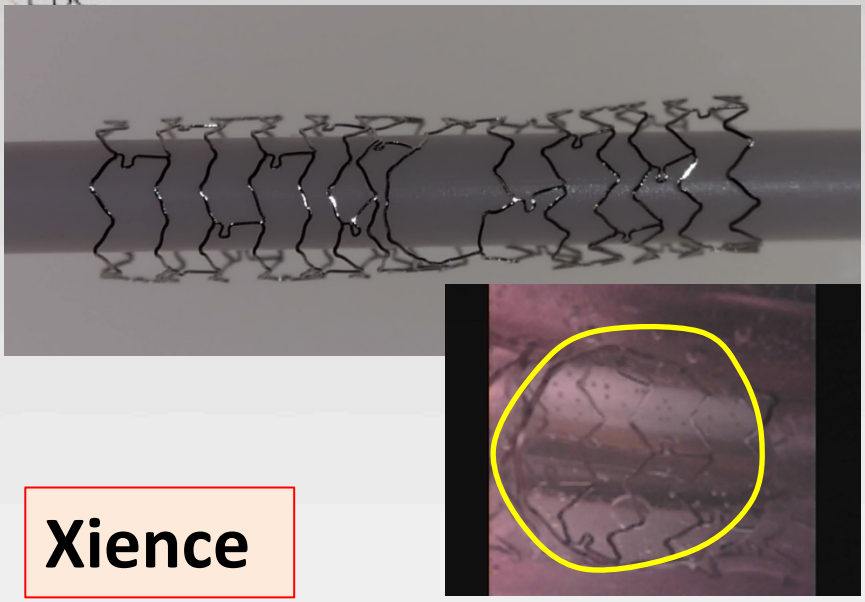
Hokusai Katsushika, “Great wave of Kanagawa” was painted using fractal manner.

Can we distinguish the real GW crossing point in the clinical setting?

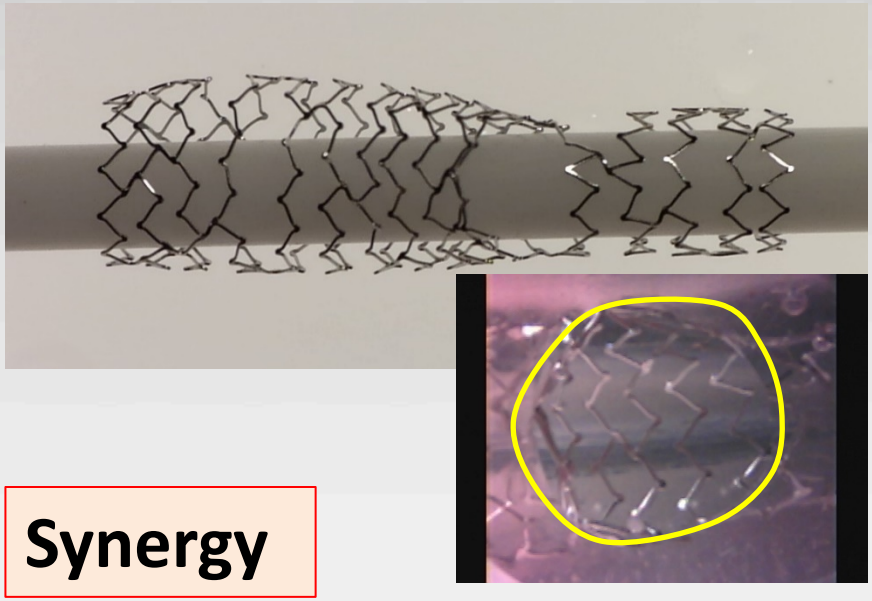




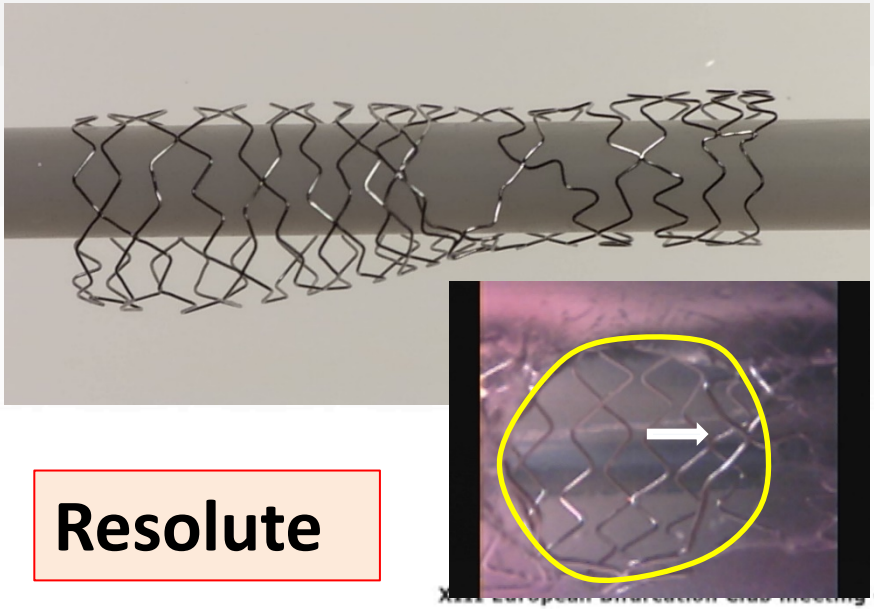
Either CAG or 2D imaging cannot differentiate these points.



Xience



Synergy

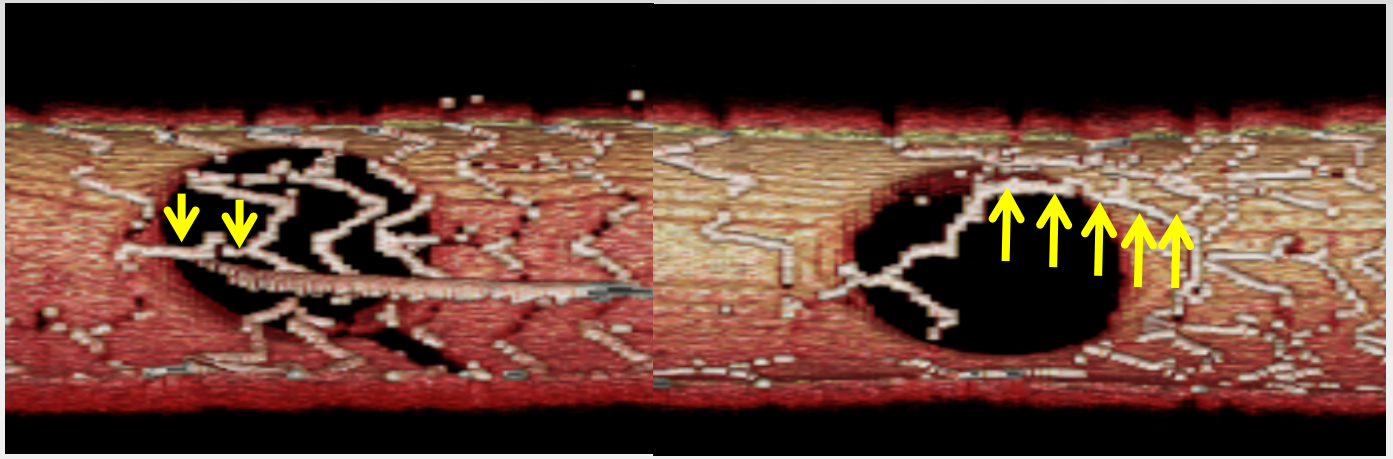


Resolute

Ultimaster

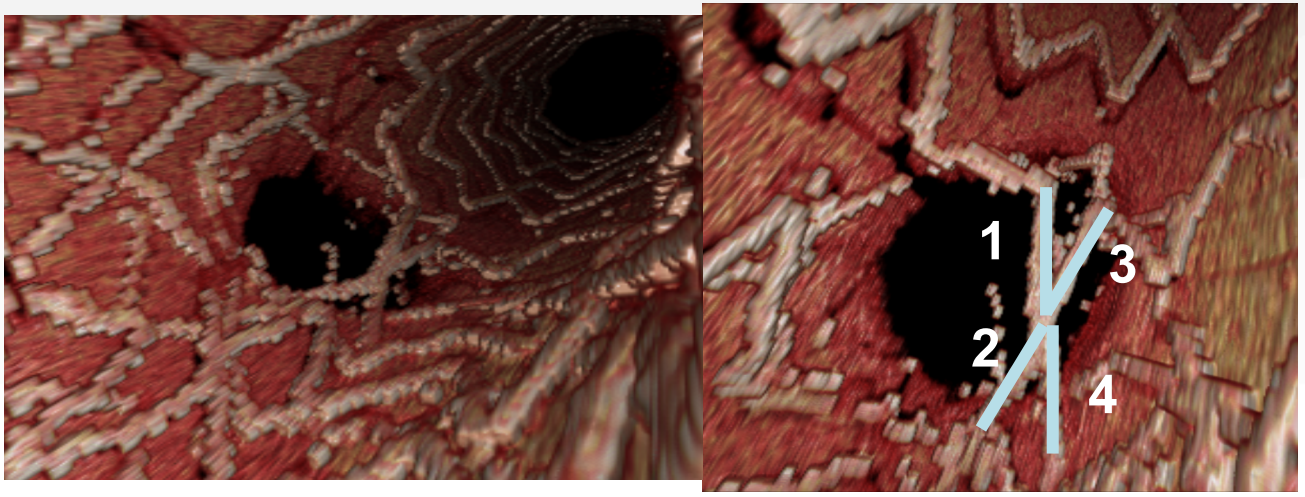
Link connection in SB ostium: 3-link vs. 2-link stent

3-link Stent



Link with single strut is easy to be expanded.

2-link Stent



About balloon compliance in bifurcation techniques: Surprise!

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Guillaume CELLIER, MD

Department of Cardiology and Interventional Cardiology
Cardiovascular Hospital - Hospices Civils de Lyon
INSERM Research Unit 1060 CarMeN
Claude Bernard University Lyon 1
Lyon - France

Why a non-compliant balloon?

- (A) high balloon inflation pressure must be applied to deform the stent

Stent deployment pressure

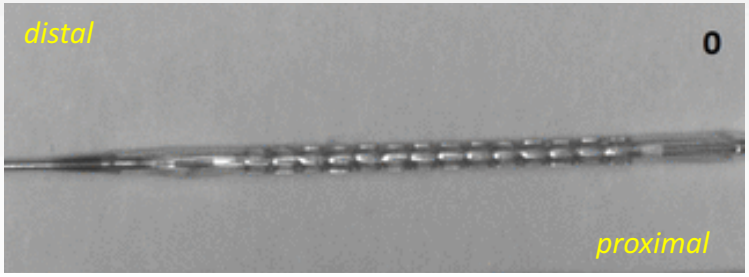
1) Tubular stent *(150 microns strut thickness)* : 2.1 atm from 2.0 to 5.0 mm diameter

2) Coil stent *(120 microns strut thickness)* : 0.25 atm from 2.0 to 5.0 mm diameter

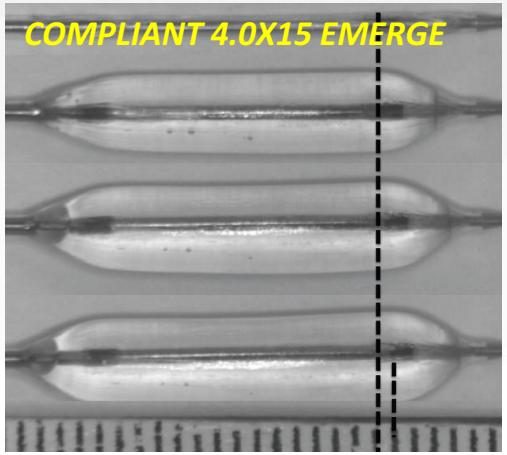
Etave F, Finet G, et al. Mechanical properties of coronary stents determined by using finite element analysis. Journal of Biomechanics 2001;34:1065-1075.

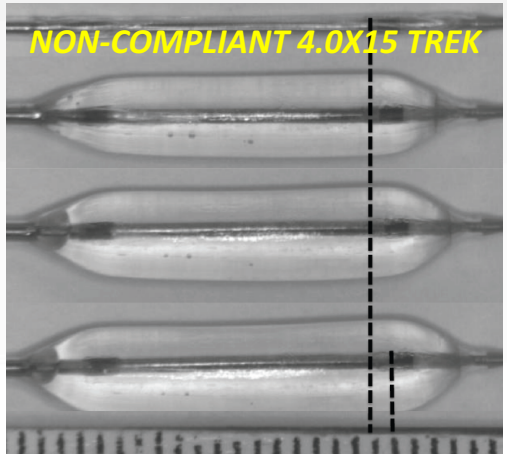
No: Last generation of DES with approximately 80 microns thickness : **< 0.5 atm**

- (B) Detrimental "dog-bone" effect with latest-generation of DES is feared



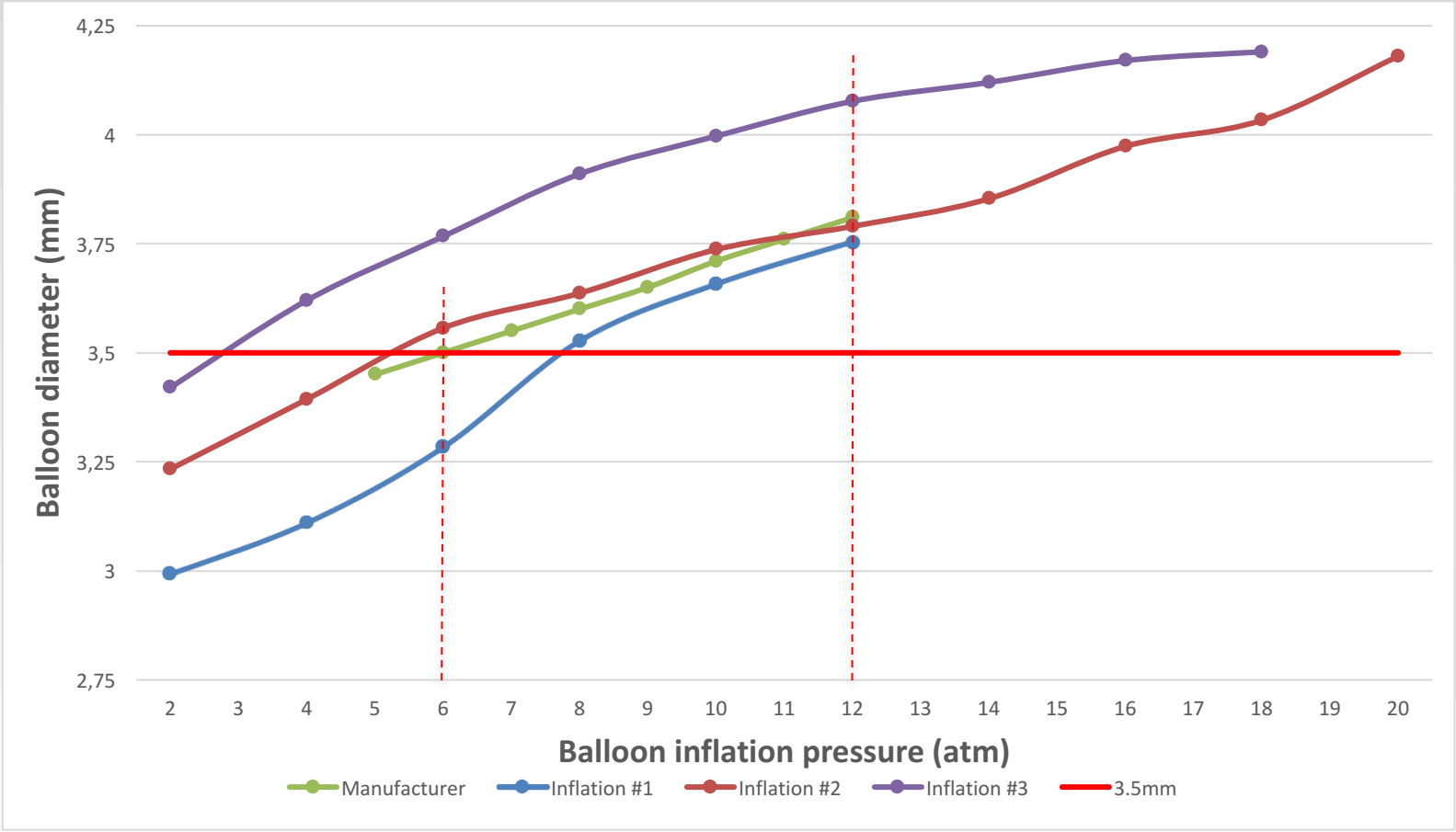
$\Delta D_{proximal}$ = 0.10±0.03 mm



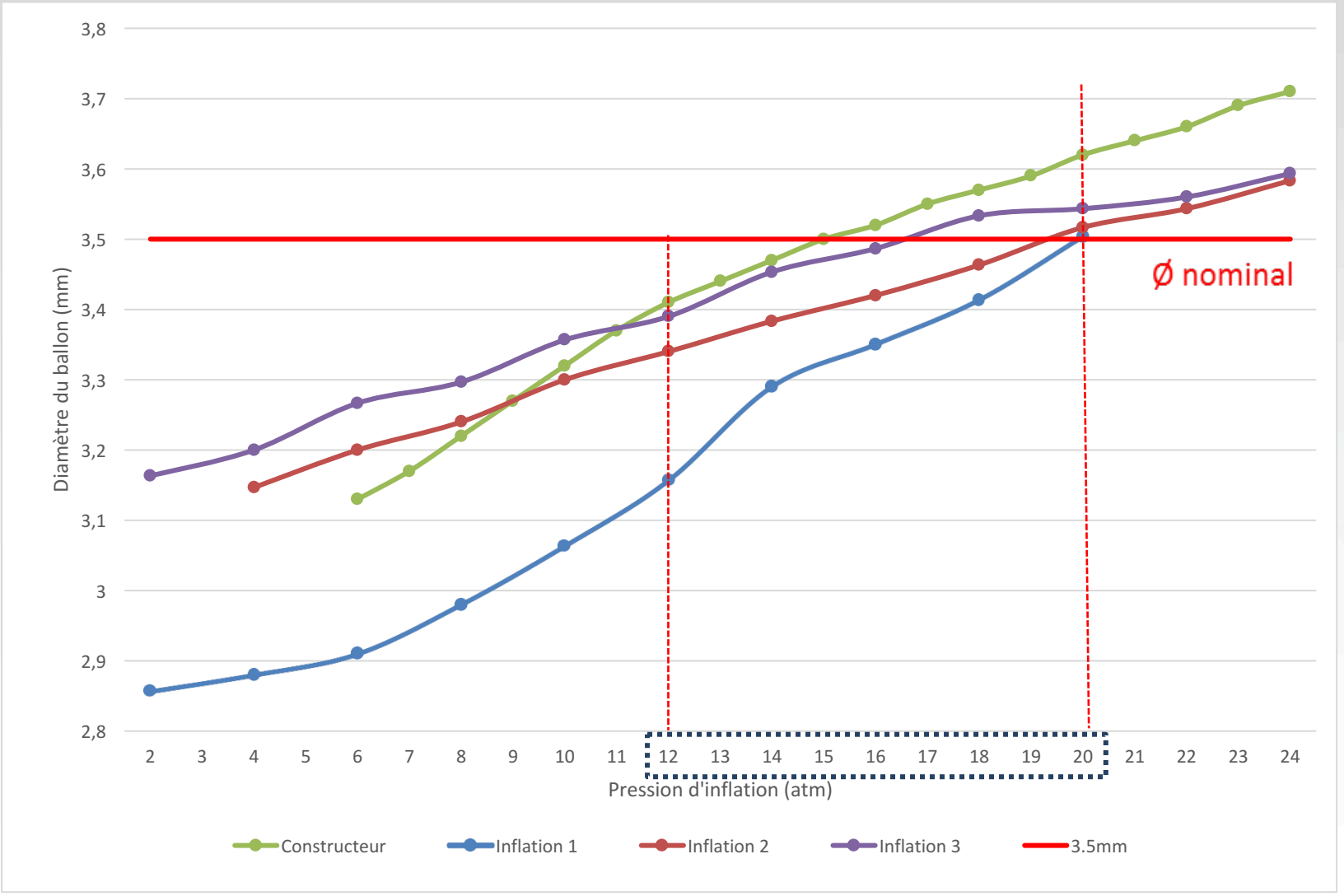


No dog-boning effect experimentally is observed

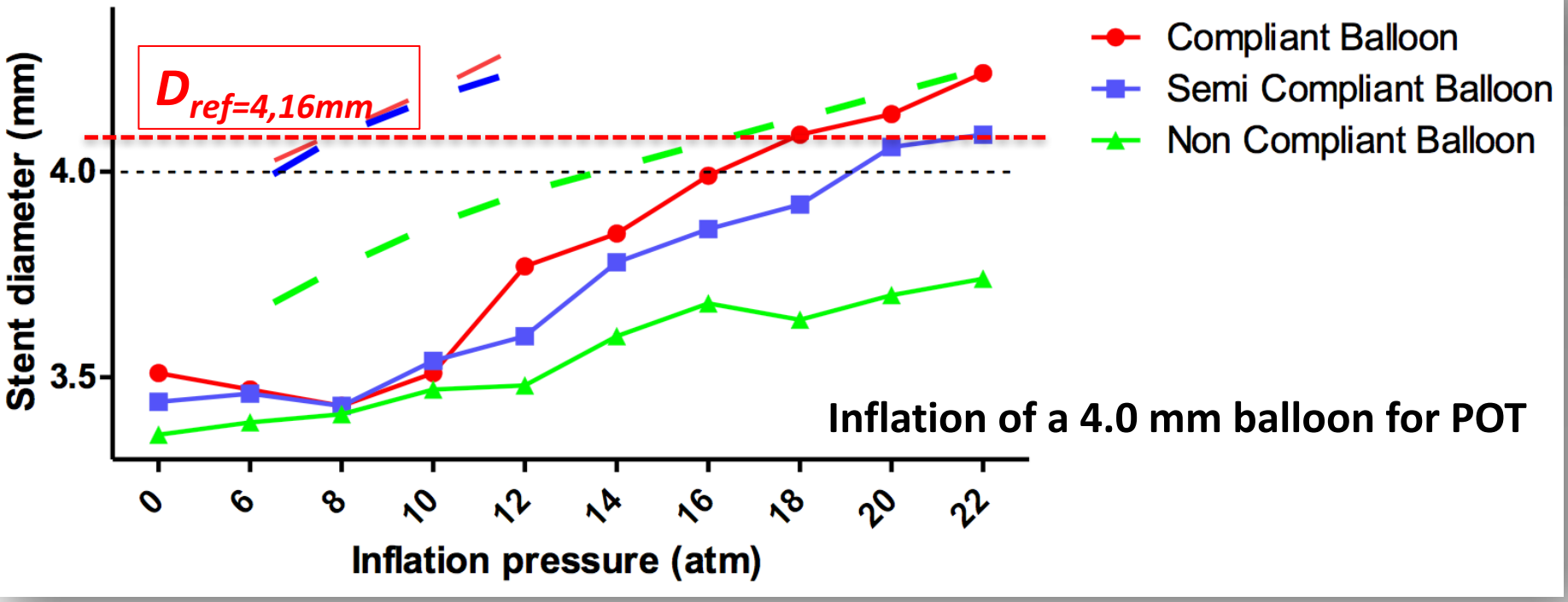
Compliant balloon - *Emerge™ 3.5 x 15 mm - Boston Scientific*

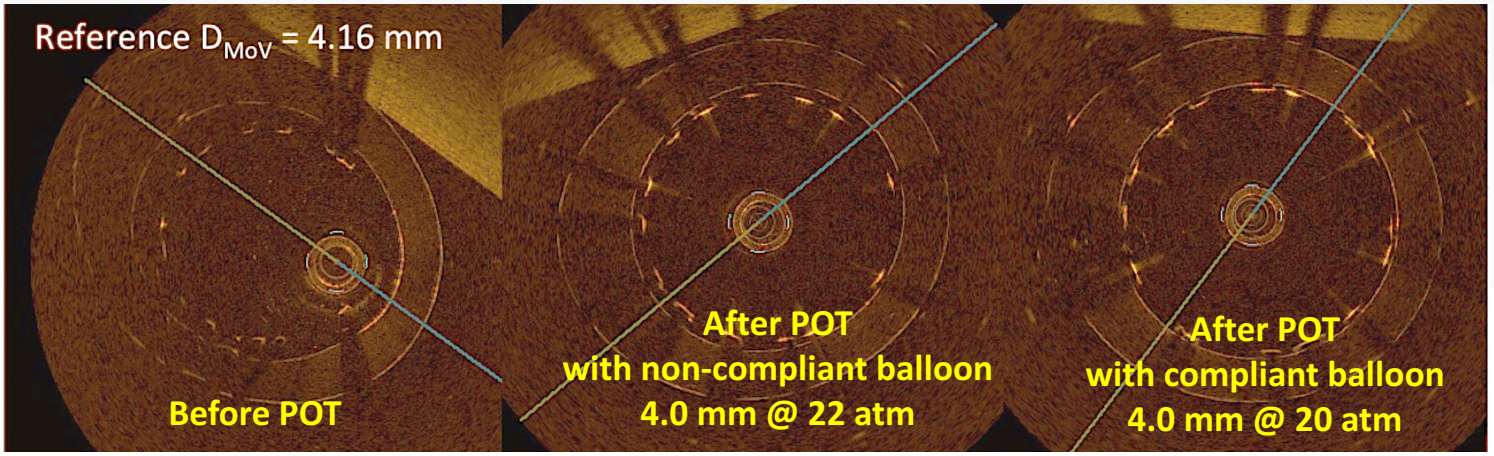


Non-compliant balloon - *NC-Euphora™ 3.5 x 15 mm Medtronic*



Issue of stent diameter optimization for SAR > 1.0





Murasato Y, Finet G, Foin N.EuroIntervention 2015;11:V81-V85