

# **OCT-Guided Bifurcation Treatment: Better than IVUS?**

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**T. Okamura<sup>2</sup>**

**T. Muramatsu<sup>3</sup>**


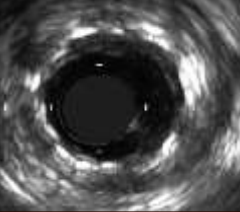


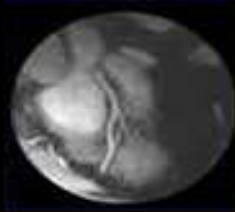

**P. W. Serruys<sup>4</sup>**

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Cardialysis B.V., Rotterdam, the Netherlands**
- 2. Yamaguchi University, Japan**
- 3. Fujita Health University, Japan**
- 3. Imperial College, London, UK**

# **3D-OCT guided bifurcation treatment**

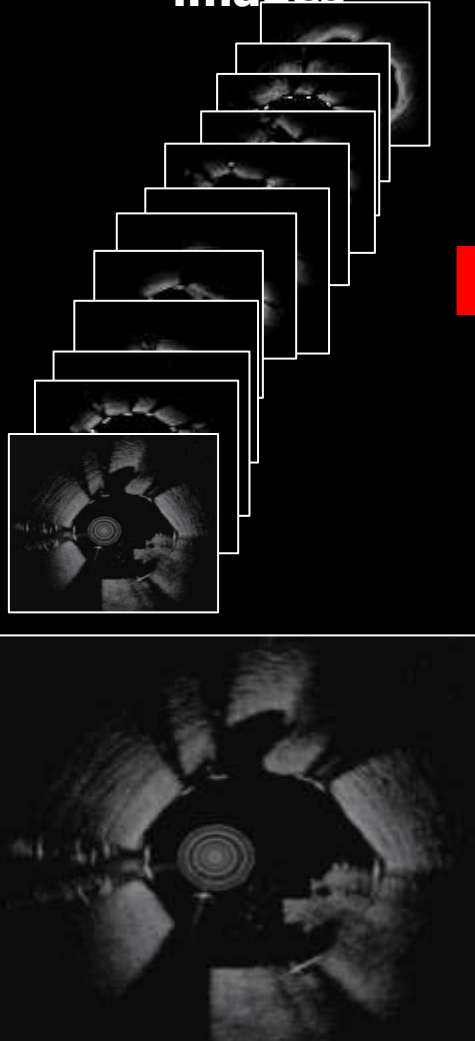
- **Advantage of OCT over other modalities in constructing 3-dimensional OCT**
- **Visualization of bifurcation on 3D OCT**
- **3D-OCT guidance to position a re-crossing guide wire during bifurcation Stenting**

# Invasive/ Non-invasive imaging in cathlab

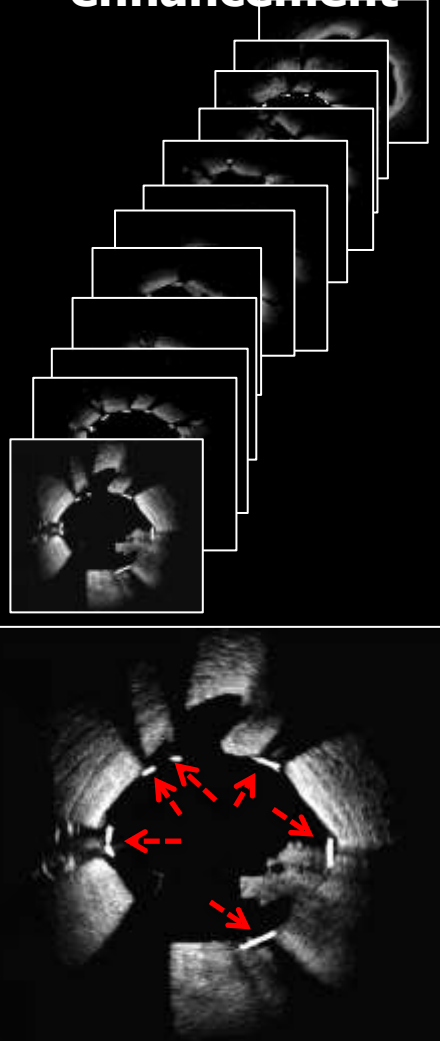
	OFDI/ OCT	IVUS	CAG	MSCT	MRI	Angioscopy
						
<b>Resolution (<math>\mu\text{m}</math>)</b>	<b>10-20</b>	<b>80-150</b>	<b>200</b>	<b>300</b>	<b>300</b>	<b>200</b>
<b>Time aspect I</b>	<b>Real-time</b>	<b>Real-time</b>	<b>Real-time</b>			<b>Real-time</b>
<b>Time aspect II</b>	<b>2-50 sec</b>	<b>20-50 sec</b>				<b>30 sec</b>
<b>Type of scan source</b>	<b>IR-light</b>	<b>Ultrasound</b>	<b>X-rays</b>	<b>X-rays</b>	<b>Magnetic rays</b>	<b>Visible light</b>
<b>Imaging target</b>	<b>Layer</b>	<b>Layer</b>	<b>Bloodflow</b>	<b>Density</b>	<b>Density</b>	<b>Surface</b>
<b>Pullback Speed</b>	<b>10-40 mm/sec</b>	<b>0.5-1.0 mm/sec</b>				

# How to reconstruct 3-dimensional image from 2-D cross sections?

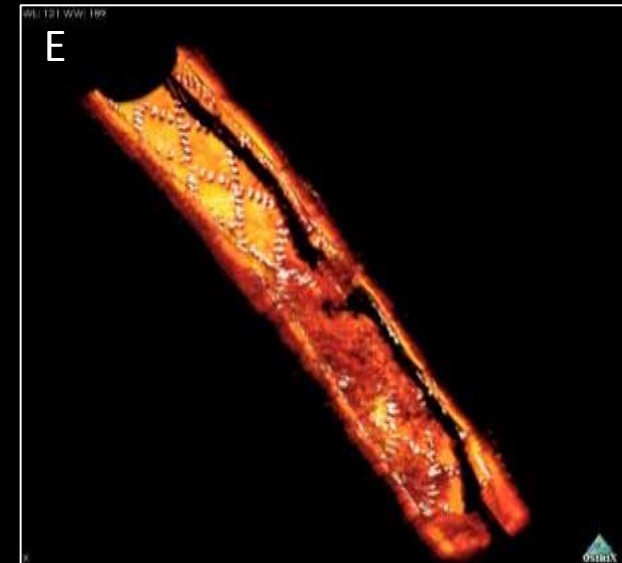
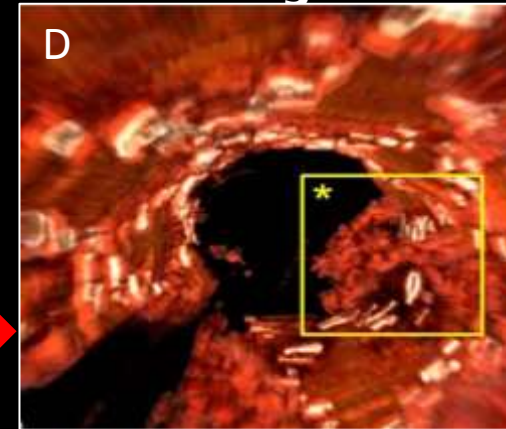
**A. Sequential 2-dimensional OCT images**



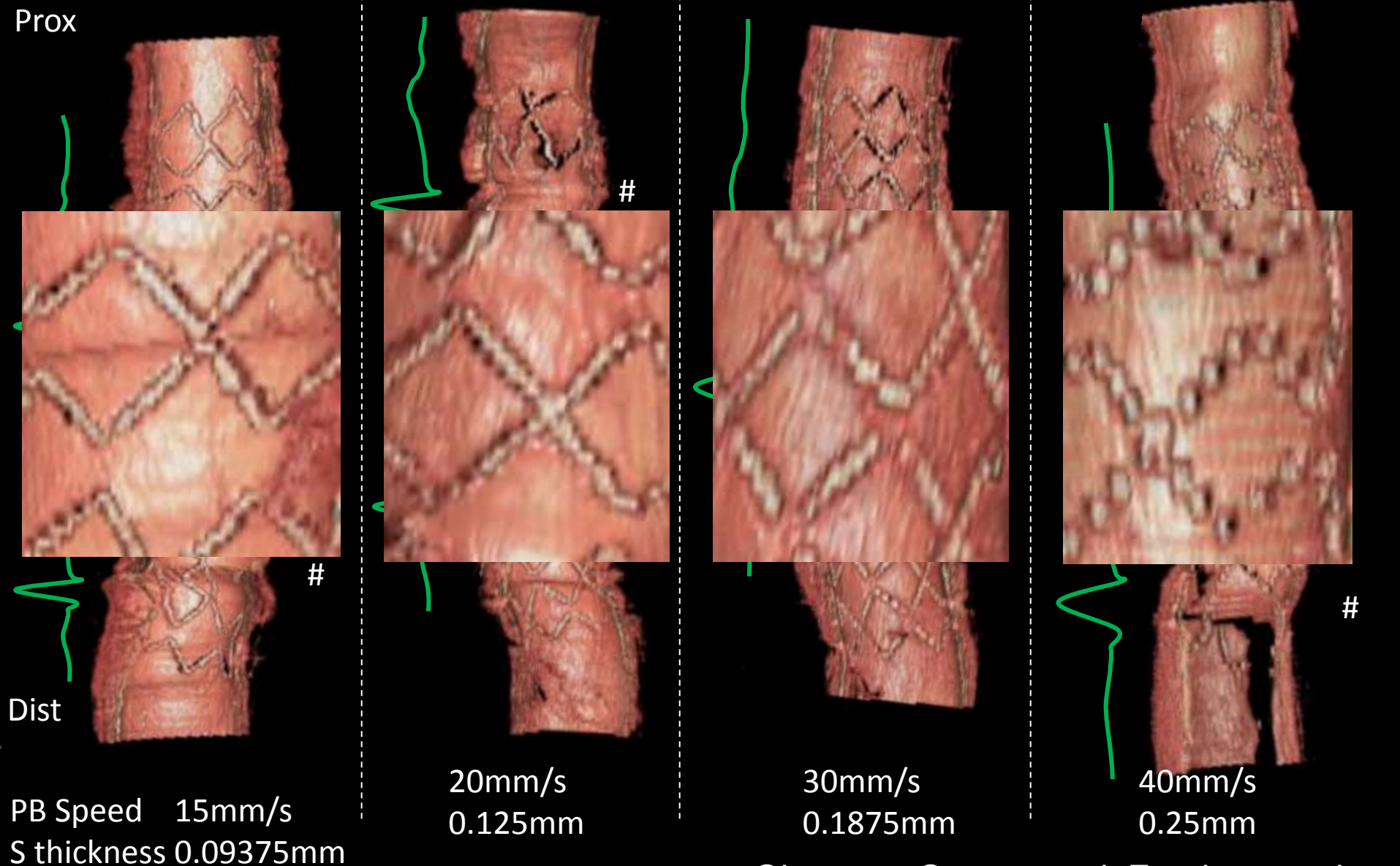
**B. Post processing: Stent enhancement**



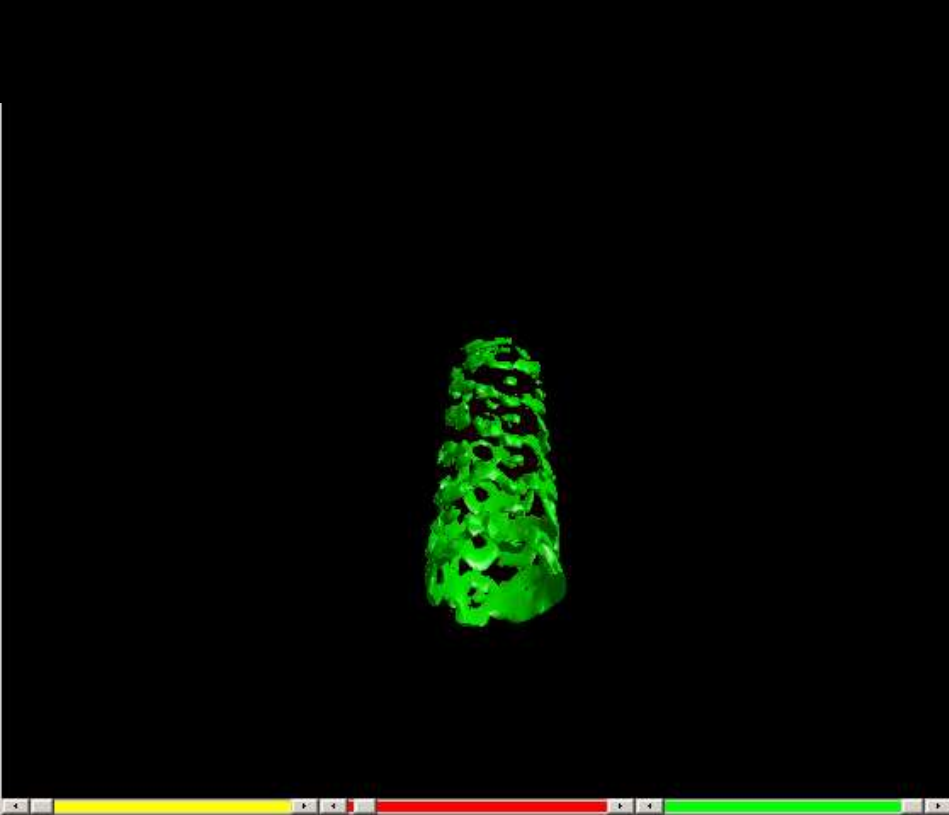
**C. 3-dimensional image**



# FASTER PULLBACK SPEED = FEWER CARDIAC MOTION ARTIFACTS BUT DEGRADATION IN IMAGE RESOLUTION



# 3-dimensional reconstruction: IVUS vs. OCT



# **3D-OCT guided bifurcation treatment**

- **Advantage of OCT over other modalities in constructing 3-dimensional OCT**
- **Visualization of bifurcation on 3D OCT**
- **3D-OCT guidance to position a re-crossing guide wire during bifurcation Stenting**

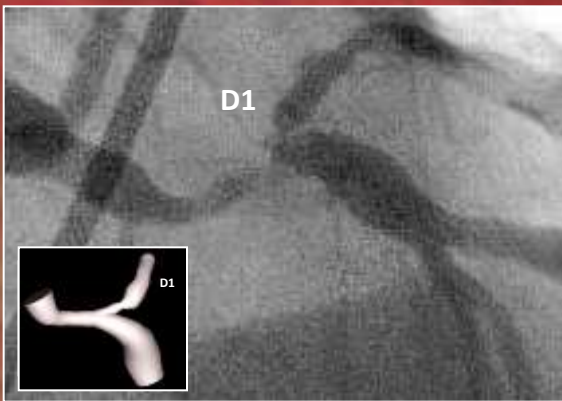




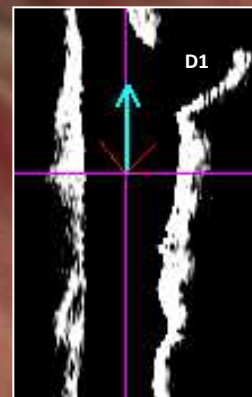
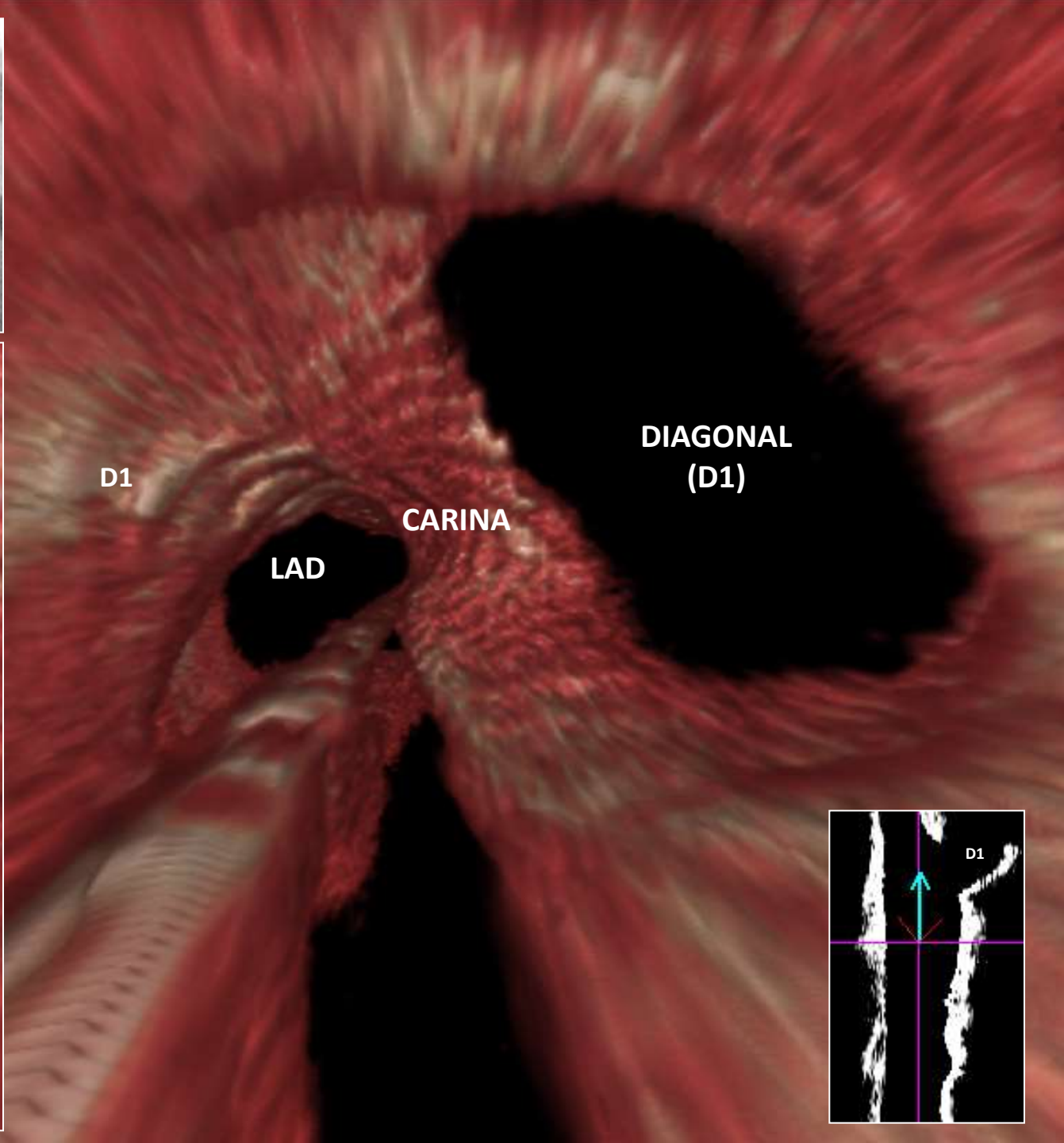
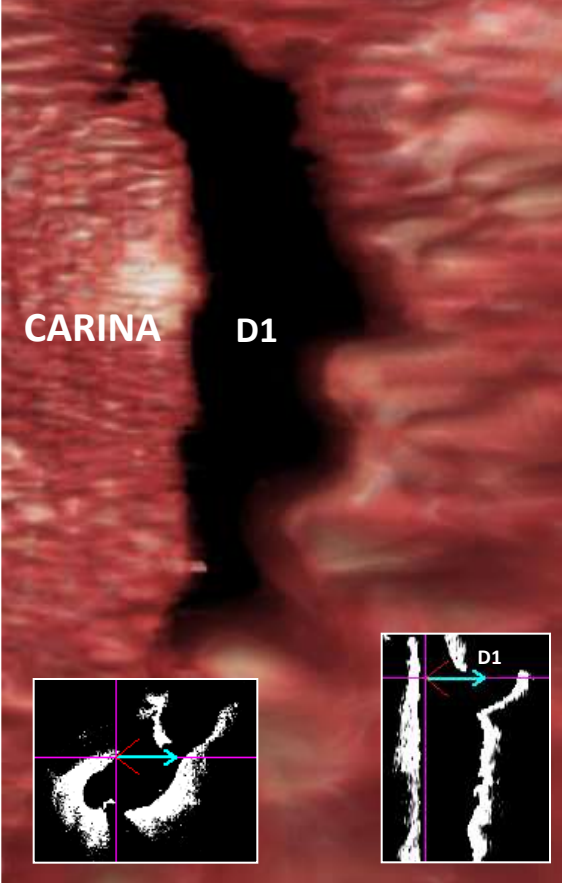
# Three-dimensional optical frequency domain imaging in conventional percutaneous coronary intervention: the potential for clinical application

**Vasim Farooq<sup>1</sup>, Bill D. Gogas<sup>1</sup>, Takayuki Okamura<sup>1</sup>, Jung Ho Heo<sup>1</sup>, Michael Magro<sup>1</sup>, Josep Gomez-Lara<sup>1</sup>, Yoshinobu Onuma<sup>1</sup>, Maria D. Radu<sup>1</sup>, Salvatore Brugaletta<sup>1</sup>, Glenda van Bochove<sup>2</sup>, Robert Jan van Geuns<sup>1</sup>, Hector M. García-García<sup>2</sup>, and Patrick W. Serruys<sup>1\*</sup>**



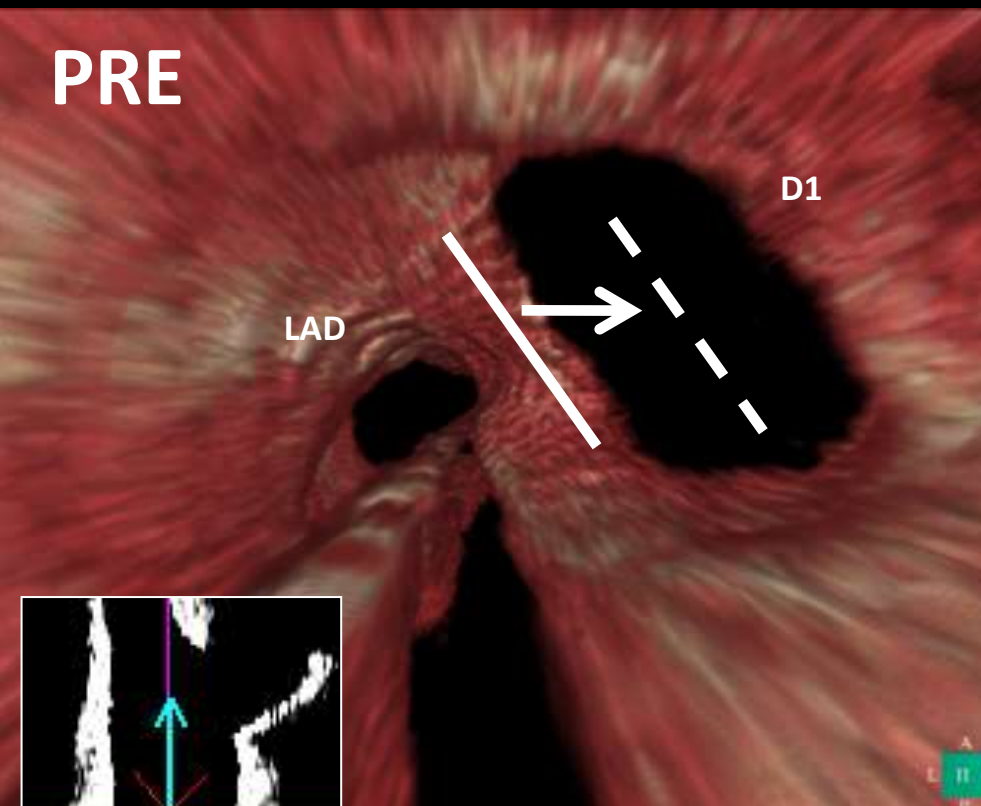


VIEW PERPENDICULAR TO  
VESSEL WALL

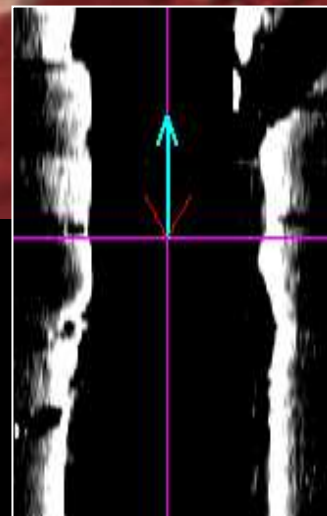
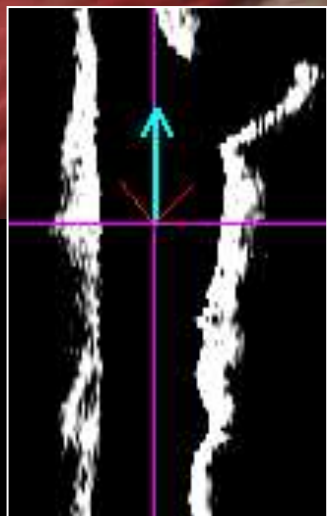
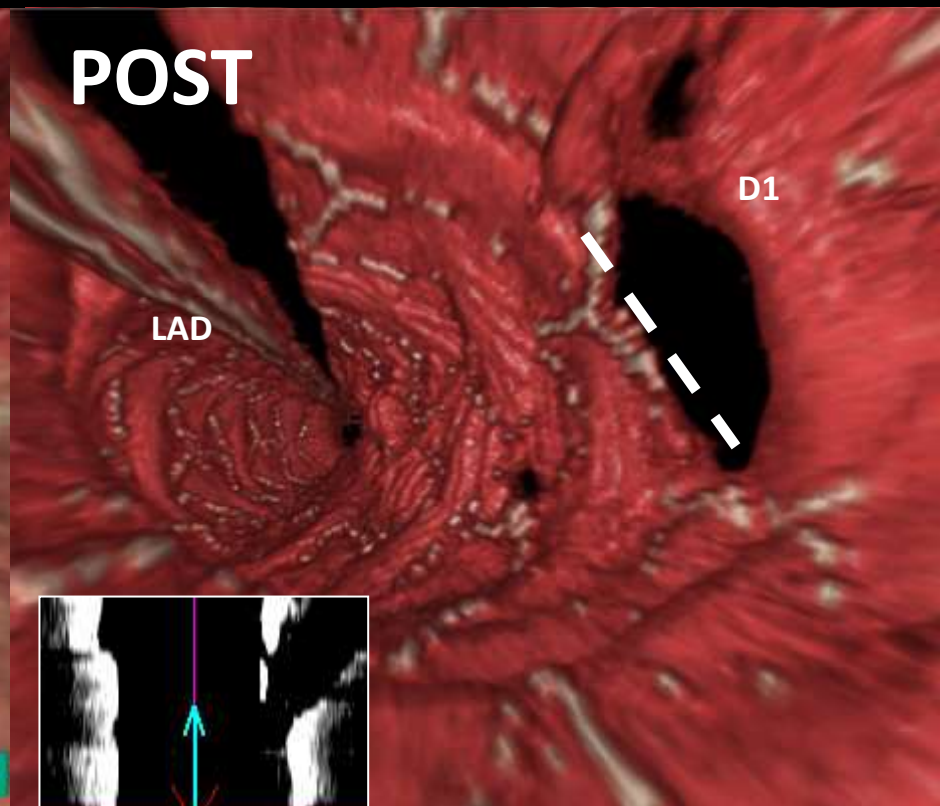


# CARINA SHIFT

PRE



POST



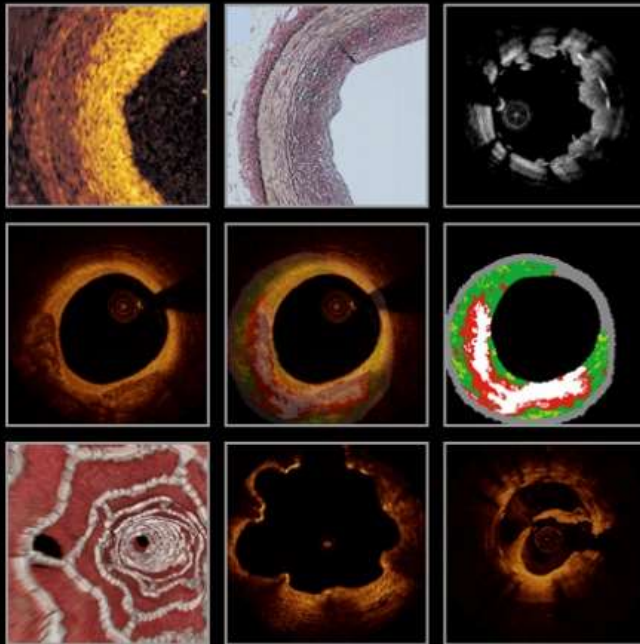
# **3D-OCT guided bifurcation treatment**

- **Advantage of OCT over other modalities in constructing 3-dimensional OCT**
- **Visualization of bifurcation on 3D OCT**
- **3D-OCT guidance to position a re-crossing guide wire during bifurcation Stenting**

- **Online-3D visualizations of  
The Jailed SideB Ostium**

PCR

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## **THE CLINICAL ATLAS OF OPTICAL COHERENCE TOMOGRAPHY**

### **EDITORS**

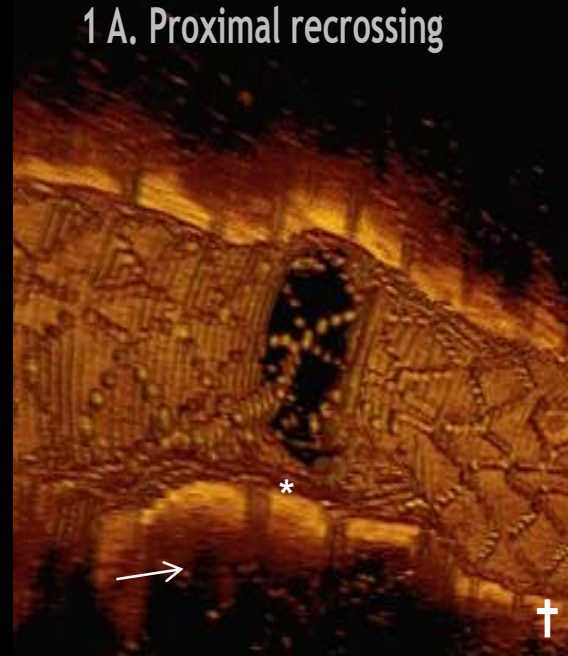
Maria D.Radu  
Lorenz Räber  
Hector Garcia-Garcia  
Patrick W. Serruys







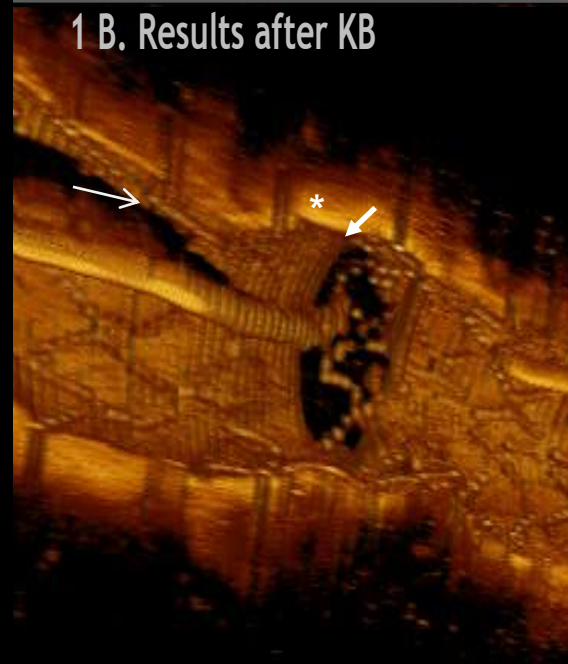
1 A. Proximal recrossing



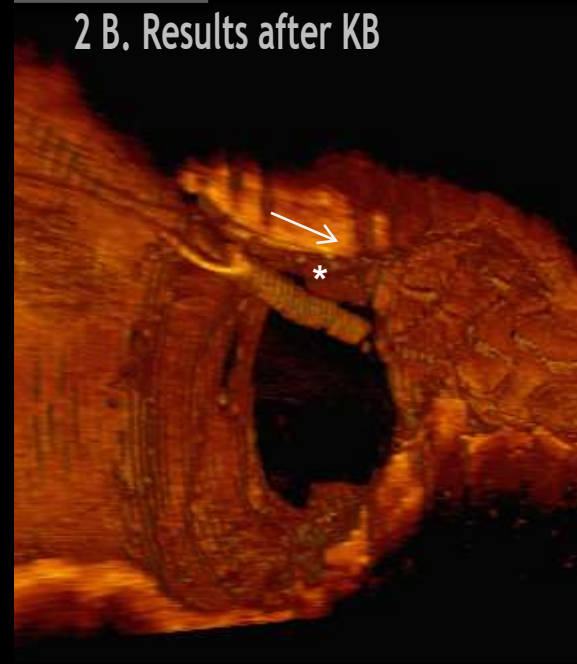
2 A. Distal recrossing



1 B. Results after KB



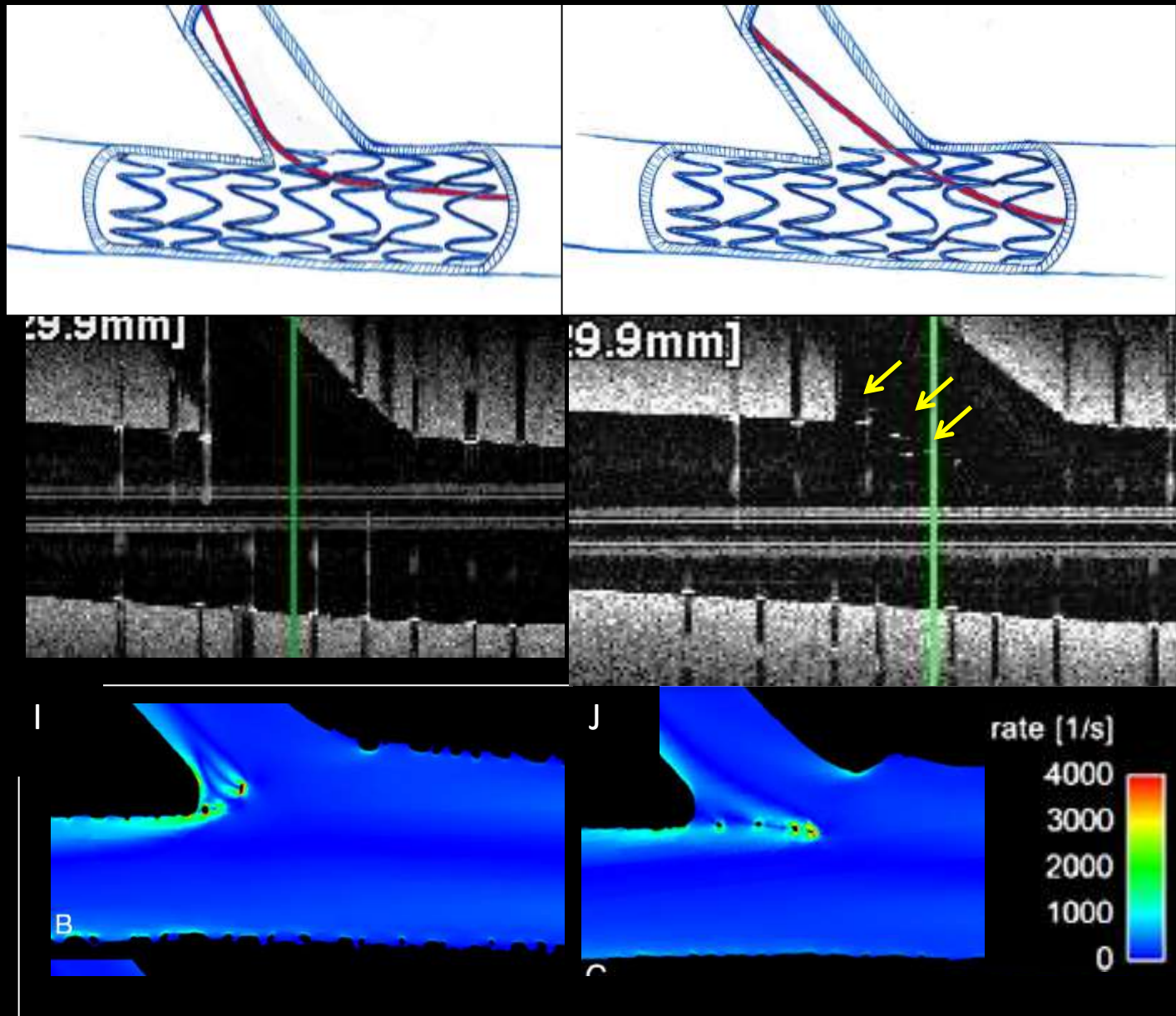
2 B. Results after KB





# Impact of recrossing wire position on shear stress after ballooning

Onuma et al. Euro intervention  
Foin et al.



**In 2011, automatic stent detection software was developed  
Still Off-line, but Reconstruction time – 7 min.  
Feasible during Procedure**

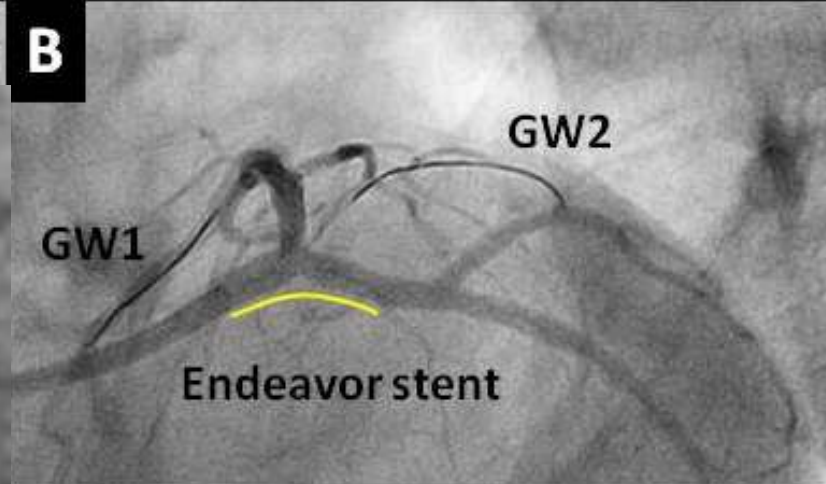
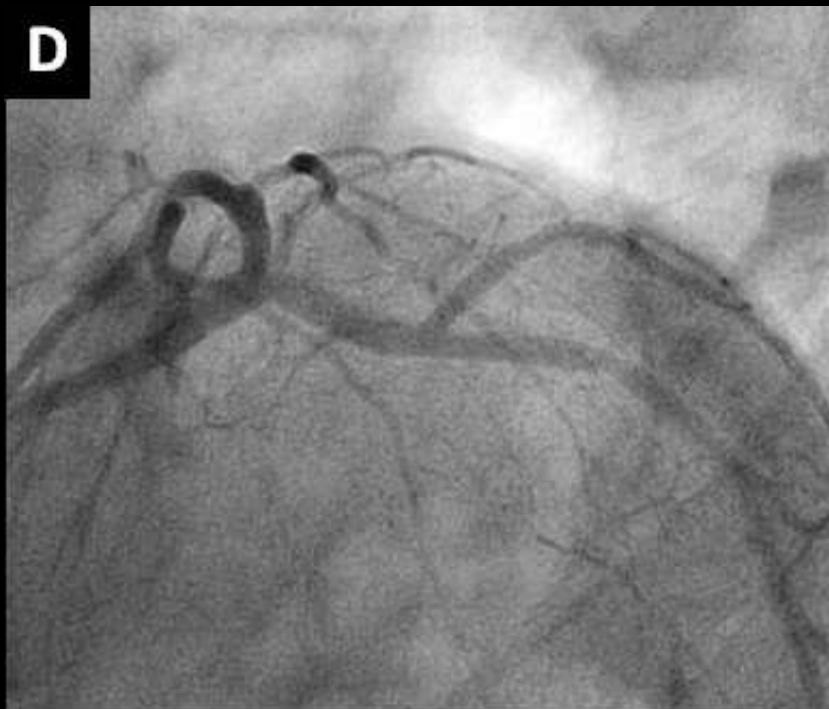
# Three-dimensional Optical Coherence Tomography Assessment of Coronary Wire Re-crossing Position **during** Bifurcation Stenting

**Takayuki Okamura, MD\*, Jutaro Yamada, MD, Tomoko Nao, MD, Takeshi  
Suetomi, MD, Takao Maeda, MD, Kohzoh Shiraishi, MD, Toshiro Miura,  
MD, Masunori Matsuzaki, MD**

Division of Cardiology, Department of Medicine and Clinical Science, Yamaguchi  
University Graduate School of Medicine, Ube, Japan

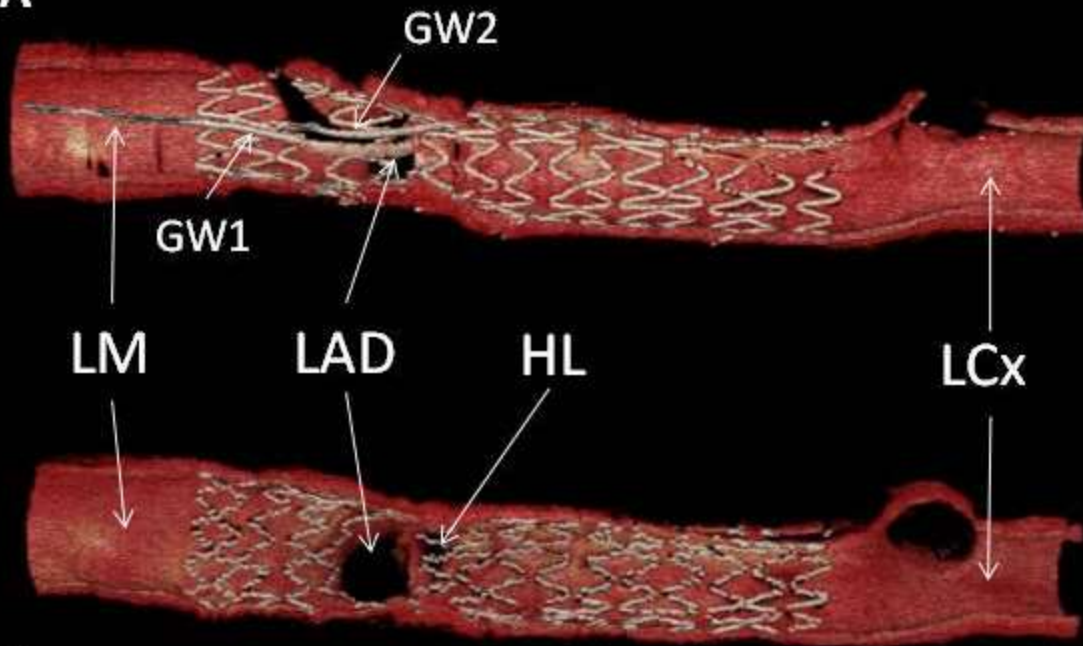
**A**

Napkin-ring Narrowing at the ostium  
of LCx (0,0,1)

**B****D**

## LONGITUDINAL CUT-AWAY VIEW

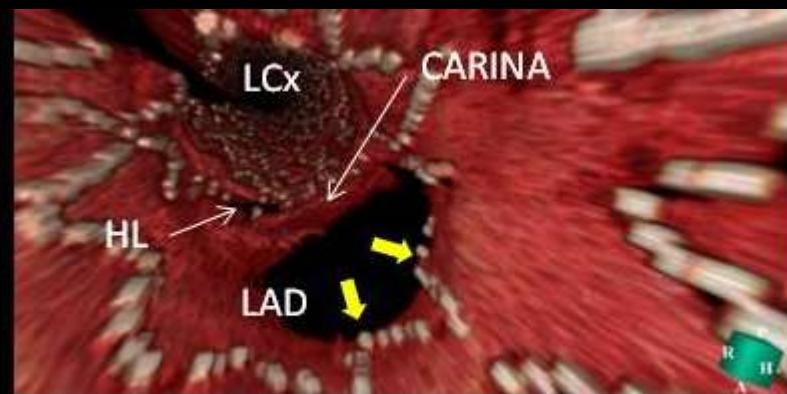
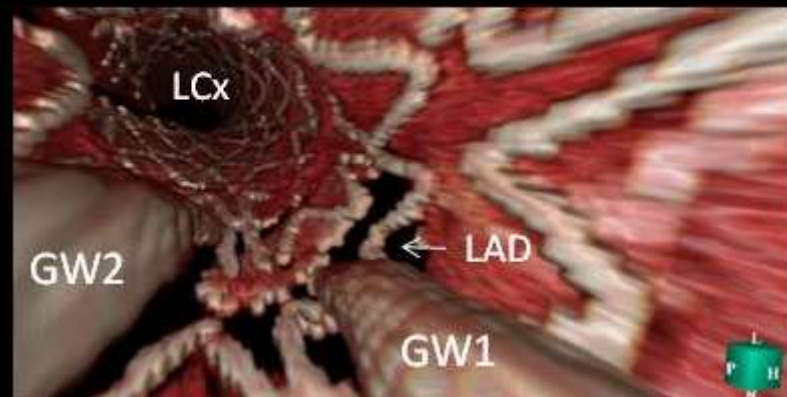
**A**



**B**



## FLY THROUGH VIEW FROM LM







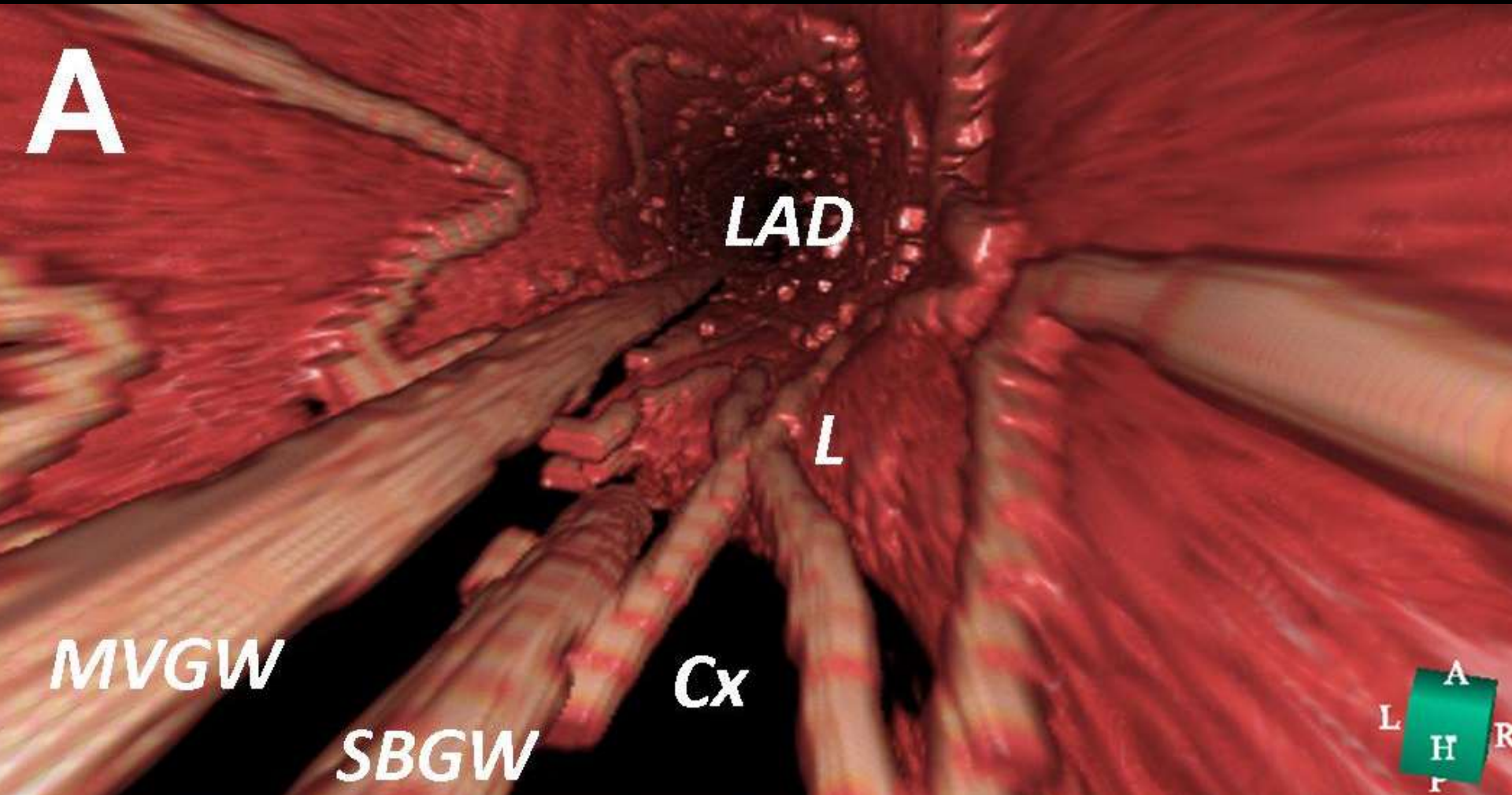
# **3D optical coherence tomography: new insights into the process of optimal rewiring of side branches during bifurcation stenting**

Takayuki Okamura, MD, PhD; Yoshinobu Onuma, MD; Jutaro Yamada, MD, PhD; Javaid Iqbal, MRCP, PhD; Hiroki Tateishi, MD, PhD; Tomoko Nao, MD, PhD; Takamasa Oda, MD; Takao Maeda, MD; Takeshi Nakamura, MD; Toshiro Miura, MD, PhD; Masafumi Yano, MD, PhD; Patrick W. Serruys, MD, PhD

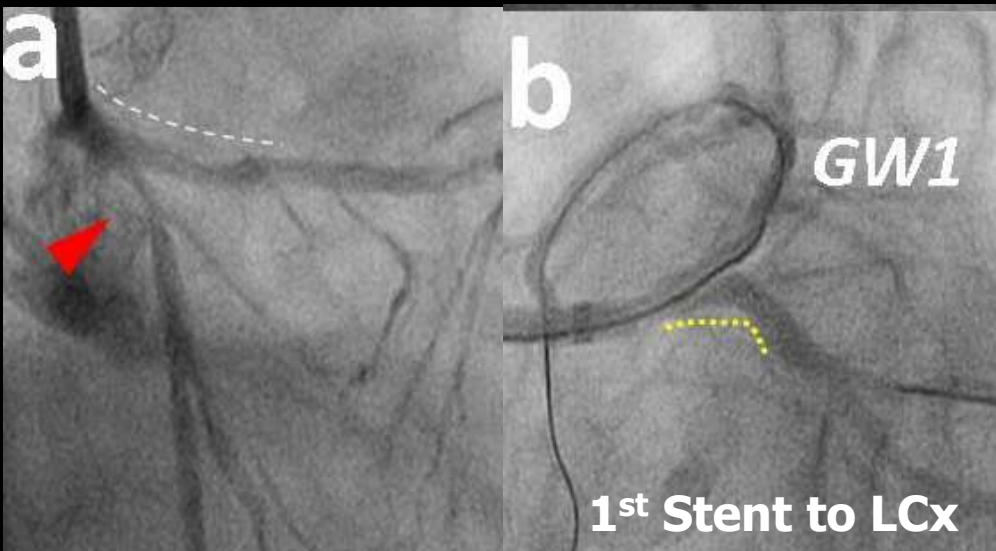
*T. Okamura and Y. Onuma have contributed equally to this manuscript.*



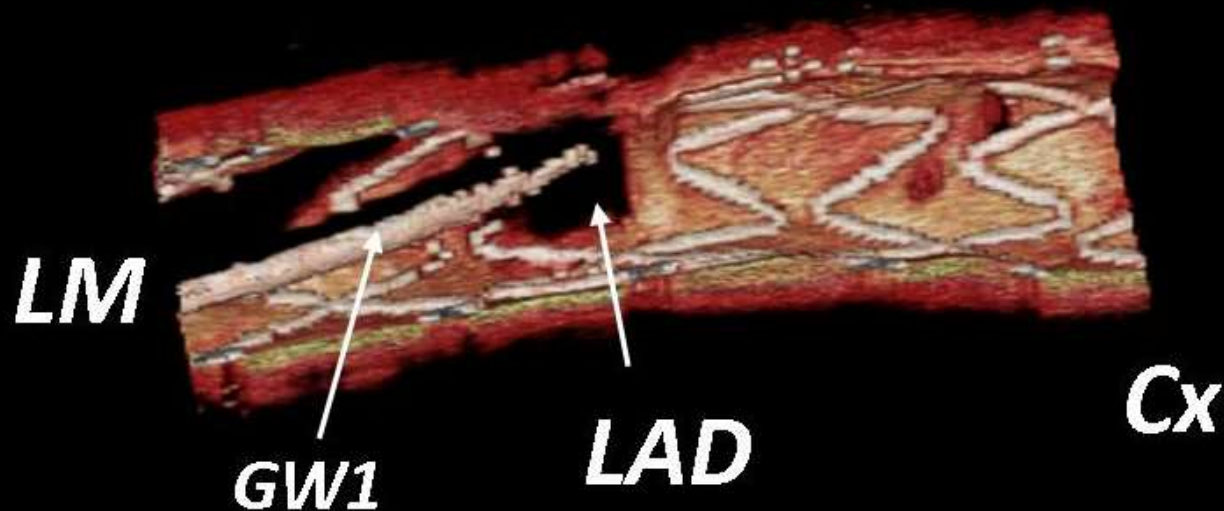
# Left Main Stenting 1



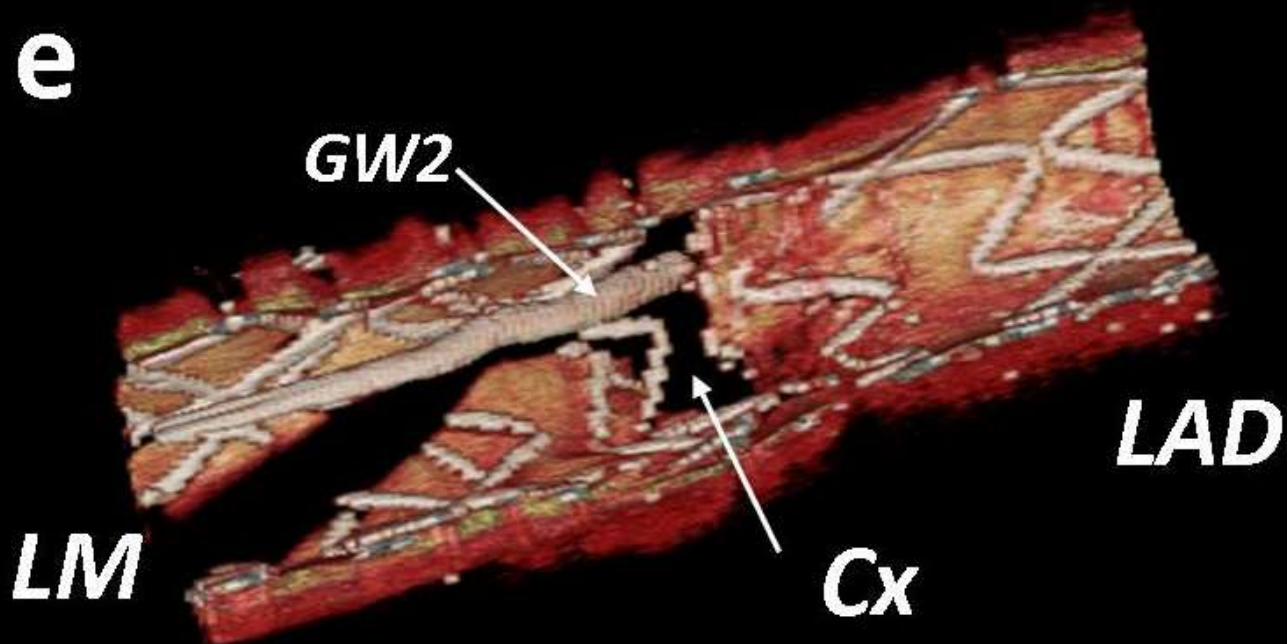
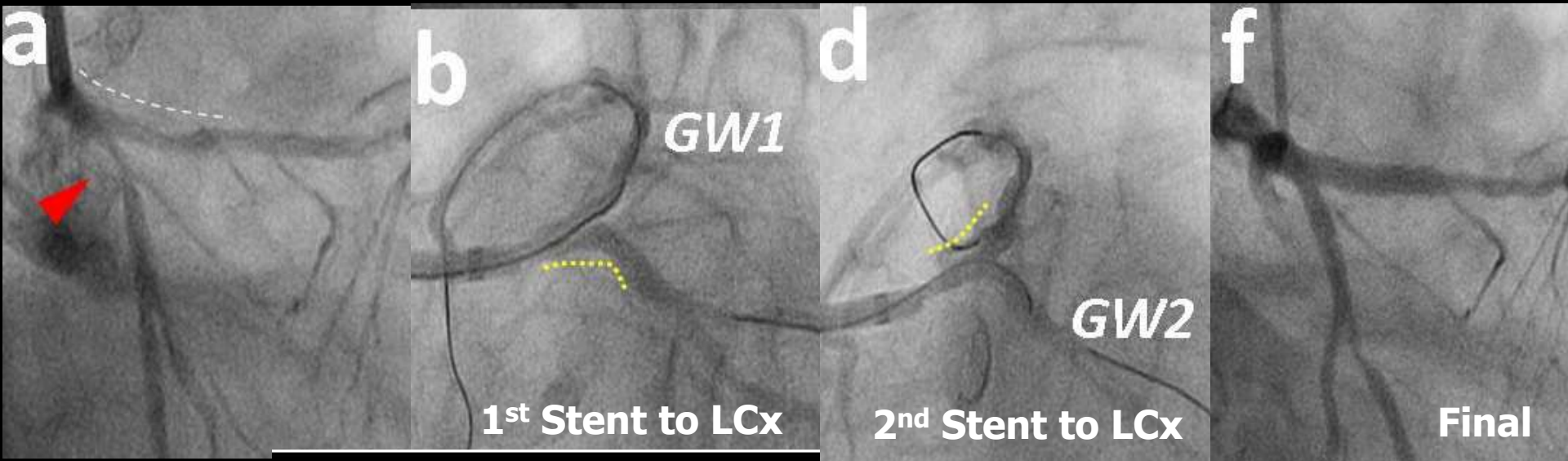
# Left Main Stenting 2 (Culotte)



**c**

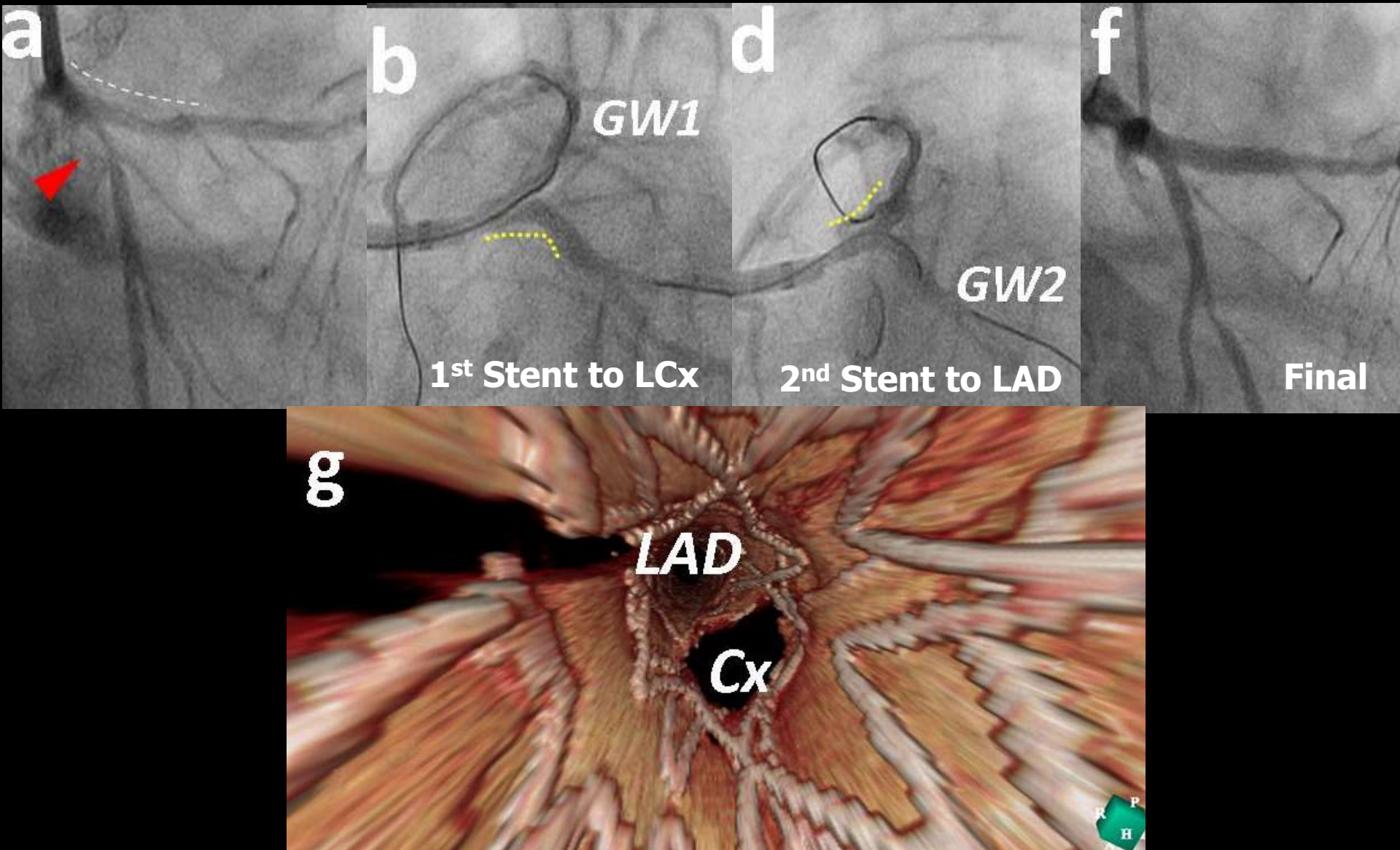


# Left Main Stenting 2 (Culotte)





# Left Main Stenting 2 (Culotte)



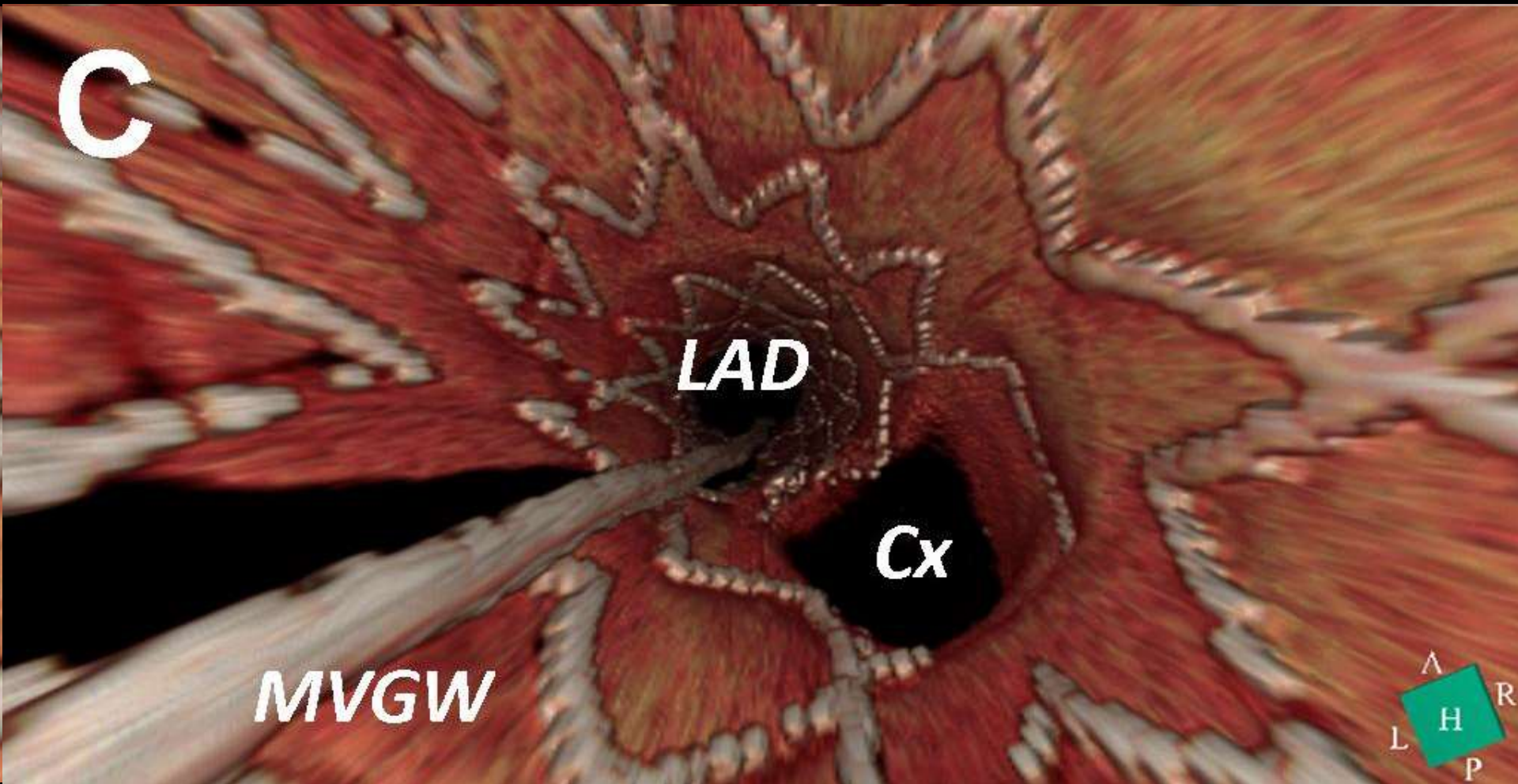
# Left Main Stenting 2 (Culotte)

**3M FUP**



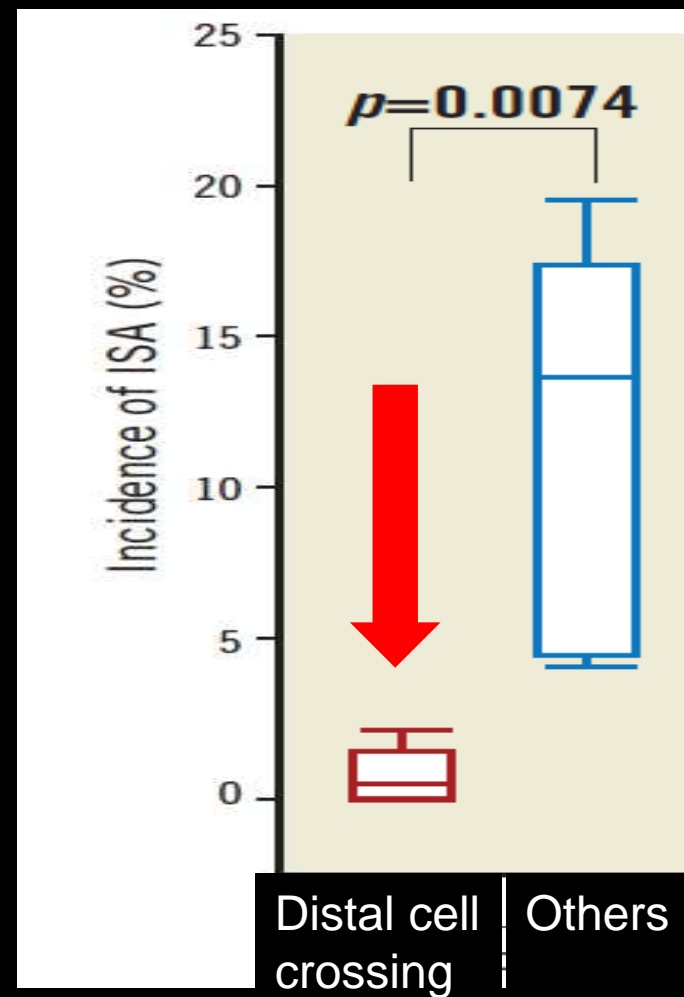
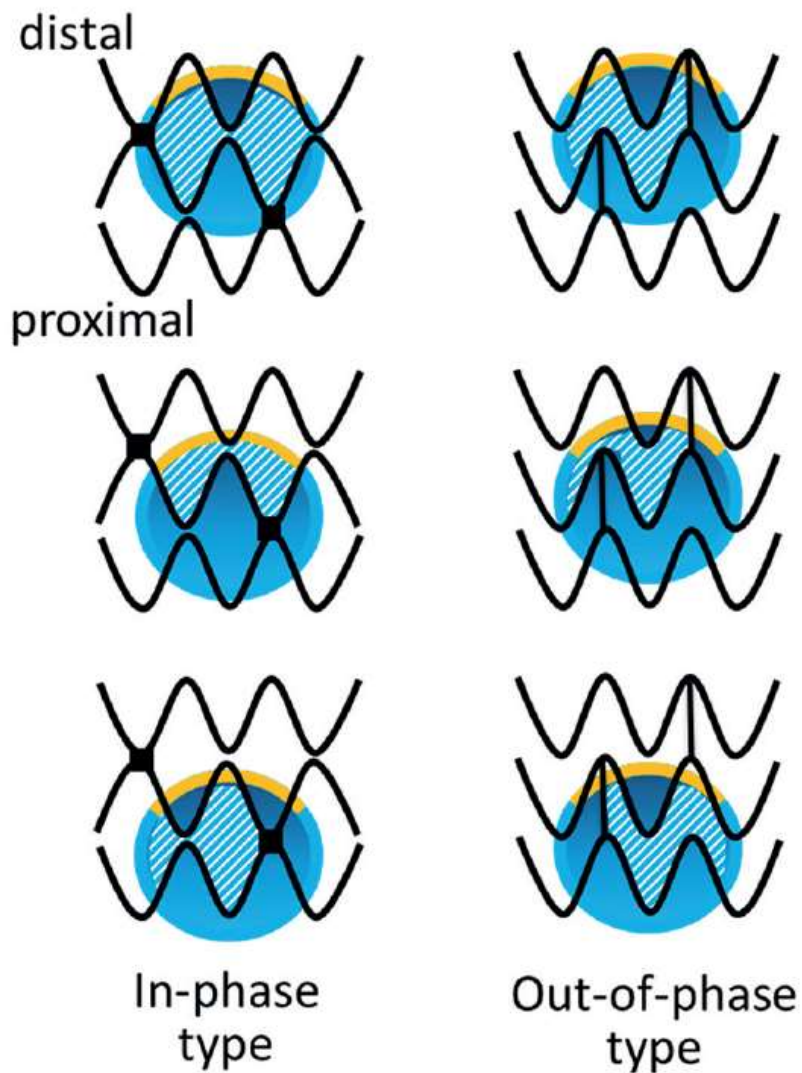


# Left Main Stenting 3





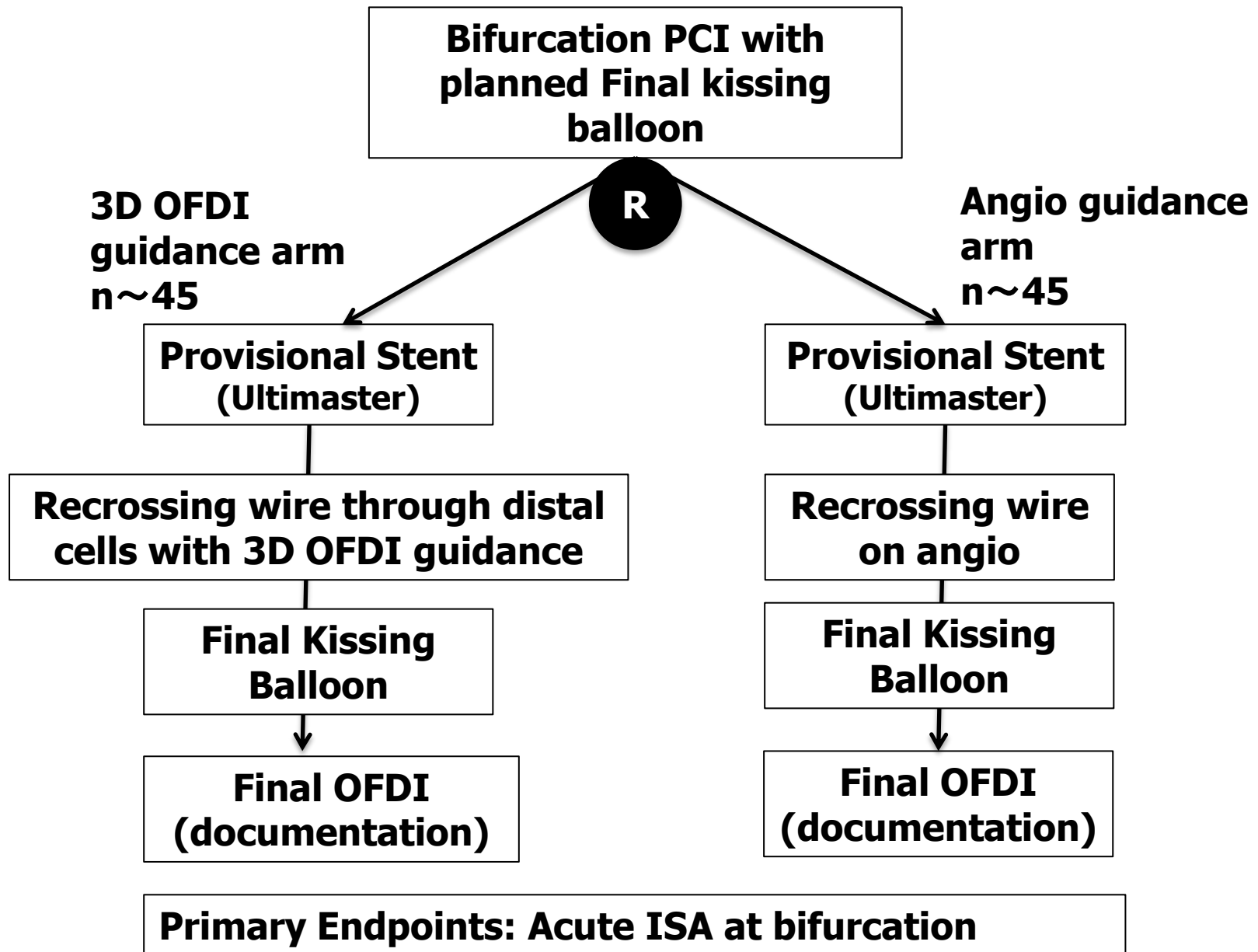
## B. The most distal cell



# On-line 3D OFDI (automatic strut detection) is now available on console



# OPTIMUM: 3D-OFDI guidance in bifurcation



# Conclusion

- With its high speed pullback and high resolution, OCT is the suitable imaging modality for 3D imaging.
- **In bifurcation**, 3D-OCT may guide positioning of the wire through the appropriate (distal) cell. The early study suggests that such a guidance strategy reduced the incidence of malapposition in bifurcation.
- In 2014, the on-line 3D OCT/OFDI with automatic strut detection is available. **The equipped “real-time” 3D OFDI** will help utilization of 3D in clinical situation.
- Prospective randomized study is planned and conducted soon.

# Thank You!



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