

# PATIENT OUTCOMES IN LONG-TERM LDL-C MANAGEMENT IN ACS

## – ROLE OF IMAGING, PROTOCOLS AND GUIDELINES



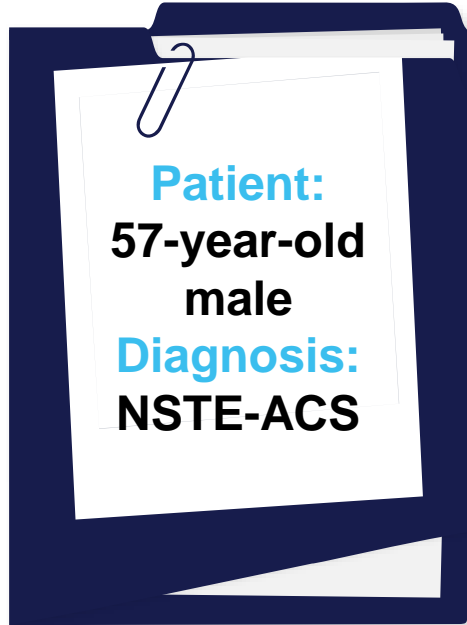
- Yoshiyasu Minami, MD, PhD, FACC
- Department of Cardiovascular Medicine
- Kitasato University Hospital
- Japan

# Yoshiyasu Minami, MD, PhD, FACC

## Financial Disclosure

- Received an honorarium from AMGEN, Sanofi, and Abbott

# Case



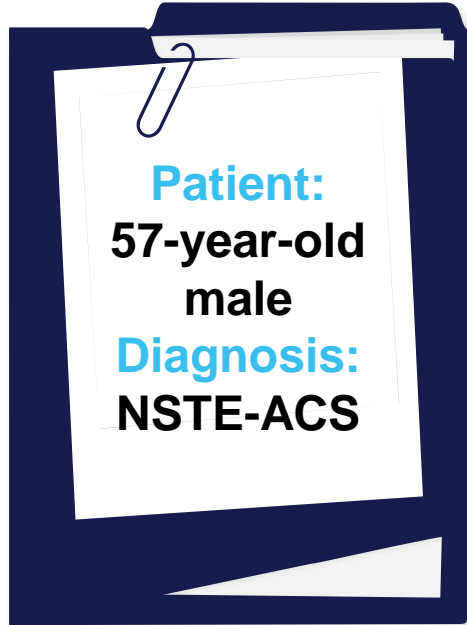
## Recent history:

- Worsening exertion chest pain since 1 month ago

## Patient's history:

- Diabetes, chronic kidney disease, dyslipidemia, hypertension, past smoker
- 3VD → PCI\*3 (midRCA, proxLAD, midLCX)

# Case



## Medication:

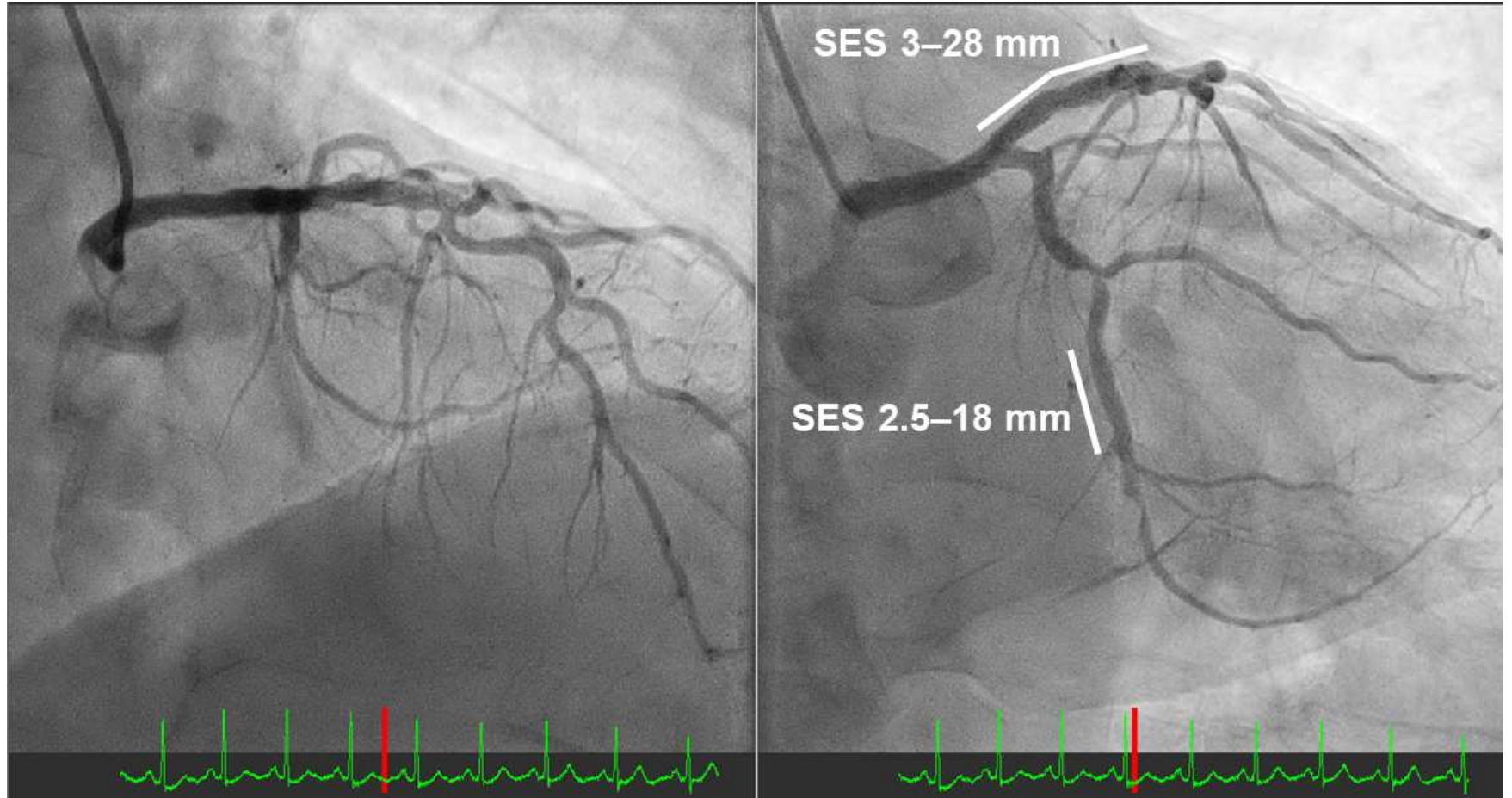
- Clopidogrel 75 mg, linagliptin 5 mg, atorvastatin 10 mg, ezetimibe 10 mg, olmesartan 20 mg

## Laboratory findings:

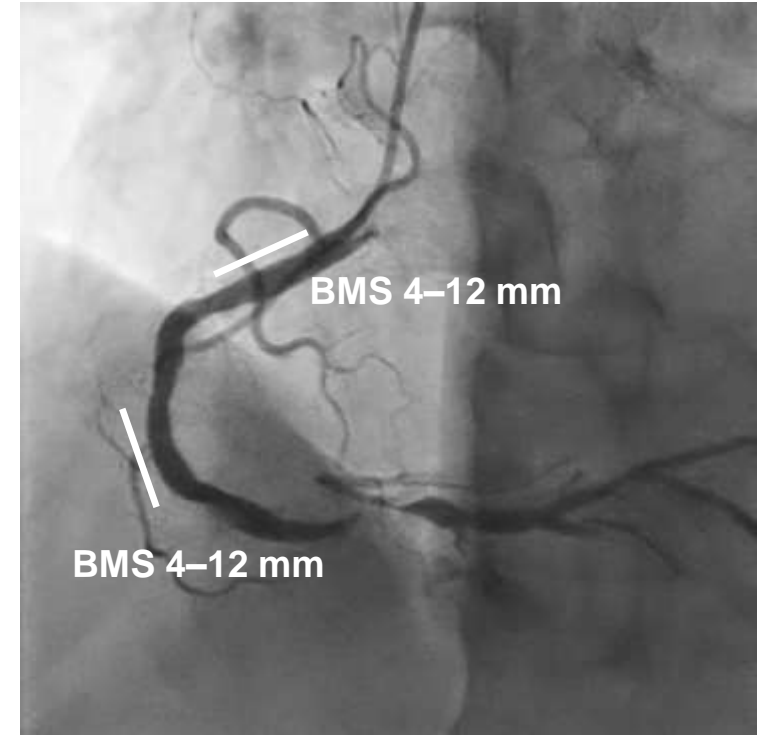
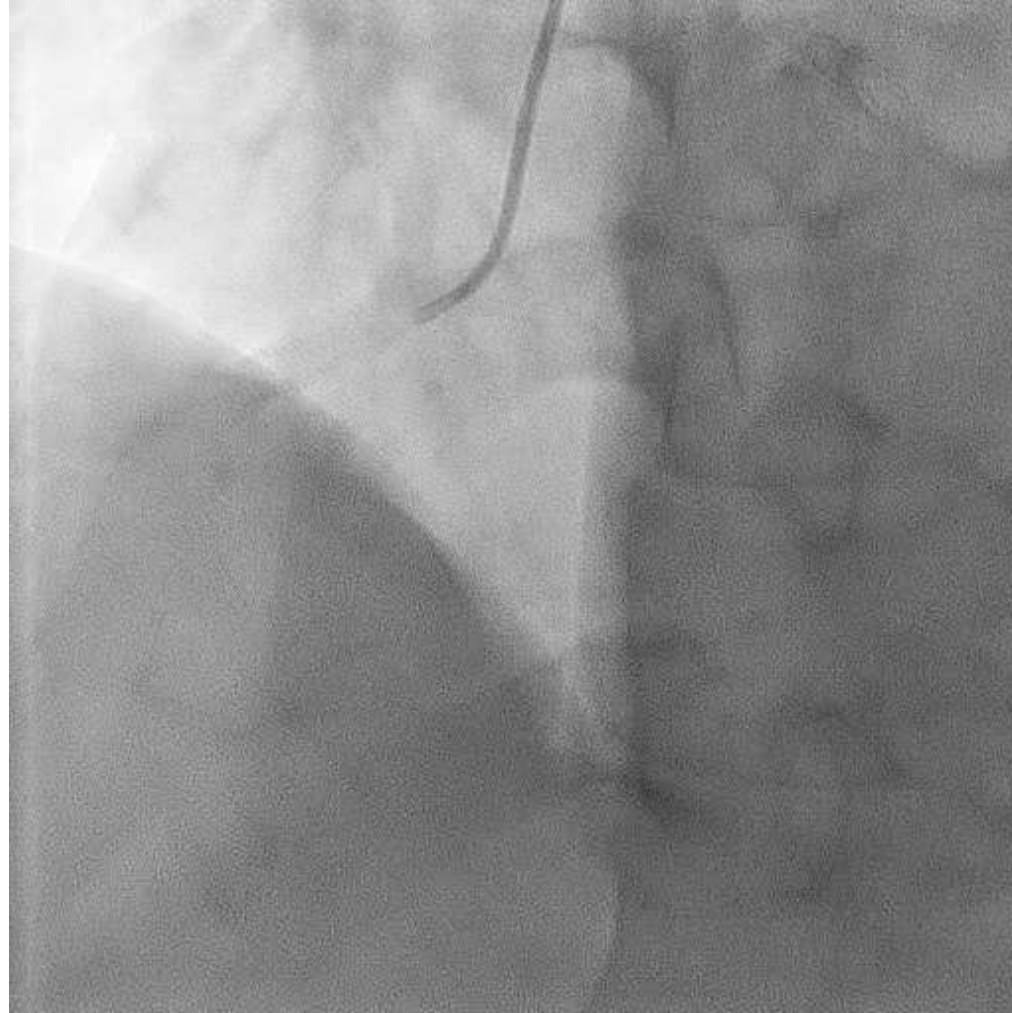
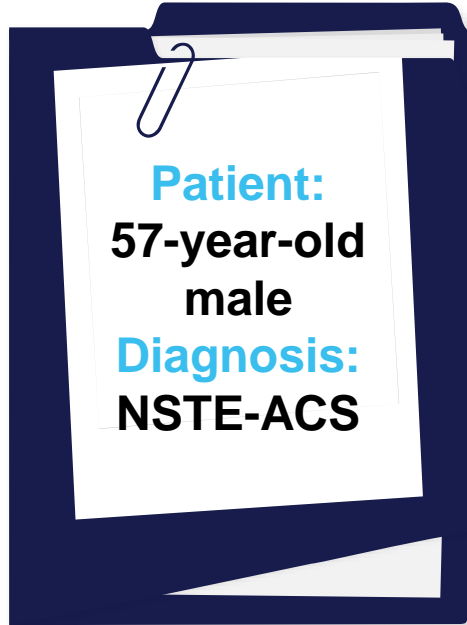
- LDL-C 137 mg/dL (3.5 mmol/L), HDL-C 42 mg/dL (1.1 mmol/L), triglyceride 225 mg/dL (2.5 mmol/L), Lp(a) 35 mg/dL
- HbA1c 7.2%, sCr 1.49 mg/dL, eGFR 36 mL/min/1.73m<sup>2</sup>
- CK 262 U/L, TropT 0.155 ng/mL, BNP 46.3 pg/mL

# Case

**Patient:**  
57-year-old  
male  
**Diagnosis:**  
NSTEMI-ACS

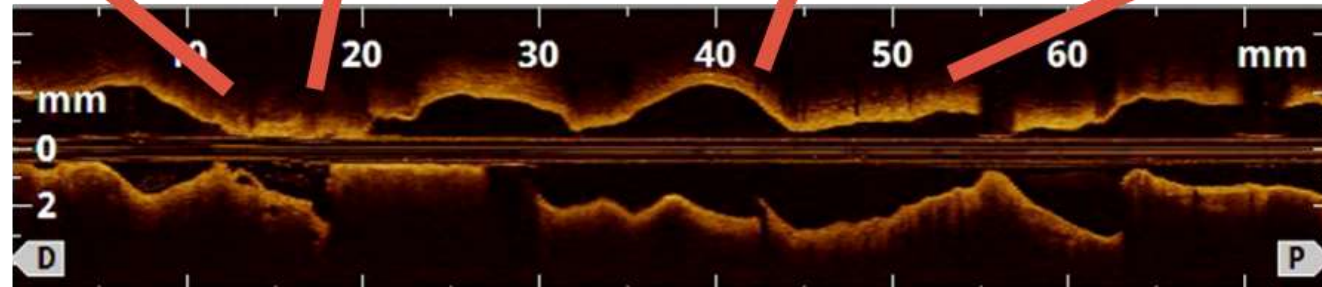
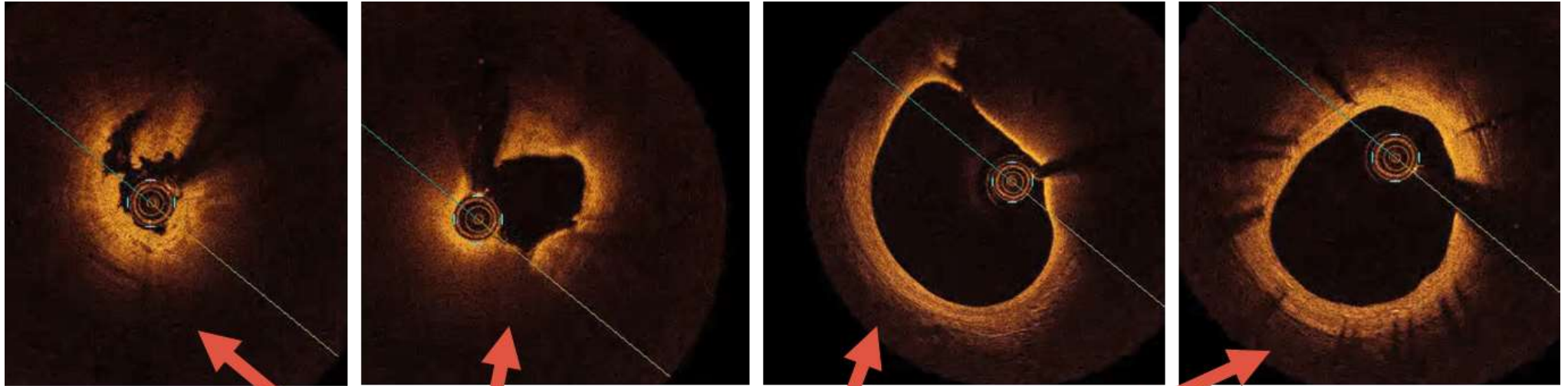


# Case



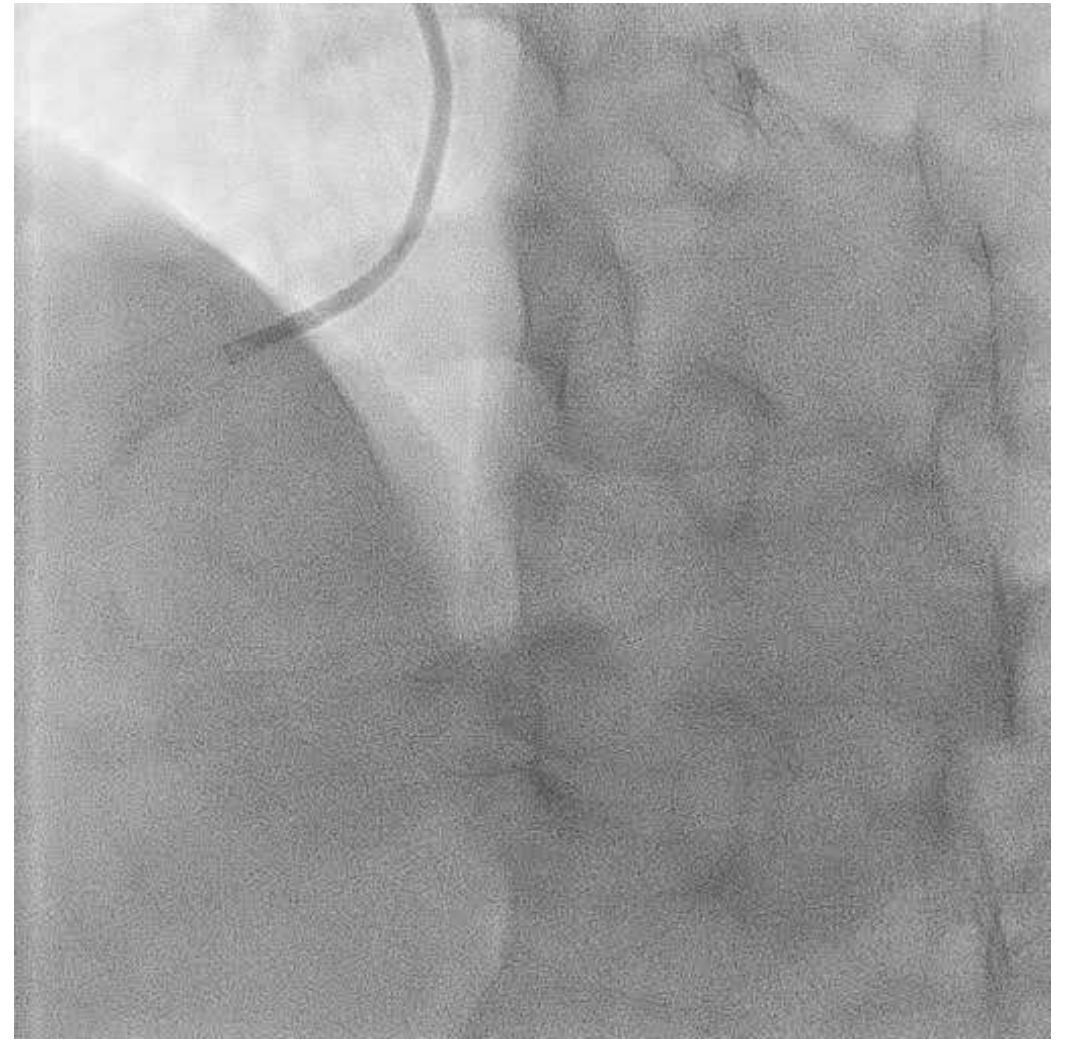
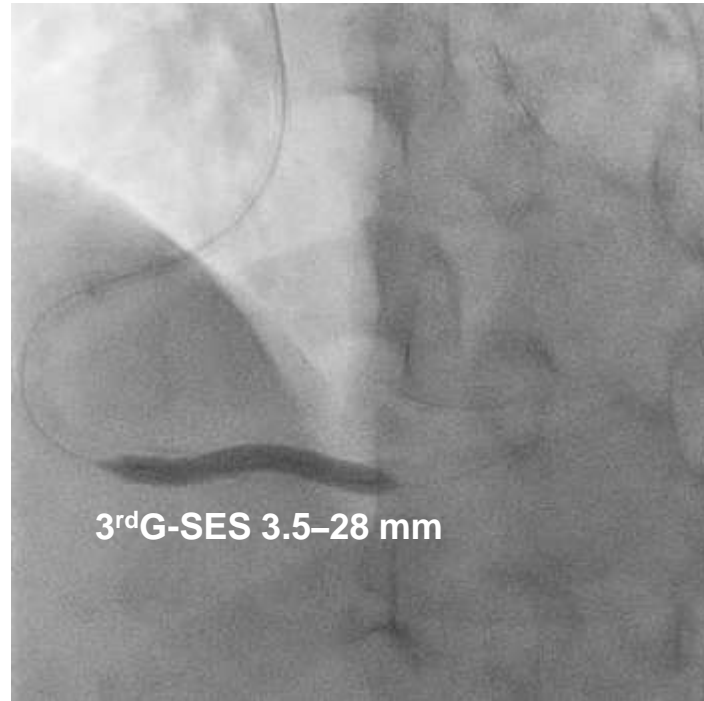


# Case



**Patient:**  
57-year-old  
male  
**Diagnosis:**  
NSTE-ACS

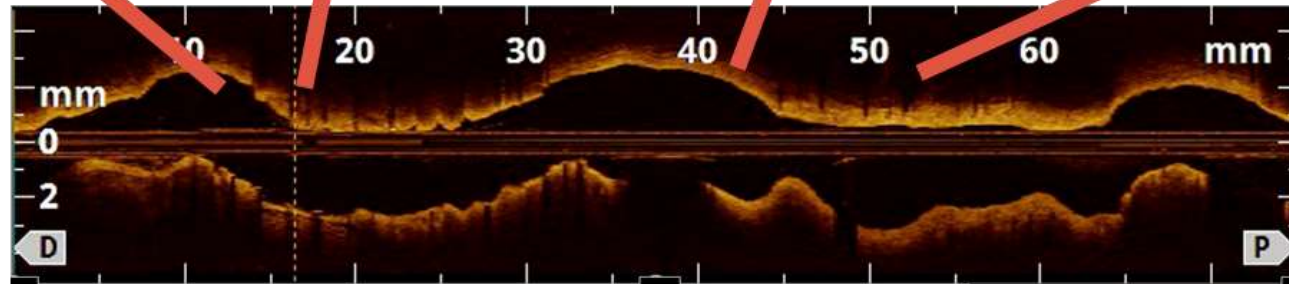
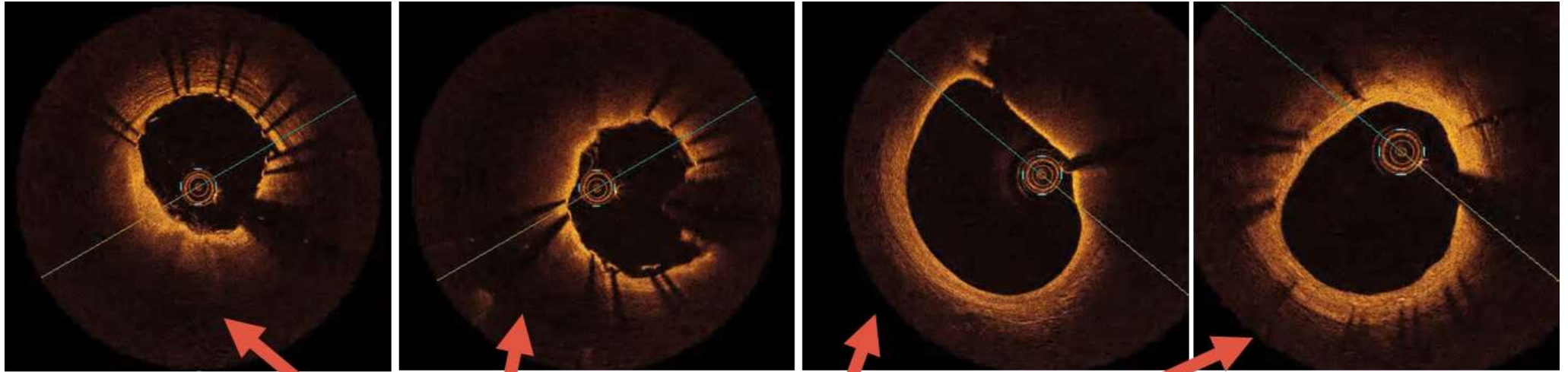
# Case



**Patient:**  
57-year-old  
male  
**Diagnosis:**  
NSTE-ACS

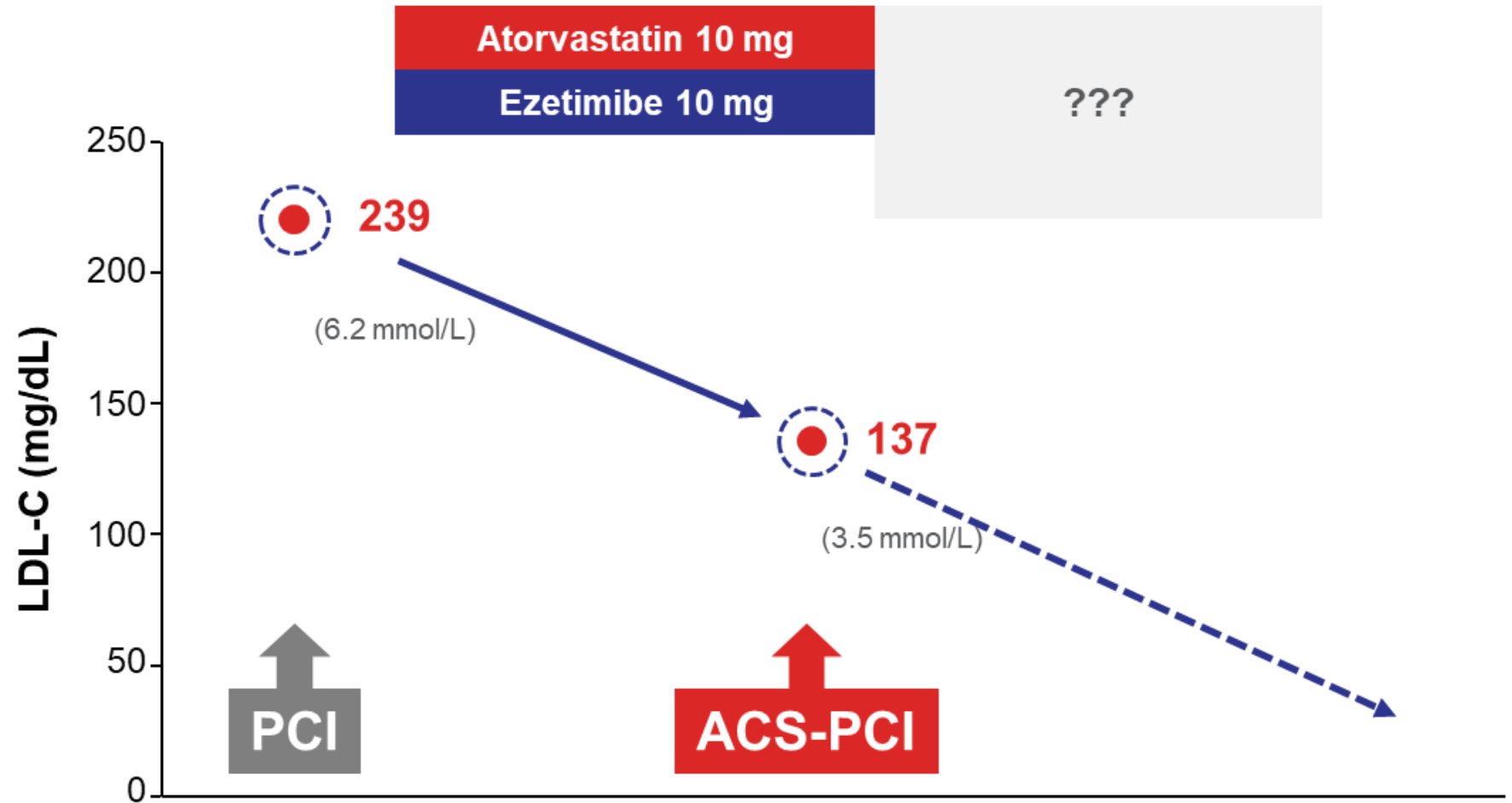


# Case

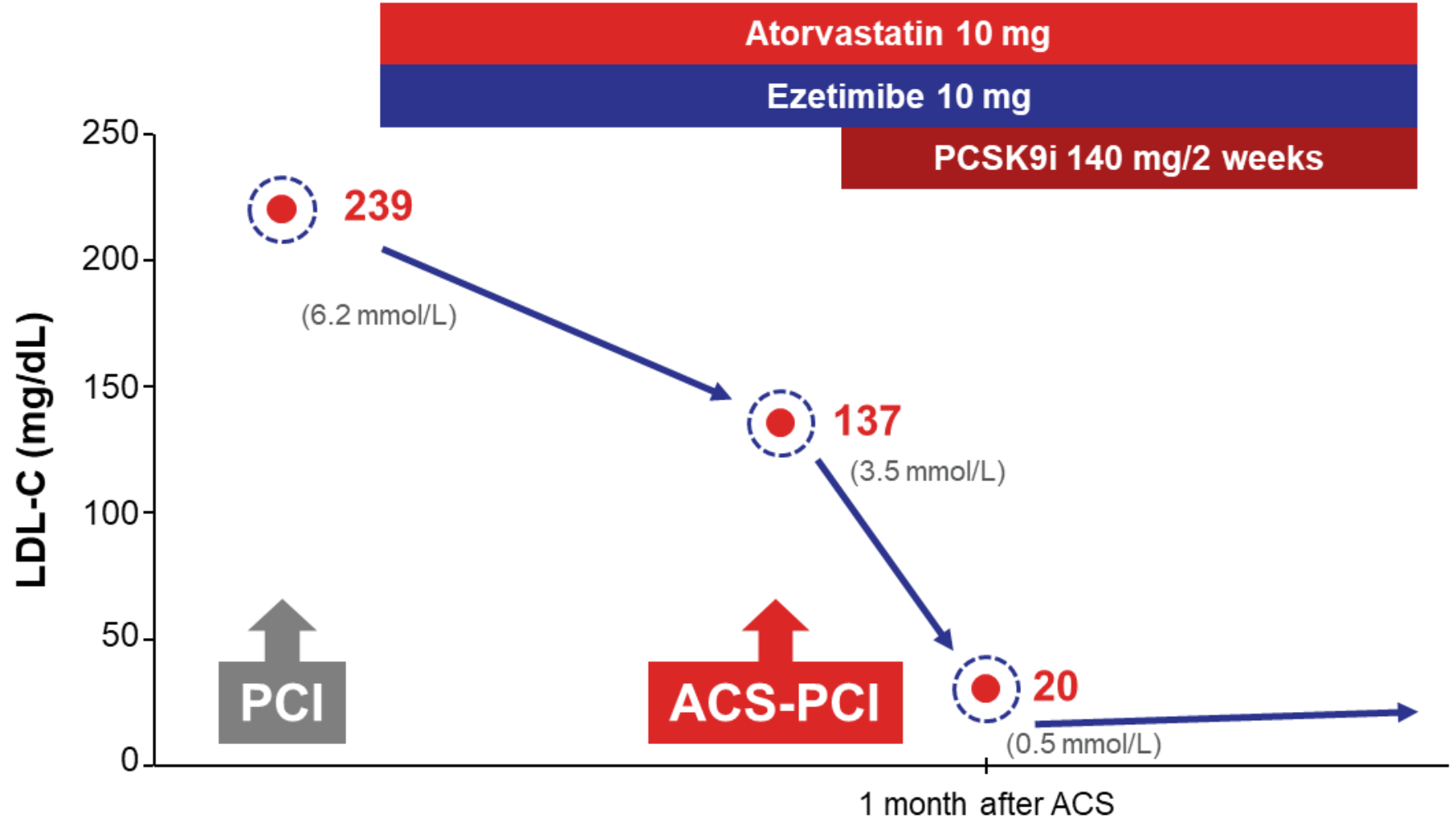


**Patient:**  
57-year-old  
male  
**Diagnosis:**  
NSTE-ACS

# Case

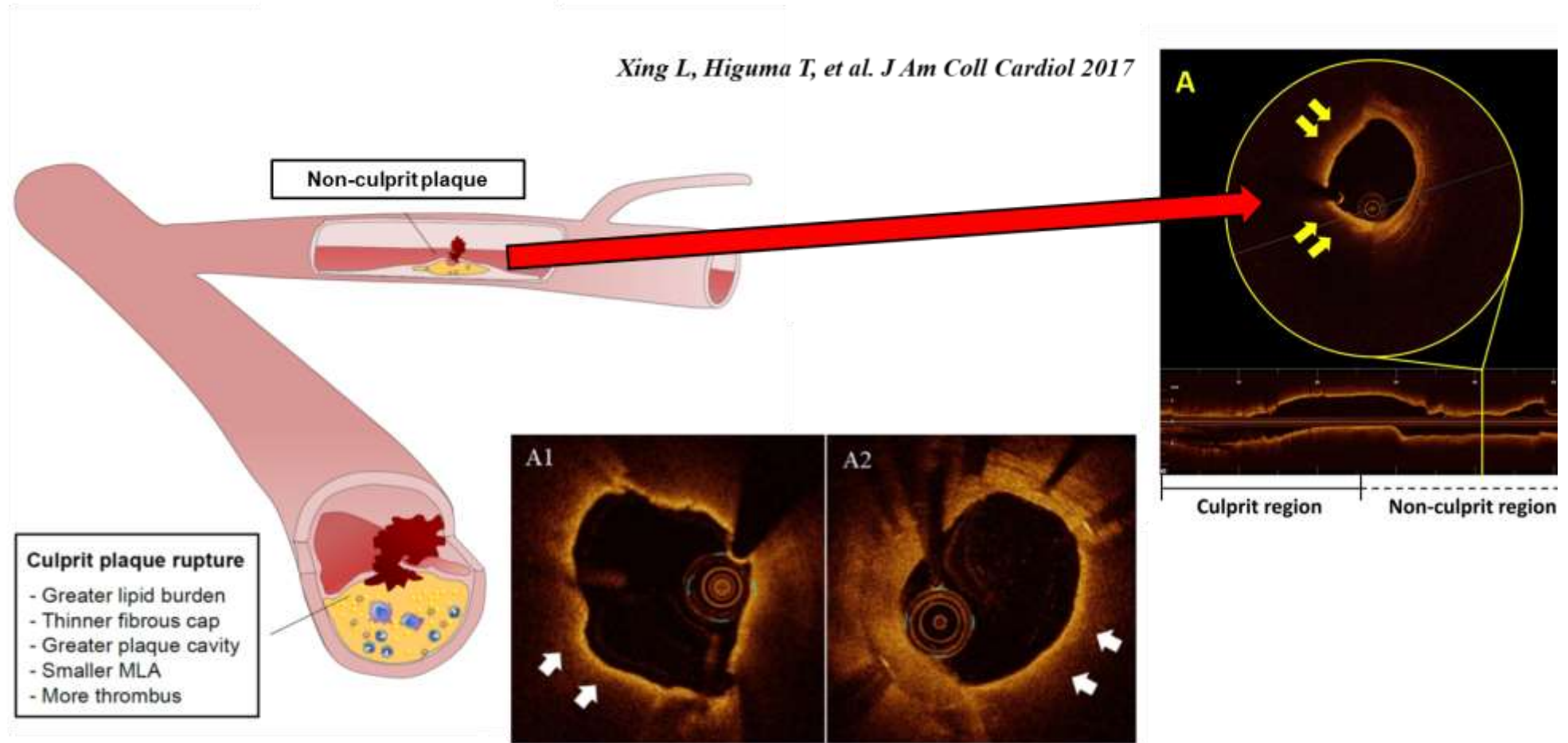


# Case



# Early Intensive Lipid Lowering in the Case of ACS

Both Culprit lesion and Non-culprit lesion cause secondary events in ACS

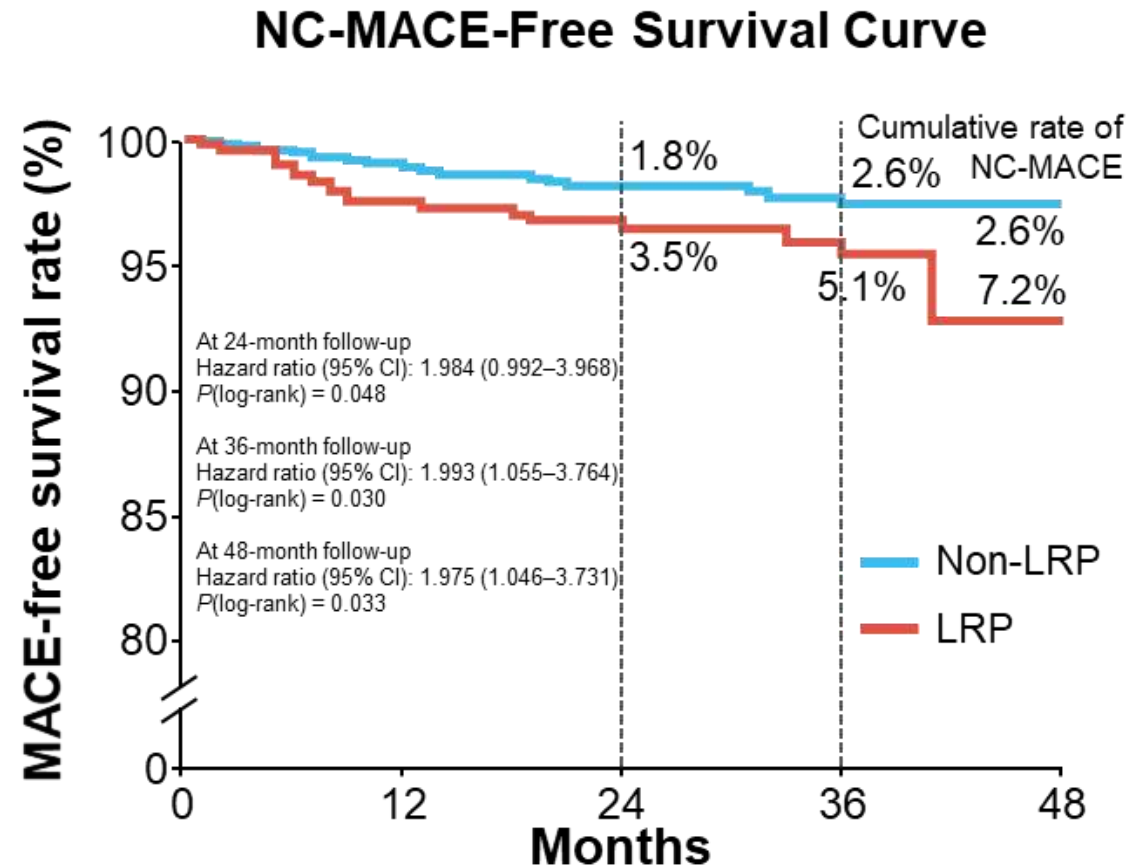
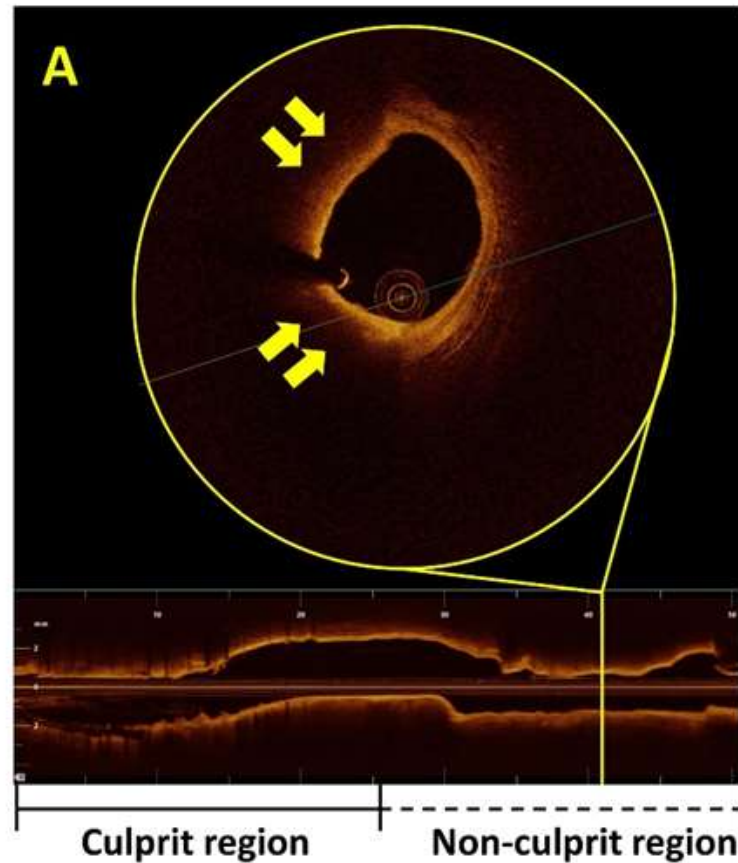


*Velgalle R, Minami Y, et al. ATVB 2017*

*Hoshino M, Yonetsu T, et al. J Cardiol 2019*

# Early Intensive Lipid Lowering in the Case of ACS

Presence of LRP in non-culprit region is an indicator for increased risk of secondary events



CI, confidence interval; MACE, major adverse cardiac events; NC-MACE, non-culprit lesion-related major adverse cardiac events.  
Xing L, et al. *J Am Coll Cardiol.* 2017;69:2502-2513.



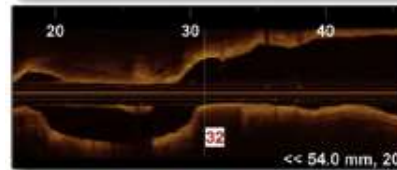
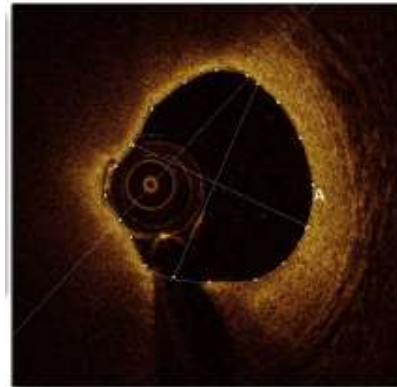
# What Is the Advantage of OCT Usage in the Case of ACS?

OCT provides detailed lesion morphologies because of the higher resolution during the PCI procedure

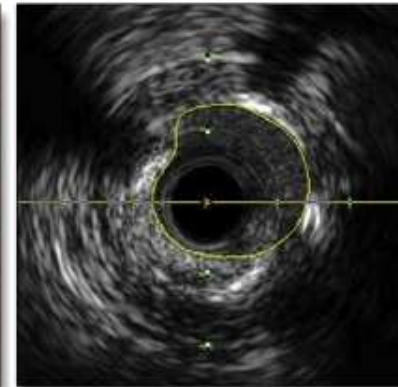
Comparison of IVUS and OCT<sup>1</sup>

	IVUS	TD-OCT	FD-OCT
Energy wave	Ultrasound	Near-infrared	Near-infrared
Wavelength, $\mu\text{m}$	35–80	1.3	1.3
Resolution, axial/lateral, $\mu\text{m}$	100/200	15/90	15/20–40
Frame rate, frames/s	30	16–20	100
Pullback rate, mm/s	0.5–1.0	1–3	20
Axial scans, x1,000		3.2–4.8	5.4
Lines, axial scans/frame		200–400	500
Maximum scan diameter, mm	10	6.8	9.7
Tissue penetration	10	1–2.5	2.0–3.5

FD-OCT<sup>2</sup>



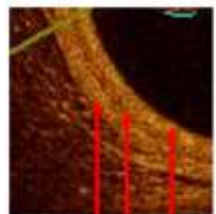
IVUS<sup>2</sup>



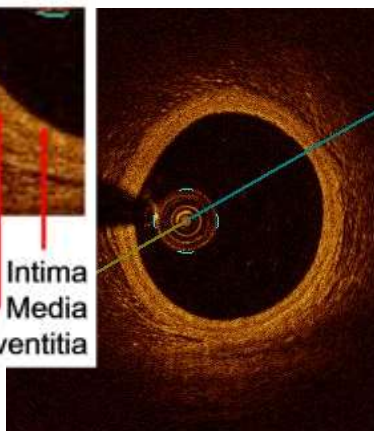
FD-OCT, Fourier domain optical coherence tomography; IVUS, intravascular ultrasound; TD-OCT, time domain optical coherence tomography.

1. Lowe HC, et al. *J Am Coll Cardiovasc Interv.* 2011;4:1257-1270; 2. Kubo T, et al. *J Am Coll Cardiol Img.* 2013;6:1095-1104.

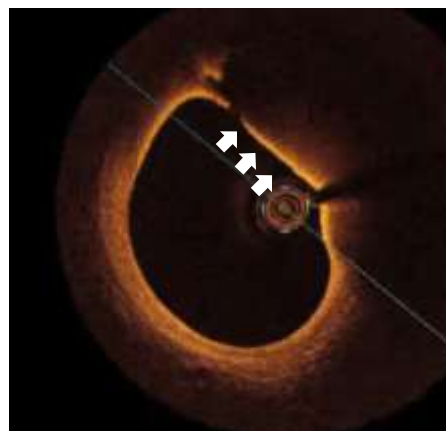
Axial resolution is measured in tissue. Scan diameter is measured in saline for TD-OCT and in contrast medium for FD-OCT. Sources: Schuman et al., Morgensen et al., and Jang, and Lightlab, Westford, MA, USA



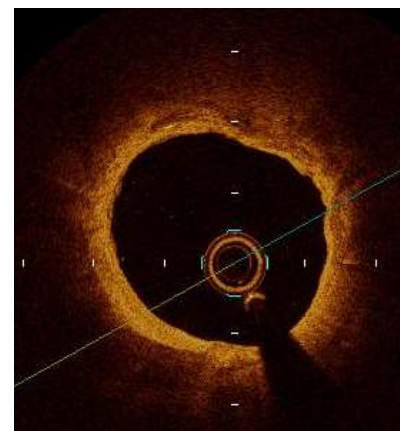
Intima  
Media  
Adventitia



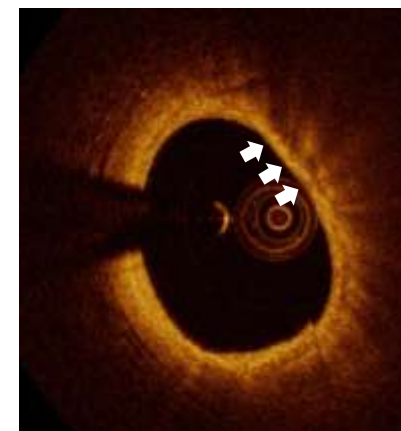
Normal segment



Lipid-rich plaque  
(TCFA: thin-cap fibroatheroma)



Calcification

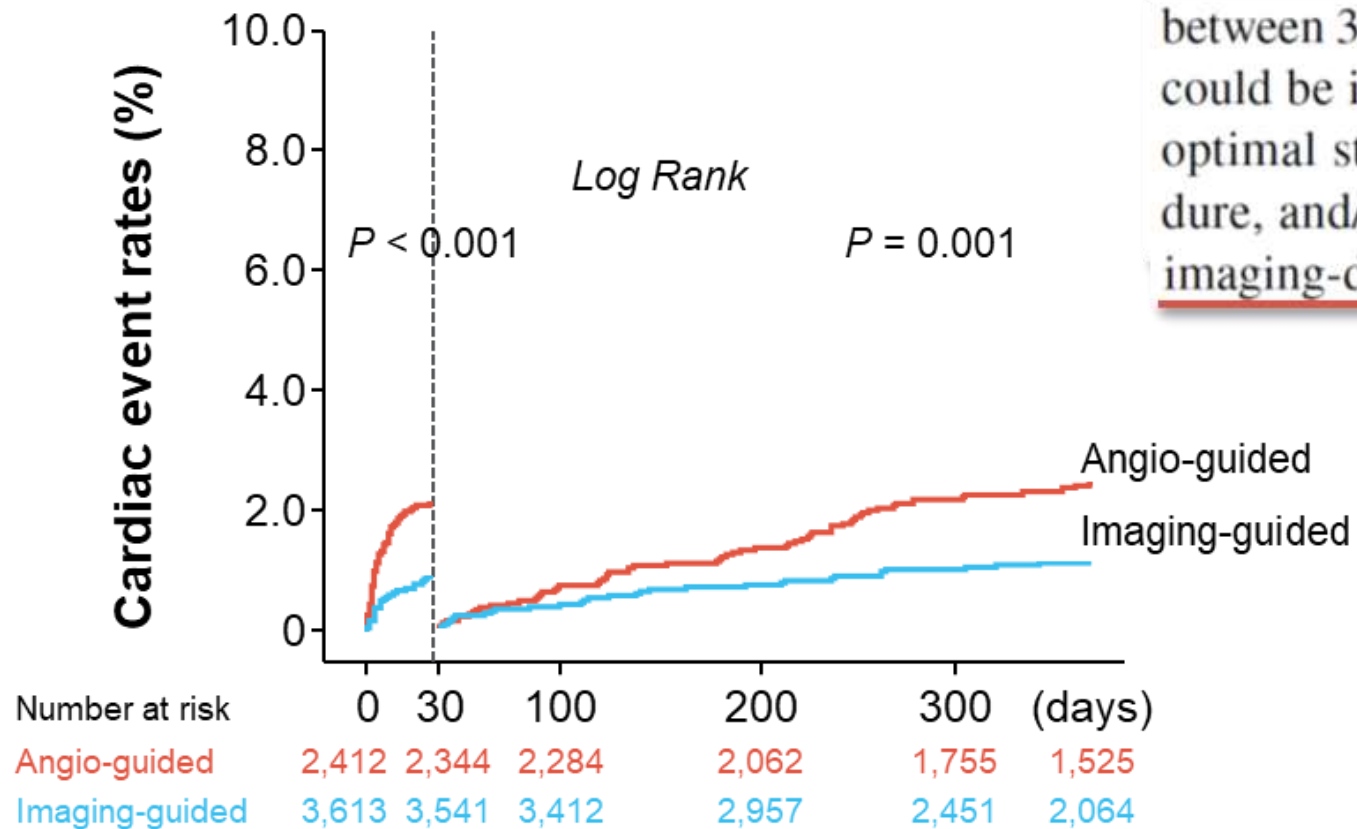


Macrophage



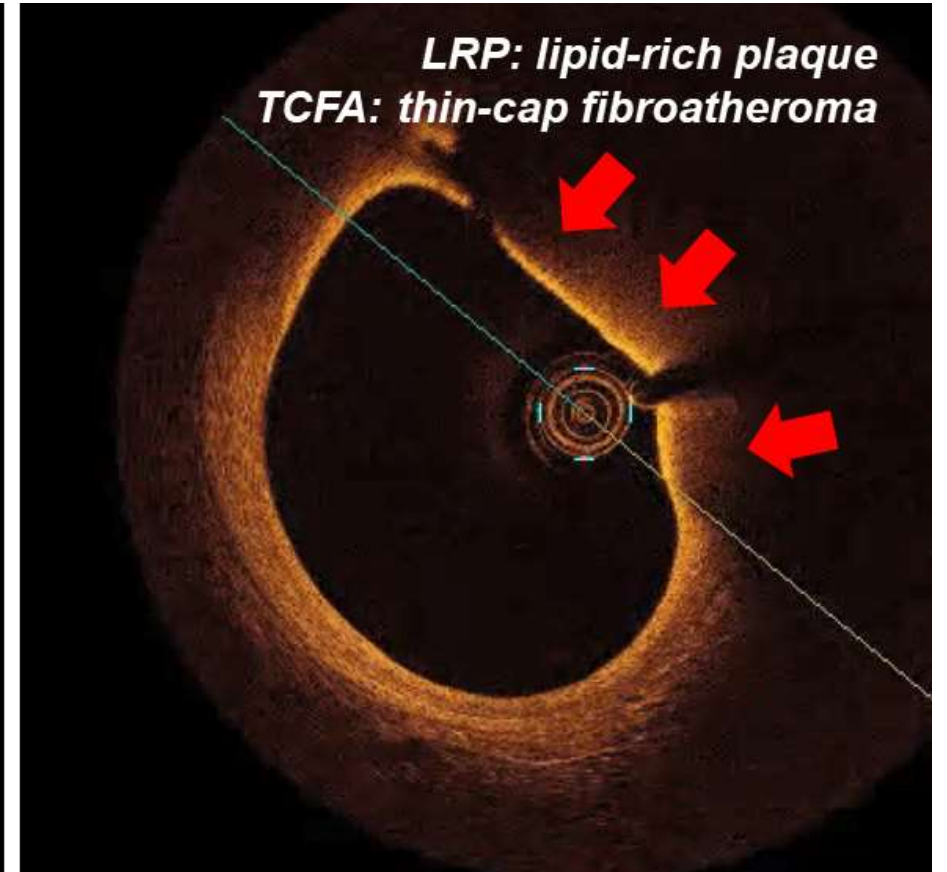
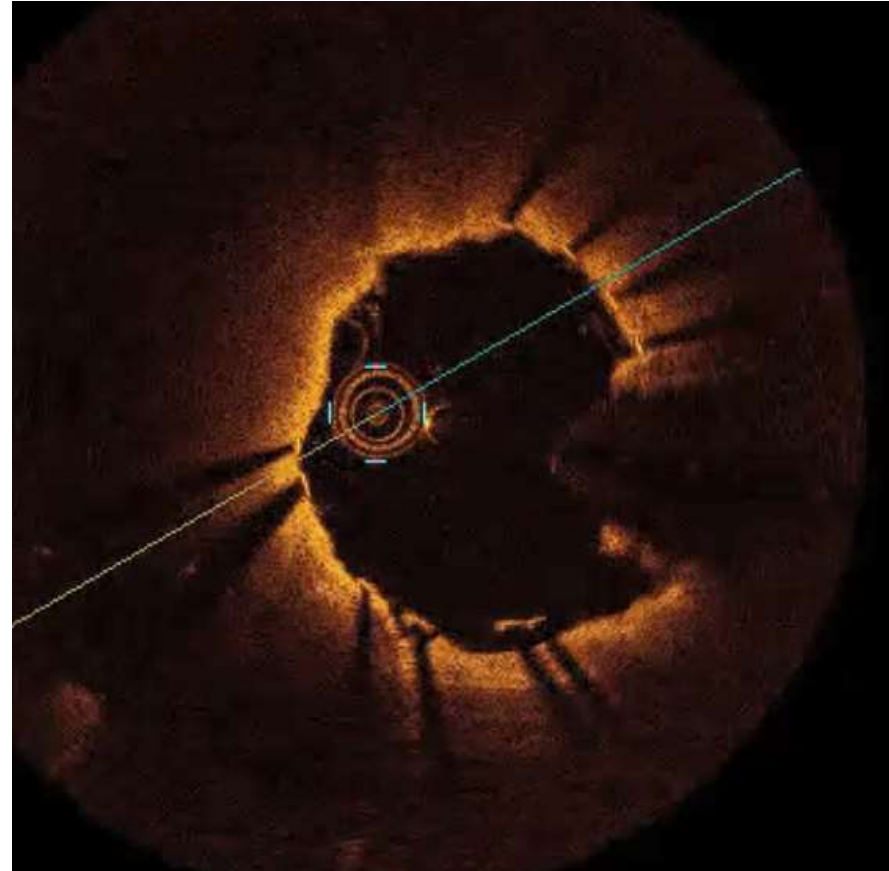
# What Is the Advantage of OCT Usage in the Case of ACS?

Superiority of imaging-guided PCI over angio-guided PCI regarding clinical outcomes has been demonstrated in several studies



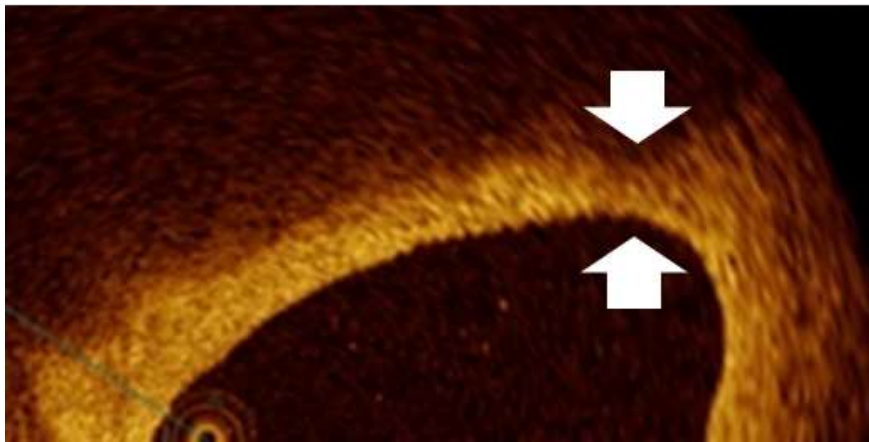
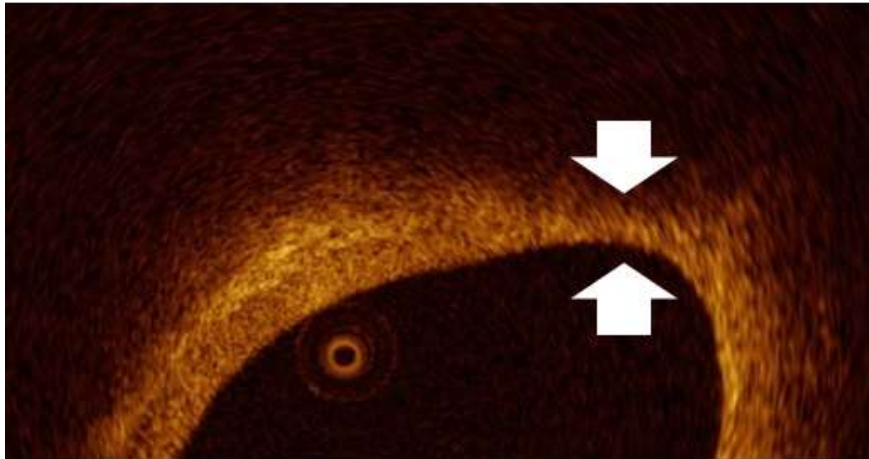
between 30 and 365 days, we could speculate that prognosis could be improved by avoiding late thrombosis because of optimal stent expansion and apposition during the procedure, and/or by aggressive risk reduction therapy through imaging-derived plaque assessment.

# Case

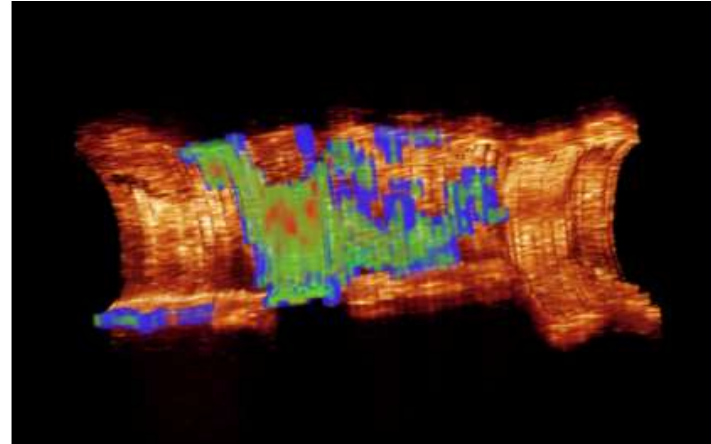


# Early Intensive Lipid Lowering in the Case of ACS

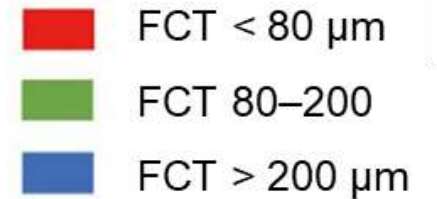
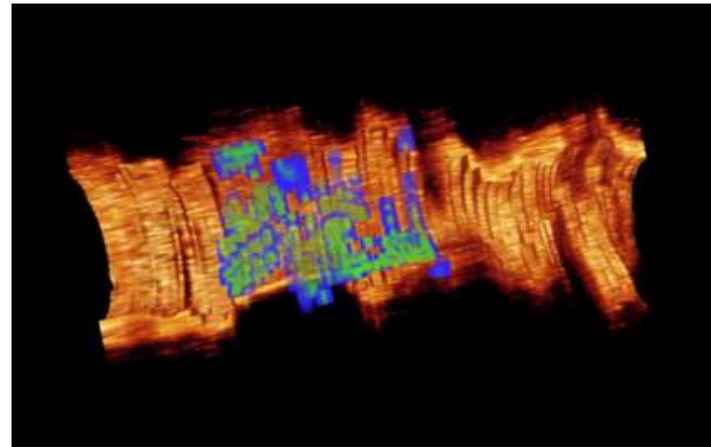
Early intensive lipid-lowering therapy stabilizes LRP



Baseline



Follow-up

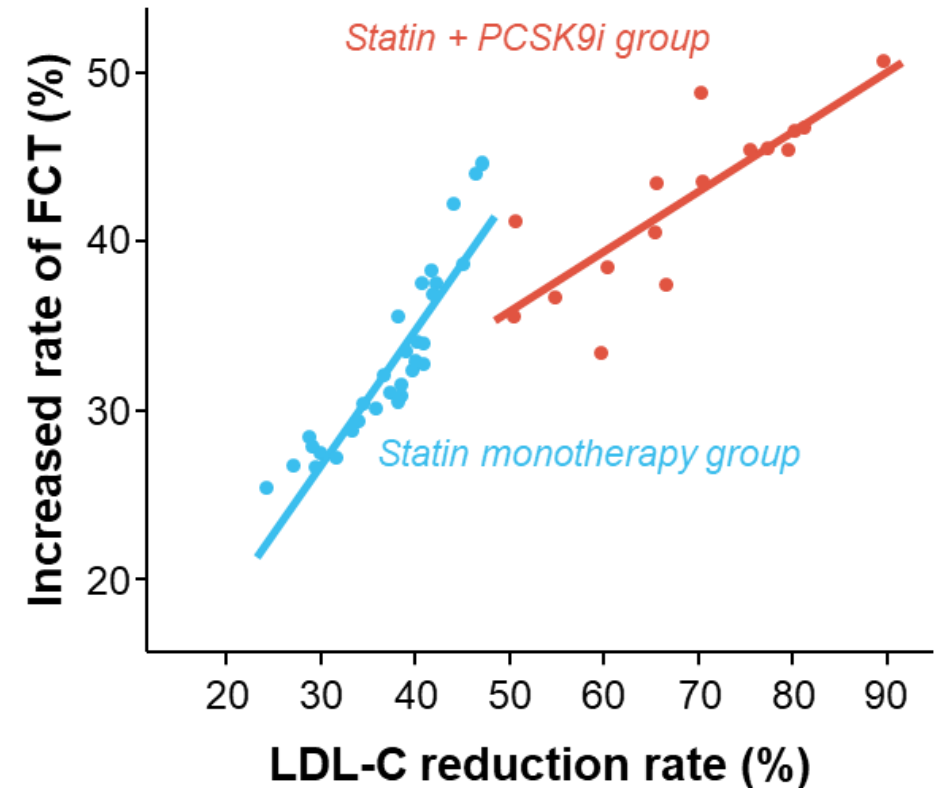
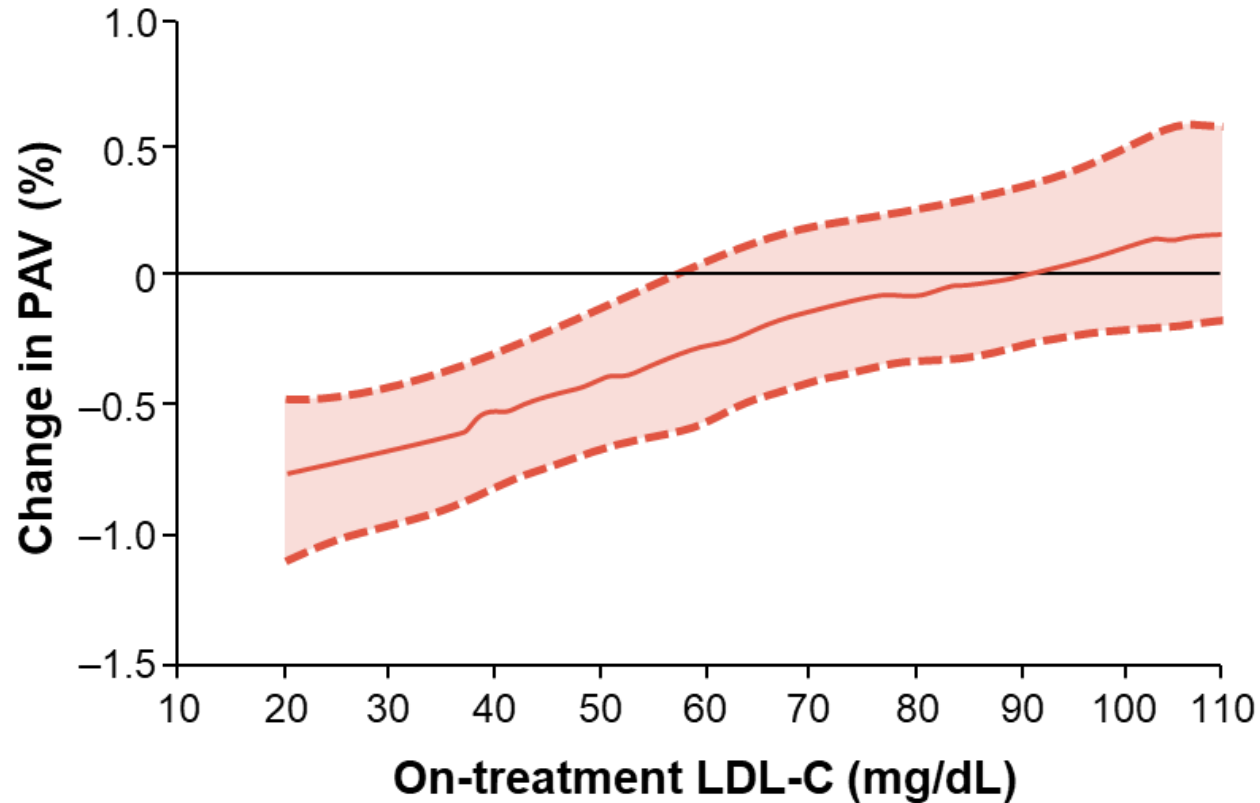


FCT, fibrous cap thickness.

Minami Y, et al. *Am J Cardiol.* 2016;117:1890-1895; Minami Y, et al. *J Am Heart Assoc.* 2017;6:e006241.

# Early Intensive Lipid Lowering in the Case of ACS

Lipid-lowering therapy using PCSK9i stabilizes LRP through the reduction of plaque volume and thickening of the fibrous cap

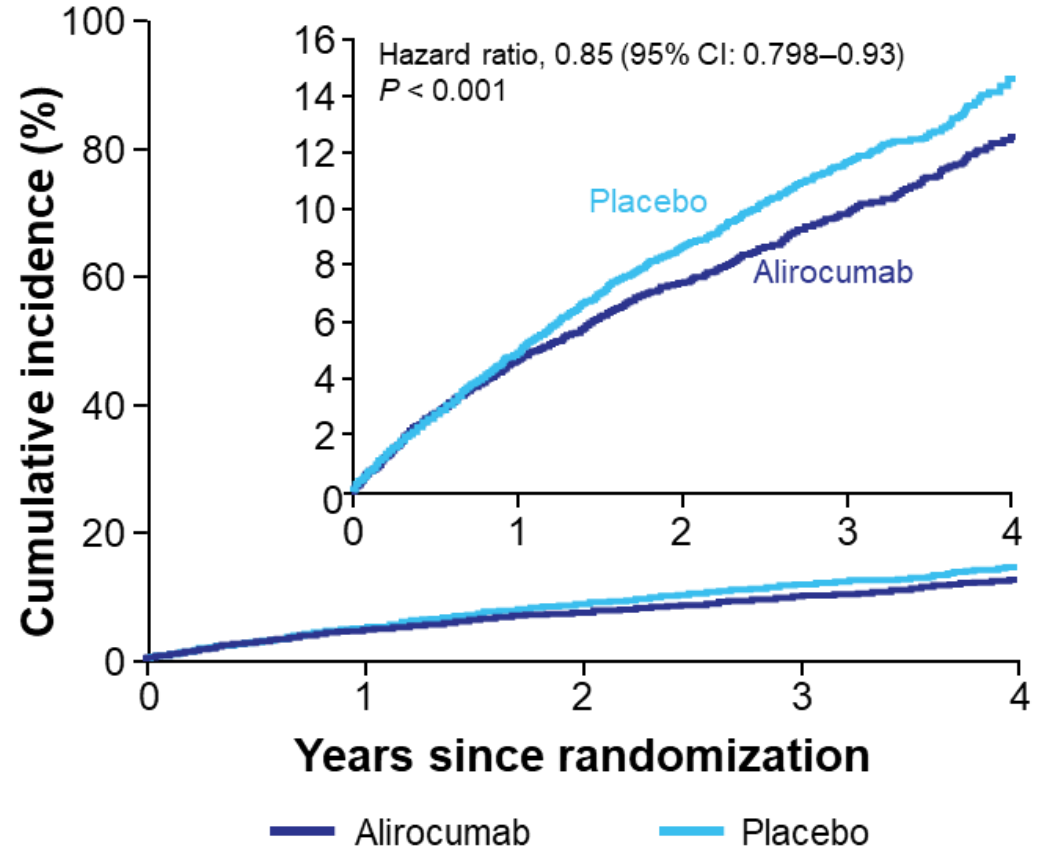
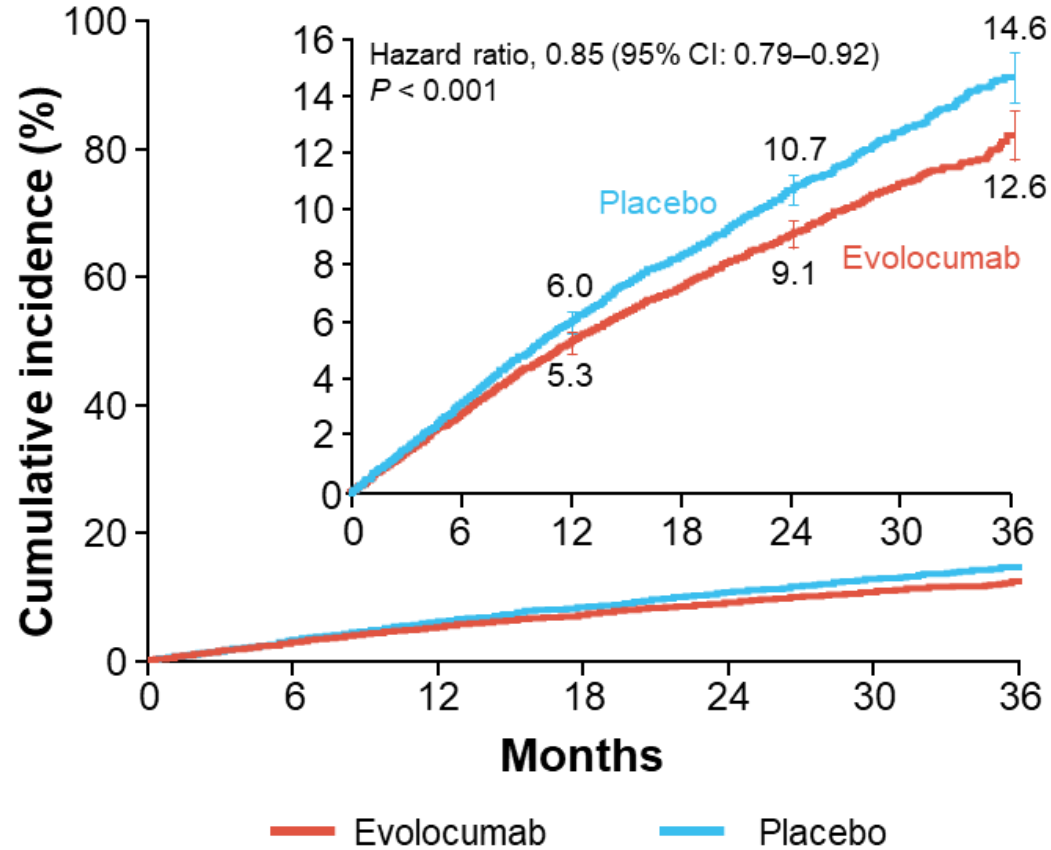


For LDL-C, 1 mmol/L = 38.67 mg/dL.

Nicholls SJ, et al. *JAMA*. 2016;316:2373-2384; Yano H, et al. *J Cardiol*. 2019;75:289-295.

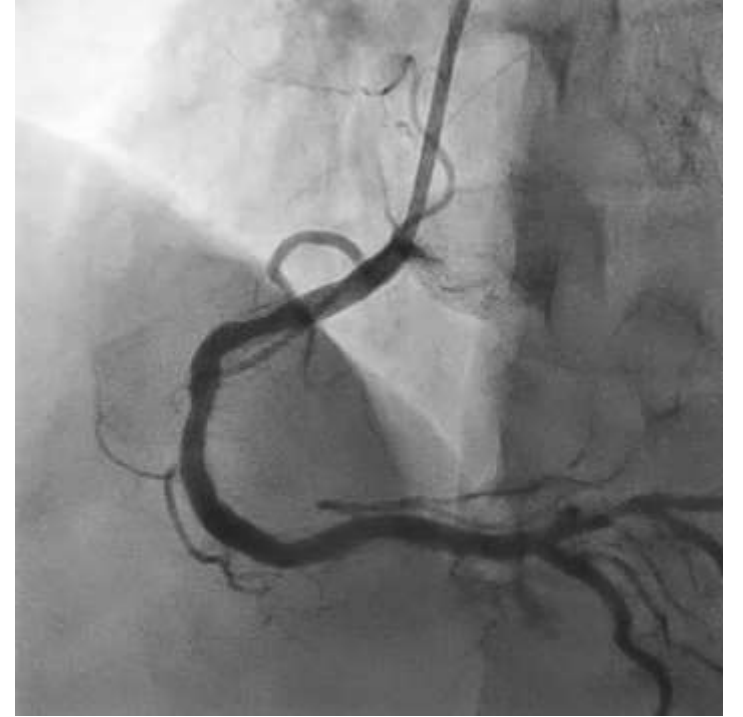
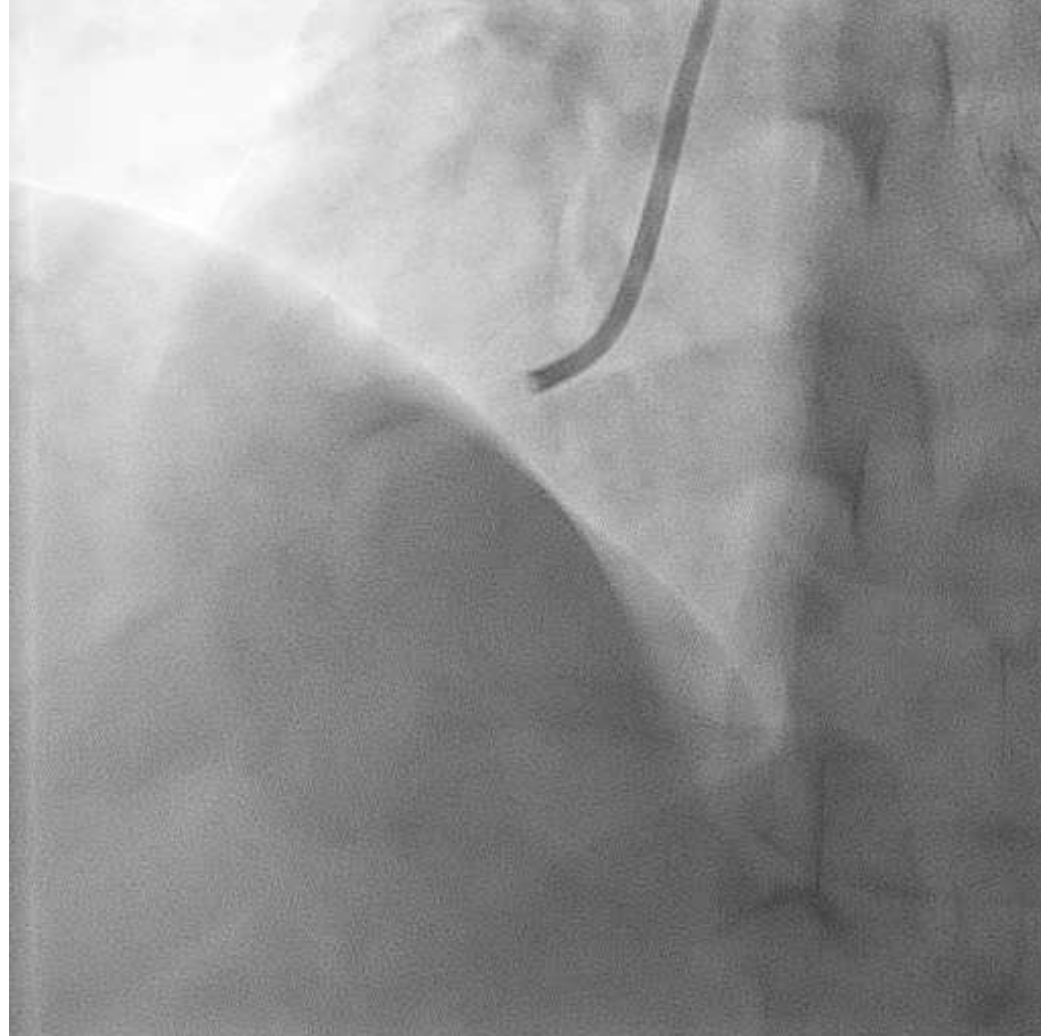
# Clinical Efficacy of PCSK9i

The FOURIER and ODYSSEY OUTCOMES trials have demonstrated 15% risk reduction of CV events in patients with CV disease



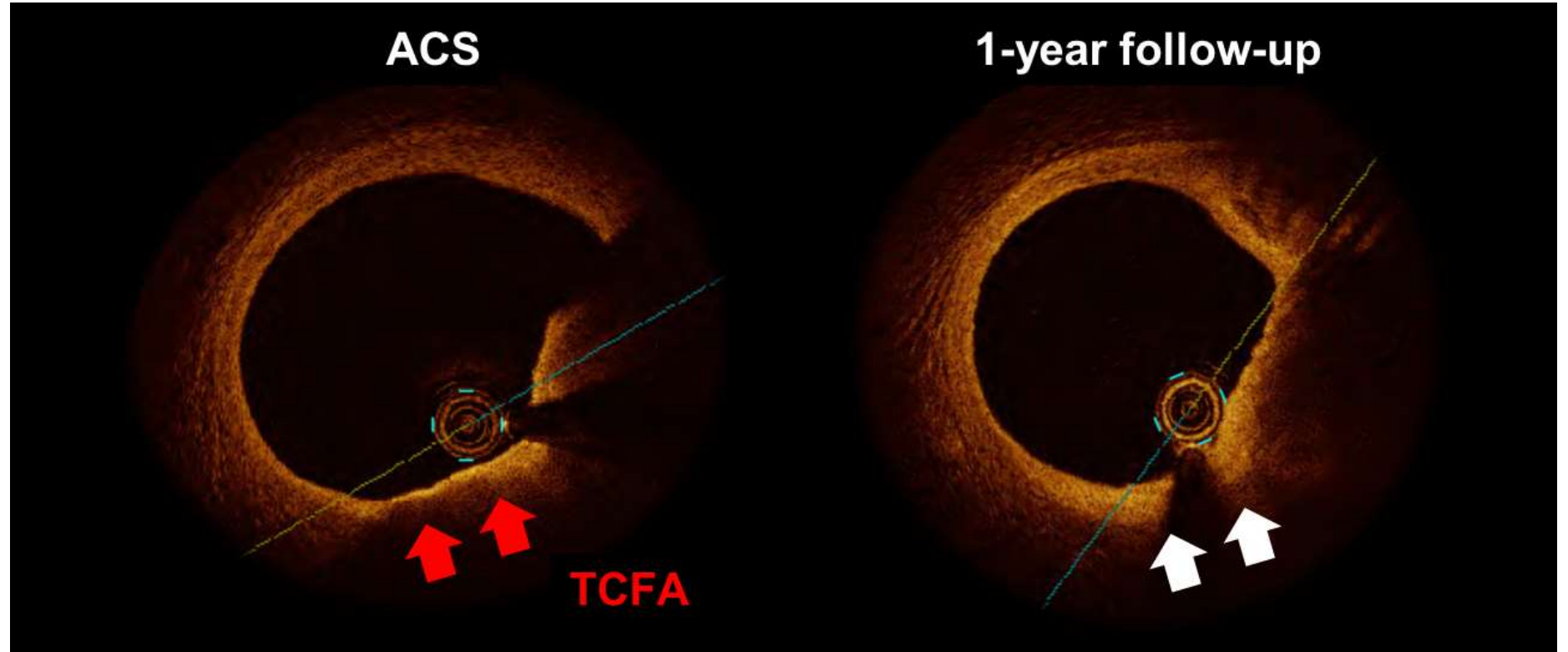


# Case: 1-year follow-up

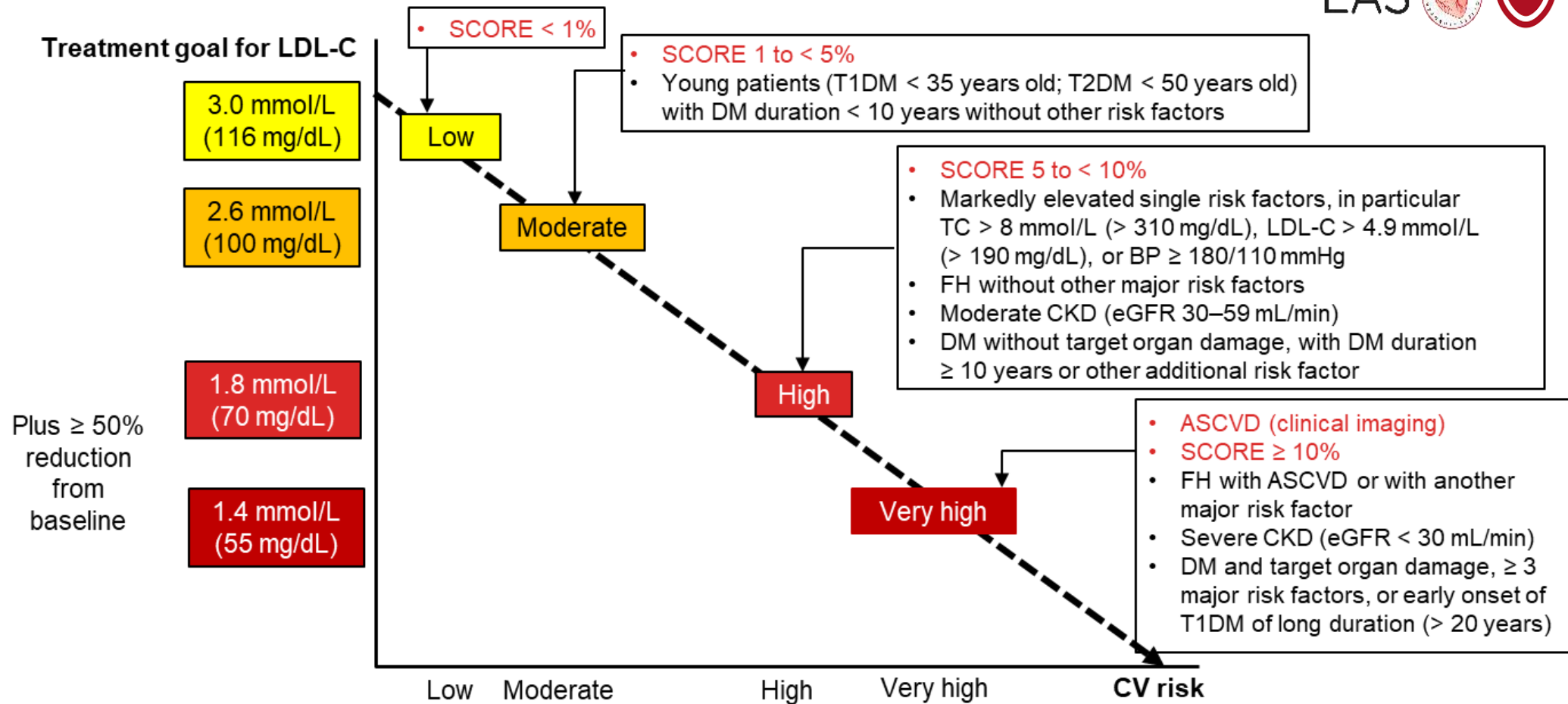




# Case: 1-year follow-up



# Treatment Goals for LDL-C Across Categories of Total CV Disease Risk



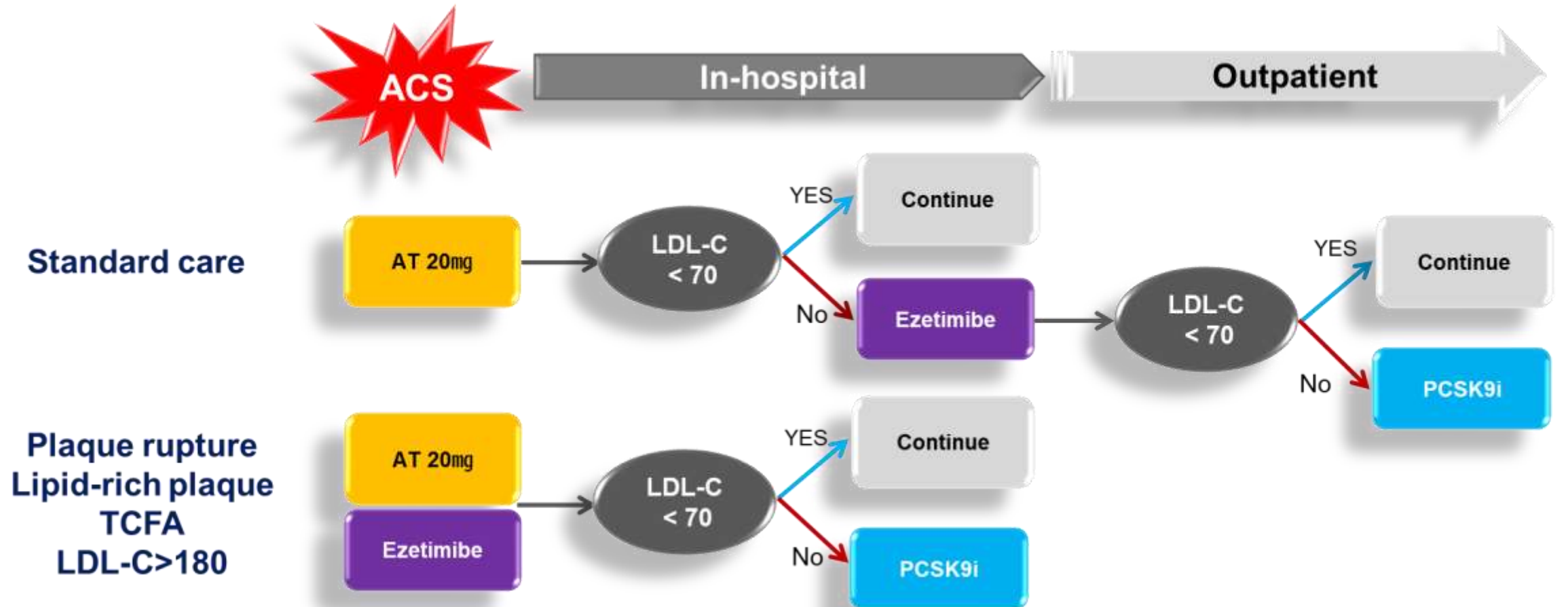
ASCVD, atherosclerotic cardiovascular disease; BP, blood pressure; CKD, chronic kidney disease; DM, diabetes mellitus; FH, familial hypercholesterolemia; SCORE, Systematic Coronary Risk Estimation; T1DM, type 1 diabetes mellitus; T2DM, type 2 diabetes mellitus; TC, total cholesterol.  
Mach F, et al. *Eur Heart J*. 2020;41:111-188.

# Treatment Goals for LDL-C Across Categories of Total CV Disease Risk

Recommendations	Class	Level
In secondary prevention patients at very high risk, an LDL-C reduction of at least 50% from baseline and an LDL-C goal of < 1.4 mmol/L (< 55 mg/dL) are recommended	I	A
For secondary prevention patients at very high risk not achieving their goal on a maximum tolerated dose of <b>statin and ezetimibe</b> , a combination <b>with a PCSK9i</b> is recommended	I	A
If the LDL-C goal is not achieved after <b>4–6 weeks</b> despite maximal tolerated statin therapy and ezetimibe, <b>adding a PCSK9i</b> is recommended	I	B

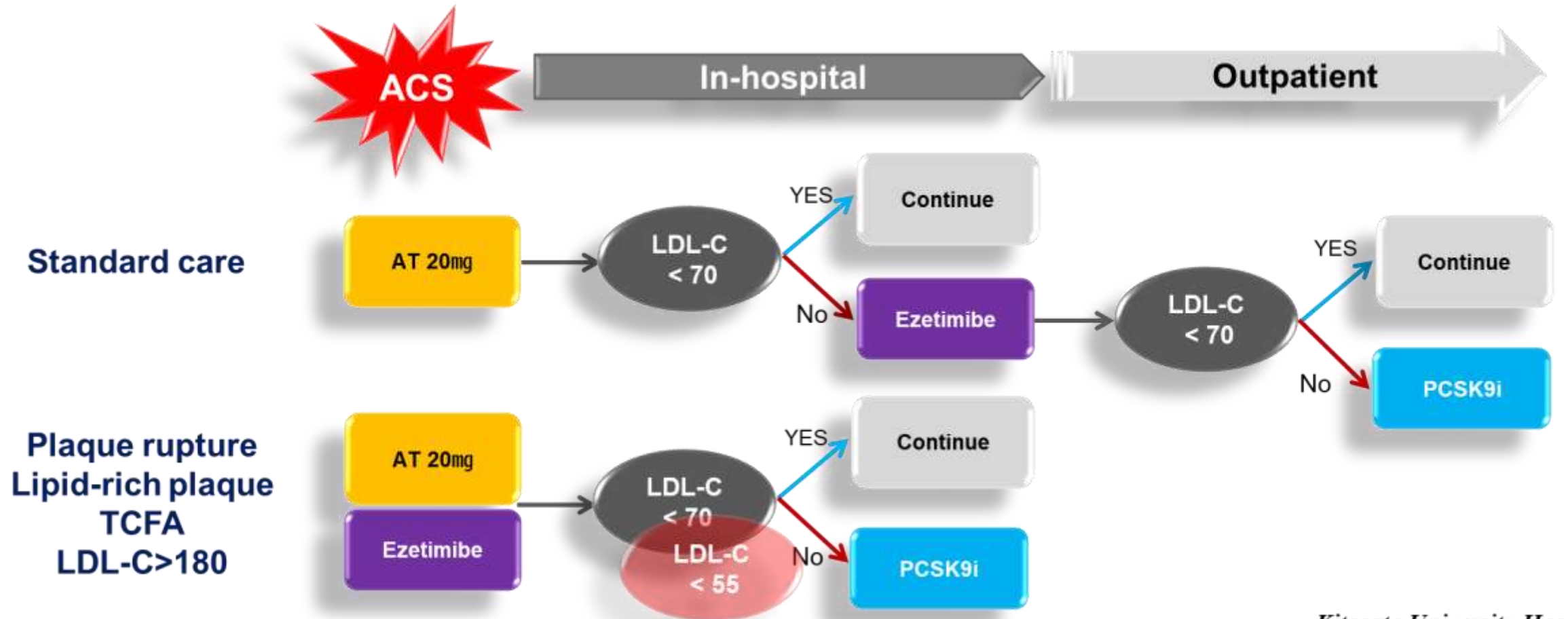
# Intensive Lipid-Lowering Strategy Used in Kitasato University

PCSK9i enables immediate reduction of LDL-C levels in patients with ACS



# Intensive Lipid-Lowering Strategy Used in Kitasato University

PCSK9i enables immediate reduction of LDL-C levels in patients with ACS



# Take home messages

Intensive lipid-lowering therapy including PCSK9i immediately decreases LDL-C levels and stabilizes vulnerable plaques in patients with ACS

Intracoronary imaging may contribute to further risk stratification and optimal lipid-lowering therapy in patients with ACS

Guidelines-based treatment flow charts may contribute to systematic lipid-lowering in patients with ACS