


Images in  
Cardiovascular Medicine



# Rediscover a Missed Culprit Lesion with Optical Coherence Tomography in Acute Coronary Syndrome: a Simple Stationary Pullback Method

Bino John Sahayo, MD<sup>1</sup>, Sundeep Mishra, MD<sup>2</sup>, Sang-Wook Kim , MD, PhD<sup>1</sup>, Arvind Dambalkar, MD<sup>1</sup>, Quang Tan Phan, MD<sup>3</sup>, Hoyoun Won , MD<sup>1</sup>, Jun Hwan Cho, MD<sup>1</sup>, and Wang Soo Lee , MD<sup>1</sup>

<sup>1</sup>Heart Research Institute, College of Medicine, Chung-Ang University Hospital, Seoul, Korea

<sup>2</sup>Department of Cardiology, All India Institute of Medical Science, New Delhi, India

<sup>3</sup>Intervention Center, Quang Nam Central General Hospital, Quang Nam, Vietnam

 OPEN ACCESS

Received: Feb 27, 2020

Revised: May 11, 2020

Accepted: May 28, 2020

Correspondence to

Sang-Wook Kim, MD, PhD

Heart Research Institute, College of Medicine, Chung-Ang University Hospital, 102, Heukseok-ro, Dongjak-gu, Seoul 06973, Korea.  
E-mail: swkimcv@cau.ac.kr

Sundeep Mishra, MD

Department of Cardiology, All India Institute of Medical Sciences, 425, Mount Kailash Tower No. 2, East of Kailash, New Delhi 110065, India.  
E-mail: drsundeepmishra@hotmail.com


Copyright © 2020. The Korean Society of Cardiology

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<https://creativecommons.org/licenses/by-nc/4.0>) which permits unrestricted noncommercial use, distribution, and reproduction in any medium, provided the original work is properly cited.


ORCID iDs

Sang-Wook Kim 

<https://orcid.org/0000-0002-7208-8596>

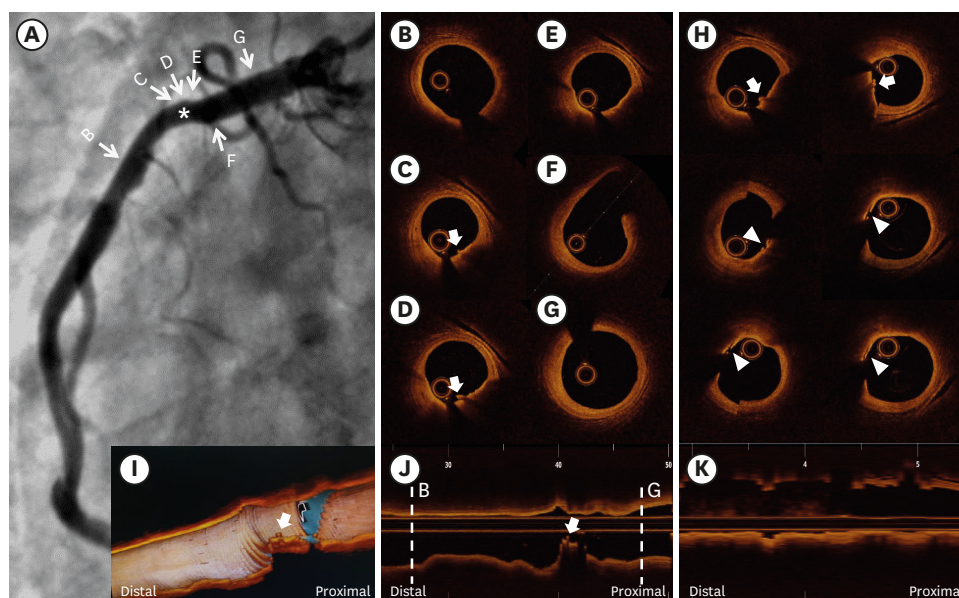
Hoyoun Won 

<https://orcid.org/0000-0002-5375-3159>

Wang Soo Lee 

<https://orcid.org/0000-0002-8264-0866>

A 54-year-old male was admitted to the hospital due to severe chest pain. He suffered from diabetes mellitus for 20 years and was an ex-smoker. The 12 leads electrocardiography showed ST-segment elevation in inferior leads. High sensitivity troponin level was elevated, and underwent coronary angiography. The echocardiogram showed basal inferior hypokinesia with normal left ventricular systolic function. The coronary angiography demonstrated an insignificant stenosis with vague plaque ulceration at the proximal portion of right coronary artery (**Figure 1A**, asterisk). The automatic motorized pullback of optical coherence tomography (OCT) was performed at 10 mm/sec with simultaneous injection of a



**Figure 1.** (A) Diagnostic CAG showed an insignificant stenosis with vague plaque ulceration in the proximal RCA (asterisk). (B-G) Cross-sectional OCT imaging with the conventional pullback showing a white thrombus without any evidence of plaque disruption (arrow). (H) Cross-sectional OCT imaging of the ROI showing a white thrombus (arrow) and tiny plaque rupture (arrowheads). (I) Three-dimensional OCT imaging demonstrating a white thrombus (arrow). (J) Longitudinal OCT imaging of the conventional pullback showing a white thrombus (arrow). (K) Longitudinal OCT imaging using the stationary pullback. CAG = coronary angiography; OCT = optical coherence tomography; RCA = right coronary artery; ROI = region of interest.

**Funding**

This research was supported by the Chung-Ang University Research Grants in 2019.

**Conflict of Interest**

The authors have no financial conflicts of interest.

**Author Contributions**

Conceptualization: Dambalkar A; Investigation: Phan QT, Cho JH; Methodology: Kim SW; Project administration: Lee WS; Supervision: Mishra S; Validation: Won H; Writing - original draft: Sahayo BJ; Writing - review & editing: Kim SW.

contrast solution before the stationary imaging (SI). The minimal lumen area of the culprit lesion was measured 4.67 mm<sup>2</sup>. While a white thrombus was shown without any plaque disruption in the conventional pullback (**Figure 1B-J, Supplementary Video 1**), however a tiny plaque rupture (arrowhead) with the white thrombus (arrow) was clearly visible in SI (**Figure 1H, Supplementary Video 2**). The imaging duration was 6 seconds with 20/sec of frame rate without pulling the optical lens back in SI, however the location of an optical lens could be adjusted manually. Although the optical lens was moving by cardiac cycle and respiration, the number of acquired images (120 frames) for the region of interest was higher than with the automatic pullback (10 frames/mm). OCT is recognized as a promising, high-resolution imaging tool in coronary intervention.<sup>1-3)</sup> However, it often missed the target lesion unexpectedly because of a limited frame of the acquired images and cardiac motion.

## SUPPLEMENTARY MATERIALS

**Supplementary Video 1**

Pre-interventional OCT with conventional motorized pullback.

[Click here to view](#)

**Supplementary Video 2**

Pre-interventional OCT with stationary pullback.

[Click here to view](#)

## REFERENCES

1. Jang IK, Tearney GJ, MacNeill B, et al. In vivo characterization of coronary atherosclerotic plaque by use of optical coherence tomography. *Circulation* 2005;111:1551-5.  
[PUBMED](#) | [CROSSREF](#)
2. Kubo T, Imanishi T, Takarada S, et al. Assessment of culprit lesion morphology in acute myocardial infarction: ability of optical coherence tomography compared with intravascular ultrasound and coronary angiography. *J Am Coll Cardiol* 2007;50:933-9.  
[PUBMED](#) | [CROSSREF](#)
3. Kwon JE, Lee WS, Mintz GS, et al. Multimodality intravascular imaging assessment of plaque erosion versus plaque rupture in patients with acute coronary syndrome. *Korean Circ J* 2016;46:499-506.  
[PUBMED](#) | [CROSSREF](#)