

Honeycomb-like structure in spontaneous recanalized coronary thrombus demonstrated by serial angiograms: a case report

Mitsuru Kahata *, Natsuko Satomi, Masato Otsuka, and Yasuhiro Ishii

Department of Cardiology, Cardiovascular Center, Ogikubo Hospital, 3-1-24, Imagawa, Suginami-ku, Tokyo 167-0035, Japan

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Background

The honeycomb-like structure (HLS) is a rare cause of myocardial ischaemia characterized by multiple communicating channels divided by thin septa. The aetiology of this specific structure remains speculative.

Case summary

A 55-year-old man was admitted due to worsening effort angina during the previous 2 months. Diagnostic coronary angiography revealed occlusion of the distal right coronary artery (RCA) with good collateral flow from the left coronary artery. We considered this lesion as a recent total occlusion, and planned a percutaneous coronary intervention (PCI). At the time of PCI, 7 days after admission, an angiogram showed a spontaneous recanalization of the occlusive RCA. Intravascular ultrasound (IVUS) depicted a HLS at the recanalized lesion, including atherosclerotic stenosis. We managed these lesions with drug-eluting stents.

Discussion

A recanalized thrombus may manifest as a HLS. In this case, the patient suffered from worsening effort angina during the previous 2 months, we confirmed a spontaneous recanalization of the occluded coronary lesion by serial angiographic images, and observed HLS adjacent to the atherosclerotic attenuated plaque by using high-resolution IVUS. Recanalized organizing thrombus is considered an entity of HLS. However, all previous studies on the HLS *in vivo* have detected the structure in an already recanalized state. Therefore, the aetiology remained speculative and evidence has been indirect. This present case demonstrates that recanalized atherosclerotic thrombosis might be one of the causes of HLS.

Keywords

Honeycomb-like structure • Recanalized thrombus • Atherosclerotic plaque • Myocardial ischaemia • Case report

Learning points

- The aetiology of the honeycomb-like structure (HLS) remains speculative.
- Honeycomb-like structure may be observed after spontaneous recanalization of thrombotic lesions.
- High-resolution intracoronary imaging modalities including optical coherence tomography and 60 MHz intravascular ultrasound are the suitable tools for diagnosing HLS.

* Corresponding author. Tel: +81 3 3399 1101, Fax: +81 3 3399 1107, Email: mtr.kht@hotmail.co.jp

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Introduction

The honeycomb-like structure (HLS) is a rare cause of myocardial ischaemia characterized by multiple communicating channels divided by thin septa, which can be detected on high-resolution intracoronary imaging, such as high-resolution intravascular ultrasound (HR-IVUS) and optical coherence tomography (OCT).^{1,2} Angiographically, the structure has a fuzzy and hazy appearance often without significant stenosis. Recanalization of a thrombus generated secondary to plaque rupture, plaque erosion, embolism, or vasculitides such as Kawasaki disease is the presumed pathogenesis of HLS.^{3–6} However, the aetiology has remained speculative because in all previous studies on HLS, the structure was detected in an already recanalized state. Accordingly, we present a case of HLS observed in a recanalizing thrombus confirmed by serial angiographic images.

Timeline

Two months before	The patient suffered worsening effort angina
Day 0	The patient underwent diagnostic coronary angiogram that revealed occlusion of the distal right coronary artery (RCA) with good collateral flow from the left coronary artery
Day 7	Coronary angiogram at the time of planned percutaneous coronary intervention revealed spontaneous recanalization of the occluded RCA
After 6 months	No cardiovascular events had occurred

Case presentation

A 55-year-old man with a coronary risk factor of diabetes mellitus was admitted due to worsening effort angina during the previous 2 months. Physical examination on admission revealed normal blood pressure (119/78 mmHg) with normal heart rate (69 b.p.m.). There were no abnormalities detected on electrocardiogram, echocardiogram, and in cardiac enzyme levels. Coronary angiography revealed occlusion of the distal right coronary artery (RCA), with good collateral flow from the left coronary artery (*Figure 1A and B*, arrows). We considered this lesion as a recent total occlusion, and planned a percutaneous coronary intervention (PCI) 7 days after admission. We administered dual antiplatelet therapy with a maintenance dose of aspirin and prasugrel. At the time of PCI, the initial angiogram showed spontaneous recanalization of the occlusive RCA with thrombolysis in myocardial infarction (TIMI) flow grade 2 (*Figure 2A*). The guide wire passed smoothly, and 60 MHz HR-IVUS (Altaview™, Terumo, Tokyo, Japan) depicted multiple channels divided by iso-echoic thin septa (*Figure 2a and b*), identified as a HLS, adjacent to the culprit atherosclerotic attenuated plaque (*Figure 2c*). After pre-dilatation, slow

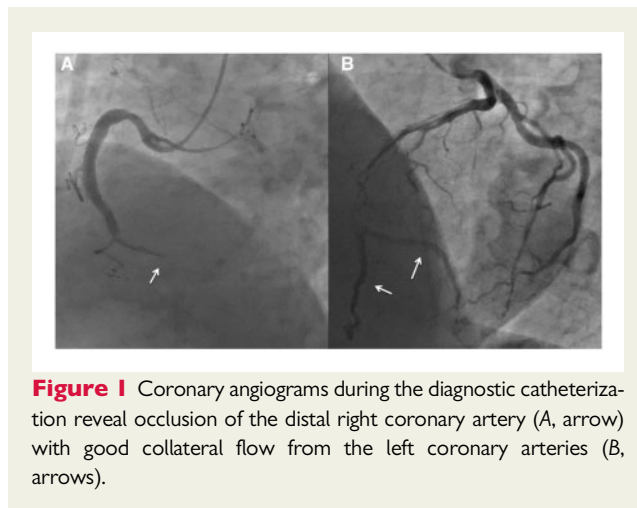


Figure 1 Coronary angiograms during the diagnostic catheterization reveal occlusion of the distal right coronary artery (A, arrow) with good collateral flow from the left coronary arteries (B, arrows).

flow phenomenon occurred, leading to ST-segment elevation, which was improved by the intracoronary administration of nicorandil. We deployed two drug-eluting stents and the procedure was completed with final TIMI flow grade 3 (*Figure 3*). The post-procedural clinical course was uneventful with no further cardiac events at 6 months follow-up.

Discussion

A recanalized thrombus may manifest as a HLS. In the present case, the patient suffered from worsening effort angina during the previous 2 months. We confirmed spontaneous recanalization of the occluded coronary lesion by serial angiographic images and observed a HLS adjacent to the atherosclerotic attenuated plaque by using HR-IVUS. Based on the findings of previous *in vivo* and *ex vivo* histopathological studies,^{7,8} we considered that the recanalization of an organizing thrombus must be an entity of that specific structure. However, to the best of our knowledge, all previous reports on HLS *in vivo* detected the structure in an already recanalized state. Therefore, the aetiologies, such as thrombosis, embolism, and erosion, remained speculative and the evidence was indirect. The present case demonstrated that recanalized atherosclerotic thrombosis might be one of the causes of HLS.

Optical coherence tomography, with its high spatial resolution, is thought to be a powerful tool for depicting and diagnosing such a complicated intracoronary structure. On the other hand, deeper penetration of ultrasound in IVUS allows visualization of underlying vessel structure. Although it may be difficult for conventional 40–45 MHz IVUS to depict HLS precisely, in the present case, 60 MHz HR-IVUS successfully depicted HLS (see [Supplementary material online](#)). Therefore, we could easily recognize two different characteristic intracoronary structures, the HLS and the attenuated plaque, which made the PCI straightforward under HR-IVUS guidance. Recently, a new technology of polarization-sensitive optical frequency domain imaging (OFDI), which measures birefringence and depolarization in tissue together with conventional cross-sectional OFDI images, was advocated to have a potential ability for providing compositional information of atherosclerosis.⁹ Using this new technology, Laurens et al.¹⁰ reported that high birefringence signals were

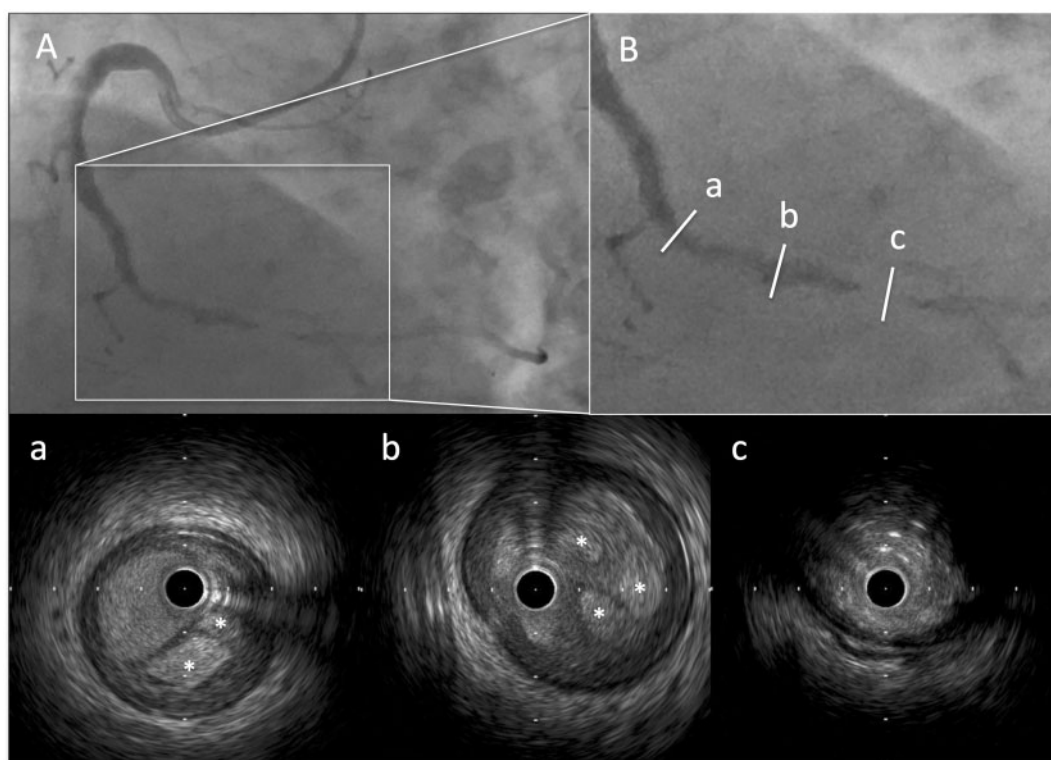


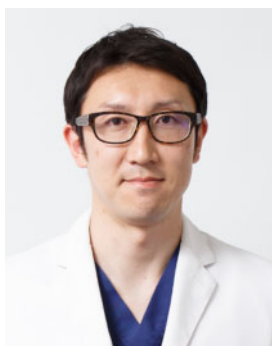
Figure 2 Coronary angiogram and intravascular ultrasound images 7 days later show spontaneous recanalization of the right coronary artery (A). Magnified view (B) of the recanalized lesion shows irregular, hazy, and tight stenosis just proximal to the crux. Intravascular ultrasound images (a and b) show multiple small channels (*) divided by iso-echoic homogeneous septa like structures adjacent to partially calcified and attenuated atherosclerotic stenosis (c).

obtained in the septa of HLS that suggested the presence of collagen and smooth muscle cells, which was consistent with the histopathological assessment of an organized thrombus.¹¹

Conclusion

Recanalization of thrombotic occlusion secondary to atherosclerotic stenosis may manifest as a HLS. More research is needed to clarify the other presumed aetiologies.

Lead author biography



Mitsuru Kahata is a cardiologist and specialist for complex cardiovascular intervention including chronic total occlusion. He is interested in general cardiology, heart failure, arrhythmia, intracoronary imaging, coronary physiology, and peripheral artery disease, currently working at Ogikubo Hospital in the Cardiovascular Center, Tokyo. He and his colleague are fighting for

patients with COVID-19, and empathizing with healthcare professionals all around the world who are working at the expense of oneself.

Supplementary material

[Supplementary material](#) is available at *European Heart Journal - Case Reports* online.

Slide sets: A fully edited slide set detailing this case and suitable for local presentation is available online as [Supplementary data](#).

Consent: The author/s confirm that written consent for submission and publication of this case report including image(s) and associated text has been obtained from the patient in line with COPE guidance.

Conflict of interest: none declared.

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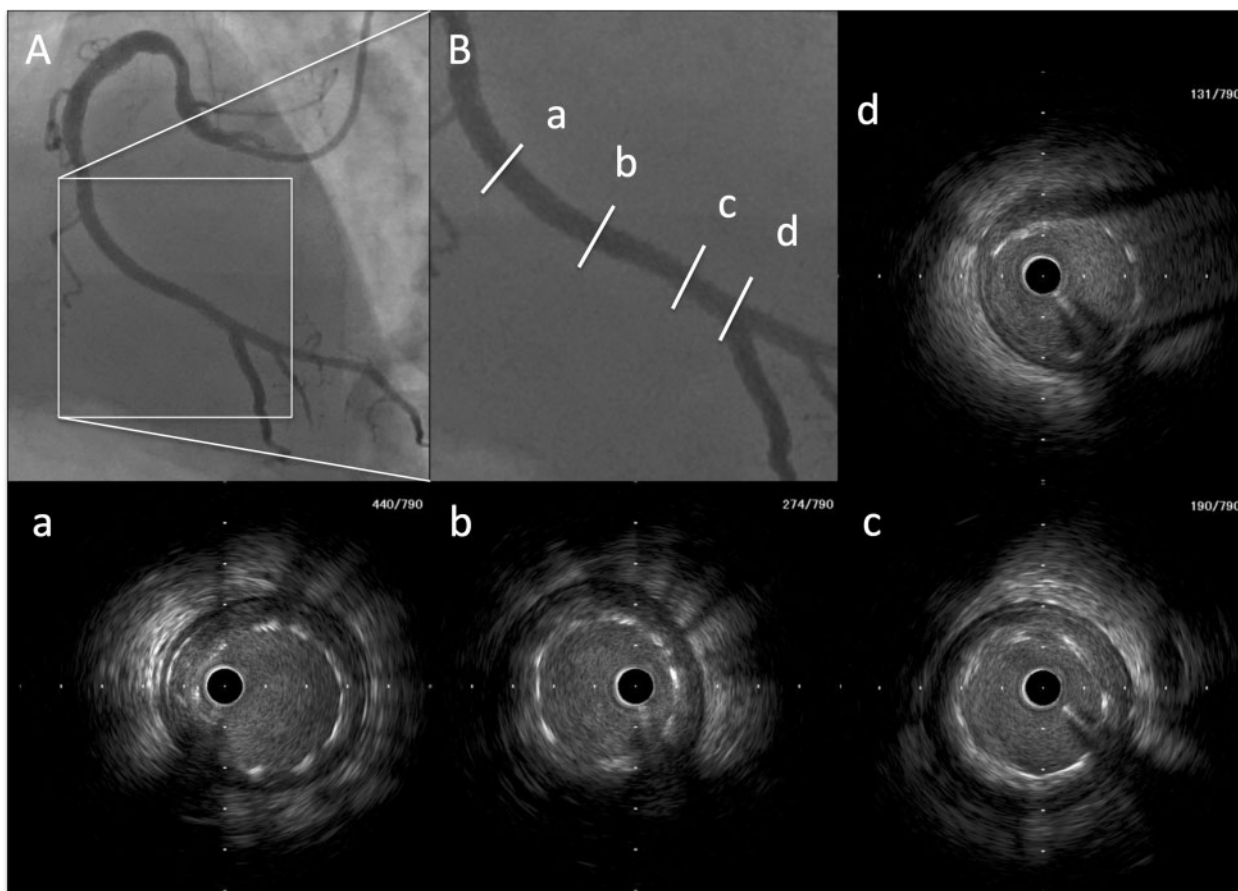


Figure 3 Thrombolysis in myocardial infarction flow grade 3 was achieved (A and B) after the percutaneous coronary intervention. Intravascular ultrasound images (a–d) show good expansion of drug-eluting stents without major protrusion.

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