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Image of the Issue

Direct comparison of optical coherence tomography and high-definition 60-MHz intravascular ultrasound imaging of intra-procedural stent thrombosis in a patient with acute coronary syndrome

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ABSTRACT

An 80-year-old man with ST-segment elevation myocardial infraction underwent coronary stenting using an everolimus-eluting stent, which resulted in a good coronary flow with no residual stenosis. However, 10 min after final coronary angiography, the patient complained of chest discomfort and the ECG again showed ST elevation. Repeat coronary angiography revealed multiple contrast filling defects in the stent. High-definition 60-MHz intravascular ultrasound (IVUS) examination showed multiple low echoic structures inside the stent, though its visualization was not clear. We also conducted optical coherence tomography (OCT) for further investigation, which clearly delineated the outline of the thrombus. An additional balloon dilatation was performed at the site of the stented lesion, and the patient's chest discomfort was relieved, and the ECG was normalized. The clinical implication of this case is that very early phase of intra-stent thrombus is low-density and coarse, and its visualization is better in OCT than in high-definition 60 MHz IVUS.

An 80-year-old man was brought to the emergency department because of sudden onset of chest pain. The electrocardiogram (ECG) showed complete atrioventricular block and ST elevation in leads II, III, and aVF, suggesting acute inferior myocardial infarction. He was given aspirin (200 mg), prasugrel (20 mg), and unfractionated heparin (8000 units) prior to emergency coronary angiography. During the procedure, activated clotting time was monitored every 30 min (286 and 257 s, 50 and 80 min after its start, respectively). The angiogram demonstrated a severe stenosis with delayed antegrade flow in the proximal right coronary artery (Fig. 1A). After crossing a 0.014″ guidewire, a manual aspiration thrombectomy was conducted and a small amount of red thrombus was aspirated. After observing the lesion with high-definition 60-MHz intravascular ultrasound (IVUS) (AltaView, Terumo, Tokyo, Japan), a 3.5-mm × 23-mm everolimus-eluting stent was implanted, and post-dilatation was performed using a 4.0-mm noncompliant balloon at 20 atm. IVUS examination demonstrated well-apposed stent struts with no remarkable tissue protrusion inside the stent (Video 1). Right coronary artery angiography showed good antegrade flow (Fig. 1B), and the patient's chest pain was resolved with normalization of ECG changes. However, 10 min after final coronary angiography, the patient complained of chest discomfort and the ECG again showed ST elevation in the inferior leads. Repeat coronary angiography revealed multiple contrast filling defects in the stent (Fig. 2). High-definition IVUS examination showed multiple low echoic structures inside the stent (Fig. 3, Video 2). We also conducted optical coherence tomography (OCT) (Ilumien Optis, Abott Vascular, USA) for further investigation, which clearly delineated the outline of the thrombus (Fig. 3, Video 3). The OCT examination also demonstrated well-apposed stent struts with no edge dissection. An additional balloon dilatation was performed at the site of the stented lesion. The patient's chest discomfort was relieved, and the ECG was normalized. An intra-aortic balloon pump was inserted to maintain the coronary flow for one day, and the patient's subsequent course was uneventful.

Intra-procedural stent thrombosis is a rare complication of coronary intervention in acute coronary syndrome, and is associated with subsequent adverse events [1]. Stent underexpansion, edge dissections and residual lesions in the outflow or inflow of the treated region have been recognized as causes of intra-procedural stent thrombosis. However, none of these were detected in the post-stent IVUS examination in this case Thus, the reason for developing

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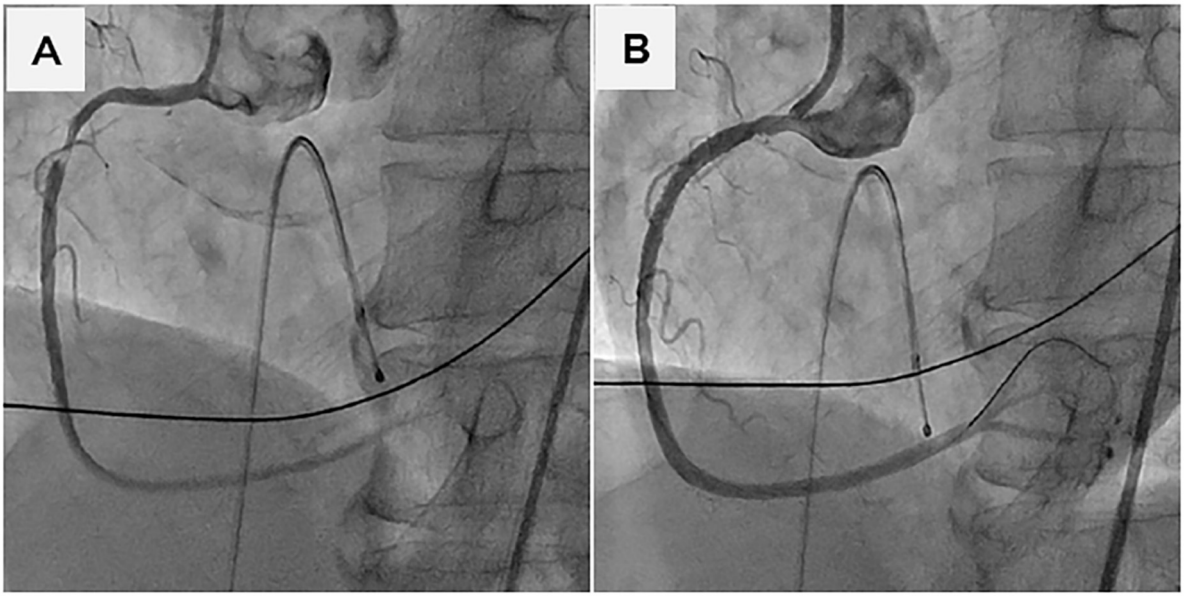

Fig. 1. Coronary angiography. (A) Severe stenosis in the proximal right coronary artery. (B) Good coronary flow was observed after stent implantation.

stent thrombosis was not clear in this case. A newly formed intra-stent thrombus is usually a platelet rich white thrombus, which is poorly visualized by conventional IVUS examination [2]. Optical coherence tomography (OCT) is a high-resolution intracoronary imaging technology. The OCT image has a homoaxial resolution of 10–20 μm, which is 10 times higher than that of conventional IVUS imaging. High-definition 60-MHz IVUS has overcome the limitations of conventional IVUS, and provides superior spatial resolution, faster catheter pull-back speeds, and rapid image acquisition [3,4]. High-definition 60-MHz IVUS makes it possible to detect an early intra-stent thrombus, as described in our case. However, the visualization of the outline of the newly formatted intra-stent thrombus was still better on OCT compared to that with high-definition 60-MHz IVUS. We believe this is the first reported direct comparison of OCT and high-definition 60-MHz IVUS for intra-procedural stent thrombosis. The clinical implication of this case is that very early phase of intra-stent thrombus is low-density and coarse, and its visualization is better in OCT than in high-definition 60 MHz IVUS.

Supplementary data to this article can be found online at https://doi.org/10.1016/j.carrev.2018.10.011.

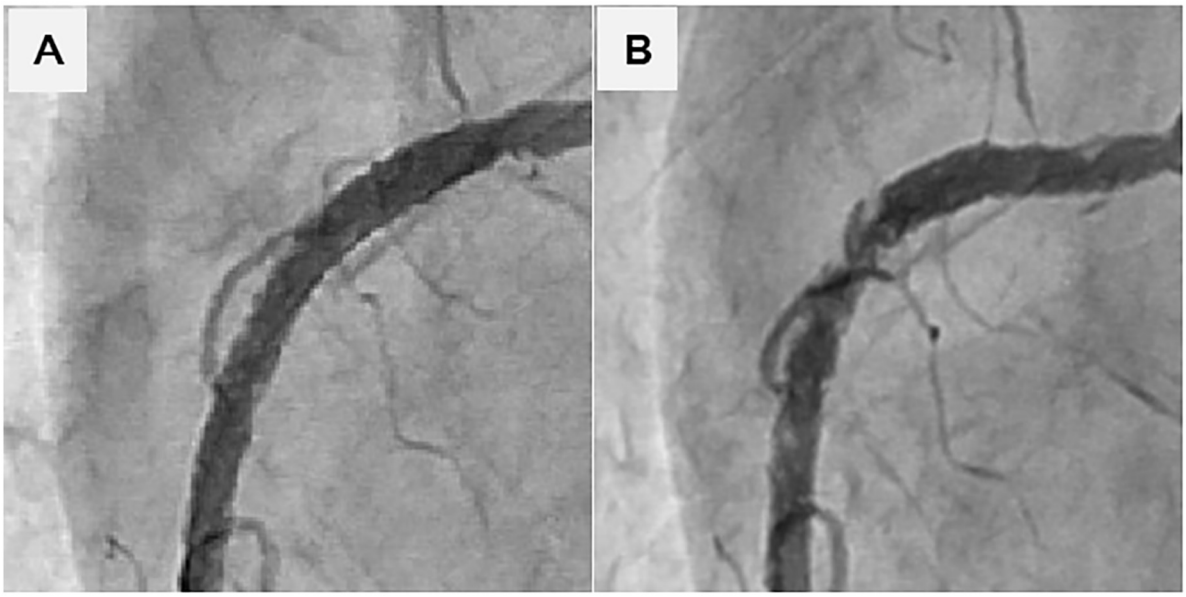

Fig. 2. Magnified images of coronary angiography. (A) The stent lumen was intact immediately after stent implantation. (B) Multiple contrast defects were observed in the stent 10 min after implantation.

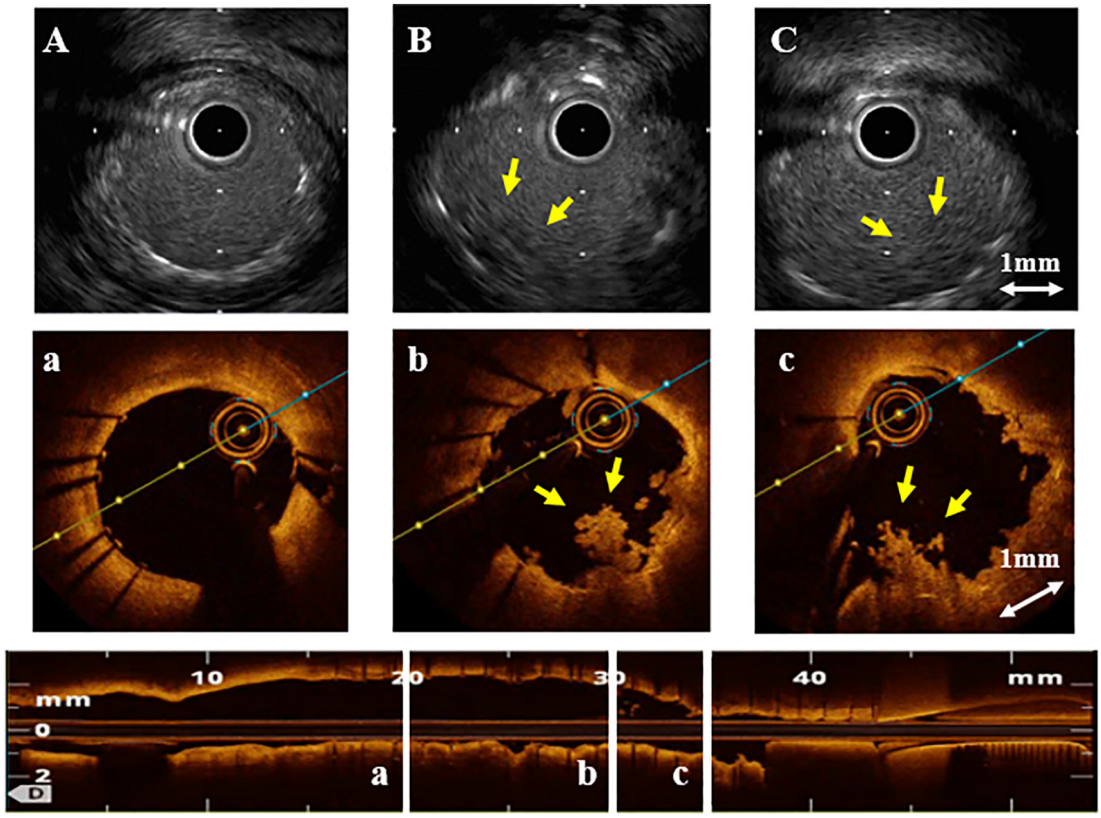

Fig. 3. (A, B, C) High-definition 60-MHz intravascular ultrasonography (IVUS). (a, b, c) Optical coherence tomography (OCT). The capital letter image and its small letter image show the same position of the stent. OCT provided better visualization of the outline of stent thrombus than high-definition 60-MHz IVUS (yellow arrows).

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