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Intracoronary polarimetry of a honeycomb-like structure

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Key words: single vessel disease, thrombus containing lesion, coronary occlusion

A 69 year old female patient was admitted to our institution for potential treatment of a non-ST segment elevation myocardial infarction after 8 days of intermittent pain. Angiography showed an unusual filling defect in the mid right coronary artery with TIMI III flow and moderate stable disease in the left coronary system. Optical frequency domain imaging (OFDI) revealed a honeycomb-like structure with multiple intraluminal microchannels confirming the presence of recanalized thrombus (figure 1). Fresh thrombus (<1 day) comprises platelet aggregates, erythrocytes, and fibrin. Lytic thrombus (1 to 5 days), containing areas of necrosis and granulocytes, transforms into organized thrombus (>5 days) characterized by the presence of smooth muscle cells (SMCs), homogeneous or hyalin fibrin, and depositions of connective tissue and capillary ingrowth (1). The patient was included in the POLARIS-I registry, designed to assess the added value of measuring birefringence with polarization sensitive OFDI in ACS patients. Collagen and SMCs have been shown to display higher birefringence than other tissue components in the vessel wall (2). In the present case (figure 1, right panel), high birefringence signals can be appreciated in connective tissue between the microchannels suggesting the presence of collagen and SMCs. To date, the progression and consistency of thrombus can only be reliably assessed using histopathological examination, which has no place in an acute setting. PS-OFDI may be of value to study age, stability and morphometric characteristics of coronary thrombus.

References

1. Silvain J, Collet J-P, Nagaswami C, Beygui F, Edmondson KE, Bellemain-Appaix A, Cayla G, Pena A, Brugier D, Barthelemy O, Montalescot G and Weisel JW. Composition of coronary thrombus in acute myocardial infarction. Journal of the American College of Cardiology. 2011;57:1359-1367.
2. Villiger M, Otsuka K, Karanasos A, Doradla P, Ren J, Lippok N, Shishkov M, Daemen J, Diletti R, van Geuns RJ, Zijlstra F, van Soest G, Libby P, Regar E, Nadkarni SK and Bouma BE. Coronary Plaque Microstructure and Composition Modify Optical Polarization: A New Endogenous Contrast Mechanism for Optical Frequency Domain Imaging. JACC Cardiovasc Imaging. 2018.

Figure 1.

Upper panel: longitudinal view of the right coronary artery. The dashed white lines denote the cross-sectional locations for A, B and C. (A,B,C) Three locations with clear recanalization in organized thrombus; from left to right: Conventional OFDI intensity, birefringence, magnified birefringence (* denotes zones of high birefringence surrounding microchannels).

