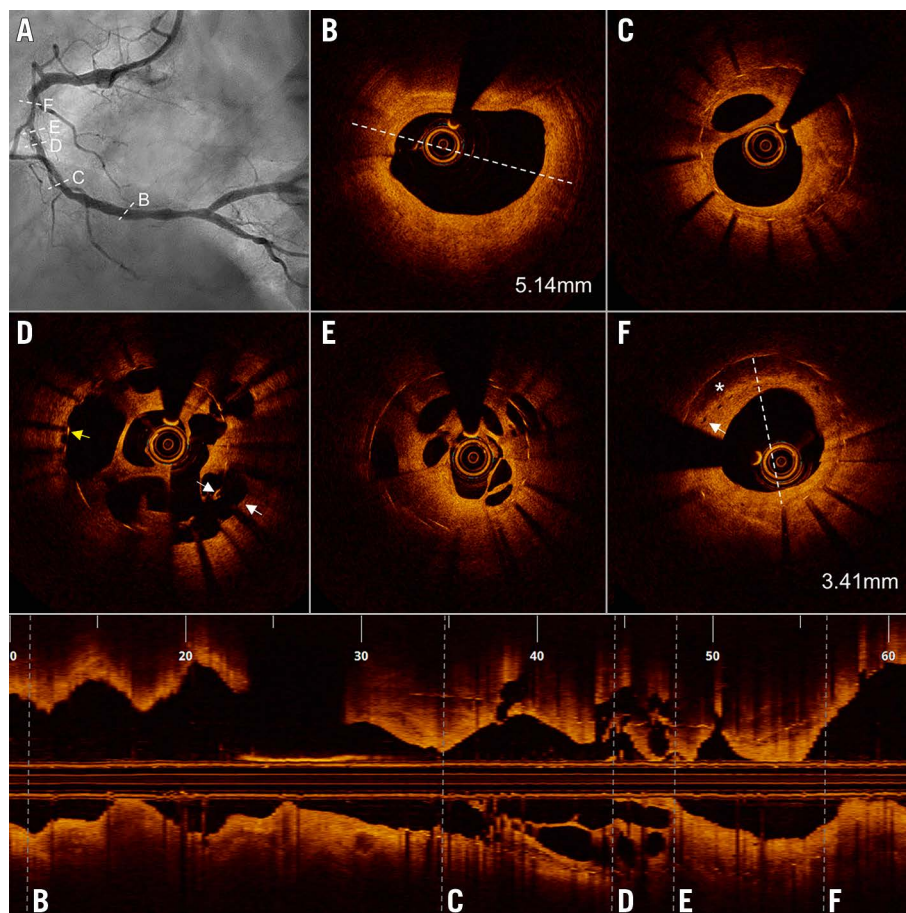


# Optical coherence tomography and tailored treatment of in-stent restenosis

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This paper also includes supplementary data published online at: <https://eurointervention.pconline.com/doi/10.4244/EIJ-D-20-00507>



**Figure 1.** Angiography and optical coherence tomography findings. A) Angiography showed in-stent restenosis in the right coronary artery. B) External elastic membrane diameter at the distal reference was 5.14 mm. C) - E) Recanalised thrombus with multiple channels within the stent. D) Recanalised thrombus with malapposition (white arrows) and uncovered struts (yellow arrow). F) Neoatherosclerosis with lipid pool (asterisk) and microvessels (white arrow) in the setting of an undersized stent.

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A 68-year-old man was admitted to our hospital with unstable angina. His medical history was remarkable for an acute myocardial infarction one year before, treated with a zotarolimus-eluting stent (3.5×30 mm) in the mid right coronary artery. Coronary angiography showed a diffused in-stent restenosis (ISR) with haziness and filling defects (**Figure 1A, Moving image 1**). In order to identify the underlying mechanisms of ISR, optical coherence tomography (OCT) was performed due to its high resolution. OCT showed a large, recanalised thrombus with multiple channels divided by thin septa (longitudinal view and **Figure 1C-Figure 1E**) in the setting of an undersized stent (**Figure 1F** compared to **Figure 1B**, distal reference). Coexistent malapposition, uncovered struts and neoatherosclerosis were also detected (**Figure 1D, Figure 1F, Moving image 2**).

Based on OCT findings, a scoring balloon followed by high-pressure non-compliant balloon inflation was used to break the multiple septa, compress the neointima and fully expand the undersized and malapposed stent segments (**Moving image 3**). Two sirolimus-eluting stents (4.0×29 mm and 4.0×23 mm) were implanted to cover the ISR segment and ruptured thin-cap fibroatheroma distally to the stent. OCT documented optimal stent expansion with a large minimum stent area (**Moving image 4**).

Although recanalised thrombus with multiple channels has been reported in native coronary disease<sup>1</sup>, it is rarely seen as a contributing mechanism of ISR. This case suggests a prior thrombotic event followed by a recanalisation process. Mechanisms leading to recanalised thrombus are intriguing. The most likely driver for failure was undersizing of the original stent in the setting of an acute myocardial infarction, leading to significant malapposition. When encountering stent failure, OCT should be the preferred imaging tool to understand the underlying mechanisms of

failure and facilitate treatment strategies. There are no specific treatments for recanalised thrombus; however, appropriate lesion preparation with stent implantation under OCT guidance is a pragmatic strategy.

## Funding

This study was supported by the National Key R&D Program of China (grant no. 2016YFC1301103 and 2016YFC1301104 to B.Y.)

## Conflict of interest statement

The authors have no conflicts of interest to declare.

## References

1. Khoueiry GM, Magnus P, Friedman BJ, Kaplan AV. Honeycomb-like appearance of hazy coronary lesions: OCT image report of a recanalized thrombus. *Eur Heart J Cardiovasc Imaging*. 2014;15:1427.

## Supplementary data

**Moving image 1.** Baseline angiography showing a diffused in-stent restenosis in the mid right coronary artery.

**Moving image 2.** Baseline OCT images illustrating coexistent mechanisms of in-stent restenosis and disrupted thin-cap fibroatheroma distally to the stent.

**Moving image 3.** OCT images after a scoring balloon and high-pressure non-compliant balloon showing successful lesion preparation.

**Moving image 4.** OCT documented satisfactory final results with adequate expansion and large minimum stent area.

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