

# Simultaneous angiographic and instantaneous wave-free ratio co-registration assisted with intravascular ultrasound for optimal assessment of left main coronary artery ostial stenosis and optimization of the angioplasty effect

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Presented herein, is the case of a 58-year-old man with a prior history of ST-segment elevation myocardial infarction treated with fibrinolysis. Percutaneous coronary intervention (PCI) of circumflex artery (Cx) was performed in 2001, left descending coronary artery (LAD) in 2003, and again in 2012 as well as Cx and right coronary artery (RCA). PCI of the left-main coronary artery (LMCA) was performed in 2013.

The present angiography revealed 50% ostial in-stent re-stenosis of the LMCA (Fig. 1A). The good effect of PCI was maintained within the Cx, LAD and RCA. Fractional flow reserve (FFR) was 0.79 (intracoronary bolus of adenosine 200  $\mu$ g) (Fig. 1B), while instantaneous wave free ratio (iFR) was 0.82 and pull-back demonstrated the main gradient drop in the ostial LMCA (Fig. 1C). Intravascular ultrasound (IVUS) was performed using the Verrata pressure guidewire

(Philips Medical Systems, Best, Netherlands). Minimal lumen area (MLA) of the LMCA was 5.5 mm<sup>2</sup> (Fig. 1D). Co-registration of angiography and iFR assisted with manual IVUS pull-back made it possible to select stent length, despite the lack of mechanical IVUS pull-back. The 4.0  $\times$  15 mm drug-eluting stent Ultimaster (Boston Scientific, MA, USA) was directly implanted at 20 atm. Optimization was performed with a 4.5  $\times$  15 mm 25 atm non-compliant balloon using the proximal optimization technique. The control LMCA MLA was 9.3 mm<sup>2</sup> (Fig. 1E).

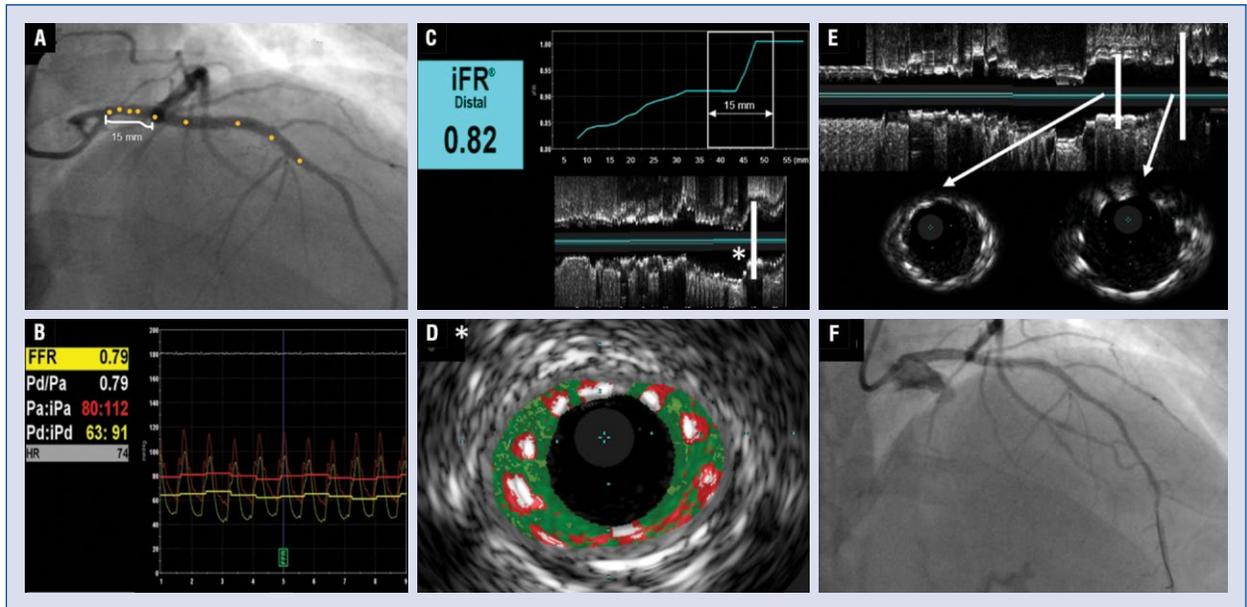
In conclusion, co-registration of coronary angiography, IVUS and iFR assisted with IVUS enables precise assessment of lesion morphology, its length and vessel width, as well as stenosis significance, especially in patients with ostial LMCA in-stent re-stenosis, where FFR assessment could be misleading (Fig. 1F).

**Conflict of interest:** None declared

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**Figure 1.** **A.** Coronary angiography — left coronary artery before percutaneous coronary intervention (PCI) with instantaneous wave free ratio (iFR) co-registration markers; **B.** Fractional flow reserve measurement before PCI; **C.** Instantaneous wave free ratio pull-back and parallel intravascular ultrasound (IVUS) longitudinal view before PCI; **D.** Transverse view of the stenosis presented in IVUS before PCI — virtual histology; **E.** Longitudinal and transverse views of the stented artery in IVUS after PCI; **F.** Coronary angiography — left coronary artery after PCI within the left main coronary artery. \*A section of the artery with a significant drop in the iFR gradient.