



First Presentation of Integration of Intravascular Optical Coherence Tomography and Computational Fractional Flow Reserve

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Intravascular optical coherence tomography (OCT) has super imaging resolution for assessment of coronary lesion morphology *in vivo*, but its accuracy in predicting the functional significance of coronary stenosis is limited. We developed a novel prototype software package (OctPlus, Pulse Medical Imaging Technology, Shanghai, China) for automatic computation of fractional flow reserve (FFR) from OCT image pullback and integrated it in an OCT console (F-1, Forssmann Medical, Nanjing, China). Immediately after OCT imaging, the lumen of the interrogated coronary artery and its side branches were automatically delineated. Subsequently, FFR at each position along the 3D reconstructed coronary artery was computed based on a novel method that was adapted from a validated computational FFR method [1]. The computed OCT-based FFR (OFR) value was superimposed on the 3D reconstructed coronary artery and on the lumen diameter curves (Fig. 1), in such a way that anatomical and functional assessment can be presented simultaneously to tailor coronary interventions. The computational time was a few seconds after obtaining the OCT image pullback and the analysis time was less than 1 minute. Pressure wire-based FFR was subsequently performed to validate the computational results. In the presented case, OFR at the most distal position of the OCT image pullback was 0.86, while the FFR value at the same location was 0.85.

This is the first time to show that OCT-based FFR can be computed online in the catheterization laboratory. OFR bears the potential of improving integration of intracoronary OCT imaging and physiological assessment in patients

with coronary artery disease. The fast computation time is promising for real time applications in guiding coronary interventions.

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Compliance with ethical standards

Conflict of interest S Tu received research support from Medis medical imaging and Pulse medical imaging technology. Other authors report no conflicts of interest in relation to this study.

Reference

1. Xu B, Tu S, Qiao S et al (2017) Diagnostic accuracy of angiography-based quantitative flow ratio measurements for online assessment of coronary stenosis. *J Am Coll Cardiol* 70:3077–3087

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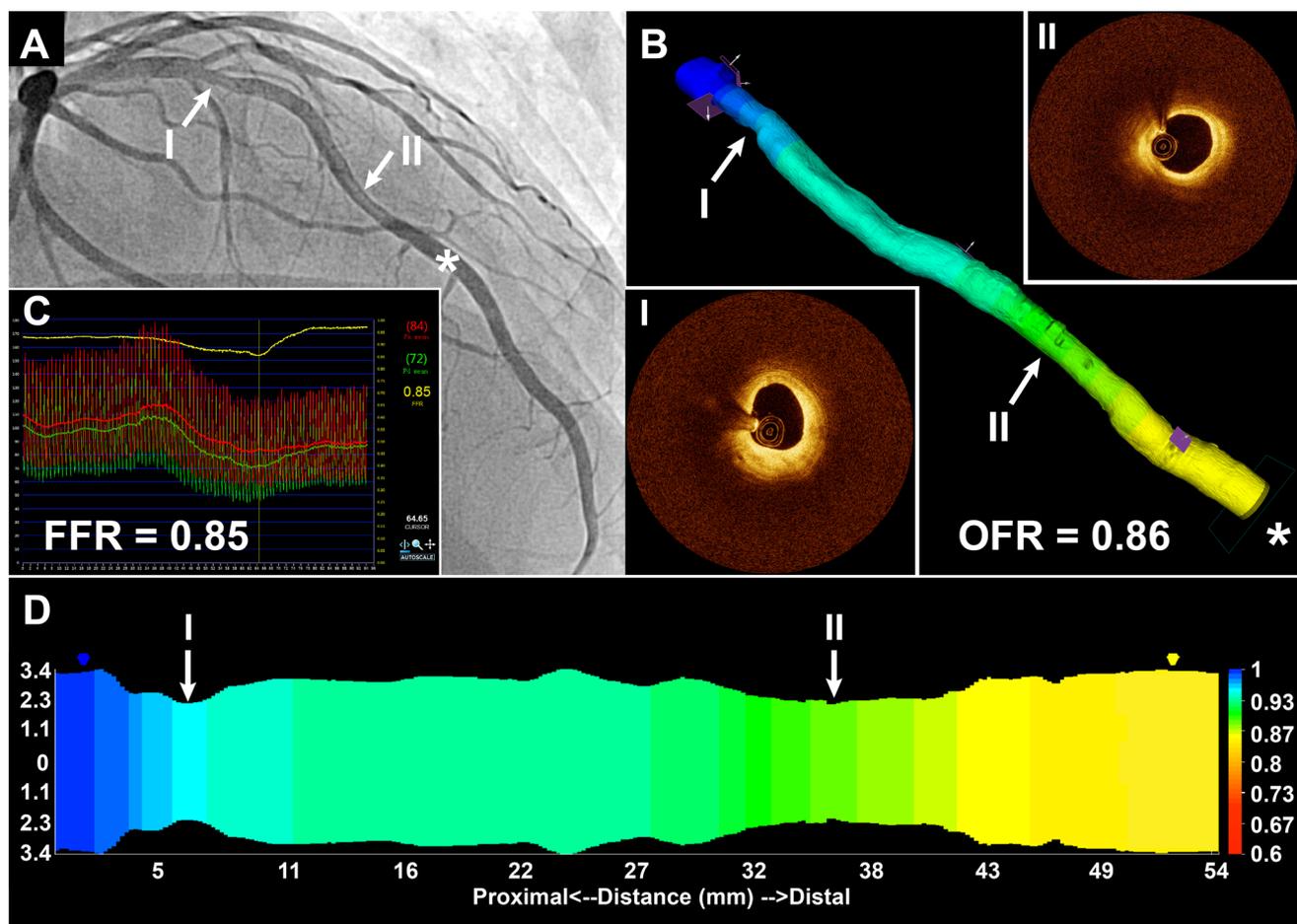


Fig. 1 Computation of OFR from OCT image pullback and Validation with FFR. **a** Coronary angiography shows two moderately obstructed lesions (I and II) in the LAD. FFR was measured by pressure wire at asterisk. **b** The computed OFR value was color-coded and superimposed on the 3D reconstructed LAD lumen. In this case, the computed OFR was 0.86 at the most distal position. Cross-sectional

OCT images at I and II show detailed plaque morphology. **c** FFR shows the lesions were physiologically nonsignificant, with FFR value of 0.85 at the asterisk position. **d** The computed OFR value at each position along the artery was also superimposed on the lumen diameter curves. *OCT* optical coherence tomography; *FFR* fractional flow reserve; *OFR* OCT-based FFR; *LAD* left descending artery