Noninvasive Fraction Flow Reserve from Coronary CT Angiography

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Invasive measurements of coronary artery blood flow and pressure can be used to assess whether atherosclerotic disease is causal of ischemia. Fractional flow reserve (FFR) is defined as the ratio of flow in the diseased vessel divided by the flow that would be attained in the vessel in the hypothetical case where the vessel was normal. Current ESC guidelines on myocardial revascularization assign a class I-A recommendation to FFR for the detection of ischemia-related lesion when objective evidence of vessel-related ischemia is not available.

Non-invasive CT-derived computed FFR (FFR_{CT}) is a novel technology that enables non-invasive assessment of the functional significance of lesions from computational fluid dynamics (CFD) applied to coronary computed tomography angiography (cCTA). Three prospective multicenter clinical studies have been conducted to evaluate the diagnostic performance of FFR_{CT}. In these trials, FFR_{CT} was demonstrated as superior to cCTA stenosis severity-based diagnosis. Since FFR_{CT} technology enabled non-invasive methods to model patient specific coronary geometry and physiology, this technology can be also utilized in other clinical applications. Virtual intervention can provide guidelines to determine the optimal strategy for treating complex lesions before the invasive procedure. In addition, this technology is applicable to the analysis of hemodynamic parameters related with plaque progression and rupture. Continuous refinement of this technology is expected to better replicate patient characteristics, thereby improve diagnostic accuracy and contribute to improving patients' care in clinics.