Fractional flow reserve and fractional flow reserve gradient from coronary CT angiography for future coronary events

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Background: Coronary computed tomography angiography (CCTA)-derived fractional flow reserve (FFRCT) is per-vessel index reflecting cumulative hemodynamic burden while percutaneous coronary intervention is per-lesion treatment that relieves ischemia in a focal lesion.

Purpose: We sought to evaluate additive prognostic value of local gradient of FFRCT (FFRCT gradient) in addition to FFRCT to predict future coronary events.

Methods: The current study included 239 patients (617 vessels) who underwent CCTA within 6-36 months prior to index angiography, of which 202 vessels had future coronary events and 415 vessels did not. Future coronary events were defined as a composite of vessel-specific myocardial infarction or urgent revascularization during mean interval of 1.5 years. Preexisting disease patterns were classified according to cumulative burden and local severity of coronary atherosclerosis, expressed as FFRCT ≤0.80 and FFRCT gradient ≥0.025/mm, respectively.

Results: Both FFRCT (per 0.01 decrease; HR 1.039, 95% CI 1.029-1.050, P < 0.001) and FFRCT gradient (per 0.01 increase; HR 1.140, 95% CI 1.096-1.185, P < 0.001) were significantly associated with the risk of future coronary events. Severe local disease defined by FFRCT gradient ≥0.025/mm showed significantly higher risk of future coronary events than FFRCT gradient <0.025/mm in both FFRCT >0.80 (52.2% vs. 29.4%, HR 2.212, 95% CI 1.357-3.607, P = 0.001) and FFRCT ≤0.80 groups (59.6% vs. 39.4%, HR 1.894, 95% CI 1.255-2.856, P = 0.002). Adding FFRCT gradient into model with FFRCT alone showed significantly increased predictability for future coronary events (global chi-square 43.1 vs. 37.5, P = 0.018), and physiologic classification of disease patterns integrating both FFRCT and FFRCT gradient was independent predictor of future coronary events (HR 1.325, 95% CI 1.135-1.548, P < 0.001).

Conclusions: Patients with severe local disease defined by high FFRCT gradient showed significantly increased risk of future coronary events irrespective of FFRCT. Integrating both FFRCT and FFRCT gradient showed incremental predictability for future coronary events than FFRCT alone.

Graphic Abstract