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Editorial

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Clinical Application of Lesion-specific Measurement of Myocardial Blood Flow in the Left Anterior Descending Artery Using Hybrid Positron Emission Tomography-computed Tomography

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▸ See the article "Diagnostic Value of Lesion-specific Measurement of Myocardial Blood Flow Using Hybrid PET/CT" in volume 28 on page 94.

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Conflict of Interest
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Myocardial perfusion imaging (MPI) with a noninvasive modality is important for the diagnosis and management of definite or suspected coronary artery disease (CAD). Single-photon emission computed tomography MPI was the first test to qualitatively assess myocardial status. A drawback of MPI is that there is a global reduction in myocardial perfusion from diseases such as multi-vessel disease, and the flow-limiting effect may hinder the detection of decrease in myocardial perfusion because of similarities between the normal hyperemic myocardium and the impaired myocardium.[1] Positron emission tomography (PET) MPI can quantitively measure myocardial blood flow (MBF) and flow reserve (MFR). It overcomes the limitation of qualitative methods and provides incremental values for multi-vessel disease[2-5] and microvascular dysfunction.[6-8] The recently developed coronary hybrid imaging, PET-computed tomography (PET-CT), can provide information regarding the myocardial perfusion status and anatomical information of patients with CAD, suggesting comprehensive interpretation of the relationship between CAD phenotypes and changes in MBF.[9][10]

However, the conventional hybrid PET-CT imaging did not improve the diagnostic accuracy of PET-measured MBF because MBF was quantified in a specific whole vascular territory instead of at a specific lesion location (vessel-specific MBF).[11] In conventional hybrid PET-CT imaging, hyperemic MBF was evenly distributed throughout the whole territory irrespective of the lesion location. Therefore, only minor changes were observed after territory reassignment, and a whole-territory-based per-vessel approach may have diluted the significance of coronary stenosis. In contrast, lesion-specific hybrid PET-CT imaging can reveal real changes in hyperemic MBF and MFR based on the specific lesion. In this issue of the journal, Cho et al.[12] reported the investigation of a more specific correlation of lesion location (proximal, middle, distal, or other small branches) using hybrid PET/CT imaging for improved assessment of the diagnostic accuracy of MBF parameters of anatomically significant left anterior descending (LAD) artery stenoses. Hyperemic MBF, resting MBF, and MFR were compared between LAD arteries with and without significant stenosis (≥ 70% reference diameter) in this study, and this lesion-specific measurement of myocardial perfusion using hybrid PET-CT imaging improved the diagnostic accuracy of PET-measured hyperemic MBF and MFR. The sensitivity, specificity, negative predictive value,

positive predictive value, and accuracy were 71%, 68%, 74%, 65%, and 70%, respectively, for conventional hyperemic MBF (optimal cutoff = 2.15 mL/min/g), 79%, 63%, 74%, 65%, and 70%, respectively, for conventional MFR (optimal cutoff = 1.82), 83%, 74%, 80%, 78%, and 80%, respectively, for lesion-specific hyperemic MBF (optimal cutoff = 1.75 mL/min/g), and 79%, 79%, 83%, 75%, and 79%, respectively, for lesion-specific MFR (optimal cutoff = 1.86). The lesion-specific territory was confined to the LAD artery (The left main stem, left circumflex, and right coronary artery have substantial floating segments, which do not directly correlate with certain myocardial areas.), and only a few patients were included in this study. However, authors of this study attempted to overcome the limitation of conventional PET-CT imaging, and this method could play a role in the evaluation of both the myocardial status and coronary stenosis in patients with CAD. Furthermore, this method can reduce downstream investigations, such as invasive coronary angiography and changes in the treatment plan, because of a more accurate assessment of the hemodynamic state in coronary stenoses. However, the relatively high radiation dose was a major limitation of this study compared to cardiac magnetic resonance imaging without radiation exposure. In the future, advanced studies on the whole coronary artery lesion-specific MBF measured using PET-CT with decreasing radiation doses are warranted.

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