

EDITORIAL POINT OF VIEW

Myocardial Perfusion Imaging in East and West: Challenge or Chance?

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In this issue of the *Annals of Nuclear Cardiology*, Kasai elegantly review the trend of myocardial perfusion imaging (MPI) in Japan (1). He showed a trend of decreasing usage of MPI in Japan, by the growing number of percutaneous coronary intervention (PCI), fractional flow reserve (FFR), and computed tomography coronary angiography (CTCA). There is also the same trend of decreasing use of MPI in USA, where the number of US patients with coronary artery disease (CAD) and cardiac procedures is also decreasing. He concluded that the role of stress MPI as a gate keeper for coronary angiography (CAG) and percutaneous coronary intervention (PCI) may be partially replaced by FFR-CT in the near future. It is a timely question to ask why the use of MPI is decreasing both in East and West despite different situations, and what challenges and chances we have.

Challenges of MPI

Assessment of coronary physiology and ischemic burden becomes an essential procedure before invasive CAG and PCI in patients with stable CAD. MPI has been regarded as a relevant and clinically feasible tool in the initial assessment of patients with stable chest pain. Significant ischemia of more than 10% left ventricular area is associated with better outcome by PCI than medical treatment (2). A recent study showed that nuclear MPI-based initial approach was associated with significantly better prognosis, as compared to direct referral for invasive coronary angiography (CAG) (3).

Preference of tools to assess coronary physiology was changed by clinical trials introducing FFR and CTCA. The

COURAGE trial showed no prognostic gain of routine PCI for anatomically significant CAD (4), and the FAME trial showed improved prognosis by FFR-guided PCI (5). The PLATFORM trial showed lower rates of unnecessary CAG after CTCA as compared to MPI (6). The PROMISE trial showed less radiation exposure by CTCA than nuclear MPI (7). The SCOT-HEART trial showed improved diagnostic certainty by use of CTCA as the initial diagnostic tool for the evaluation of stable chest pain as compared to MPI (8).

The calculation of the pre-test probability of significant CAD uses out-of-date study results which are based on patients referred for CAG. The actual prevalence of significant CAD was quite lower than expected in patients with high pre-test probability (9). The prevalence of significant ischemia on nuclear MPI is also decreasing, resulting in ‘too much negative scans’ (10). These important changes – less ischemia, less CAD – inevitably lead to the preference for imaging tools with a high negative predictive value such as CTCA. Clinical practices are already being influenced as shown in the UK: the updated NICE 2016 guideline recommends that CT be performed as the modality of choice in patients with typical or atypical angina symptoms regardless of pre-test probability (11).

Chances for multimodality imaging

It should be noted that the functional studies, which were grouped as one modality entity in recent CTCA trials (6-8) consisted with substantially heterogeneous imaging and non-imaging studies (e.g., exercise electrocardiography). The end-points used in those trials are advantageous for anatomical studies as they were mainly based on anatomical CAD

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visualized on CAG. It is not yet appropriate to simply let CTCA replace nuclear MPI. Nuclear MPI and CTCA are not competing but complimentary. The two imaging tools can be chosen by more accurately validated pre-test probability. In patients with intermediate-to-high pre-test probability of significant CAD, MPI would be more effective directly deciding the need for PCI. In those with low-to-intermediate pre-test probability, CTCA can be an optimal tool. Nuclear MPI and CTCA represent coronary physiology and anatomy, respectively. Coronary flow physiology can be explained by the anatomical features of epicardial CAD (12-14). The additional information obtained by combined MPI and CTCA can guide treatment. In patients with diffuse atherosclerosis showing decreased coronary flow reserve bypass surgery resulted in better prognosis as compared to PCI (15).

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Conflicts of interest

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