EDITORIAL COMMENT

Positron emission tomography; viable tool in patients pre-CABG?

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Assessment of myocardial viability and ischemia continues to be an important issue in patients with coronary artery disease and left ventricular dysfunction [1–10]. In particular in patients following a myocardial infarction and in the evaluation of patients eligible for interventional procedures such as coronary artery bypass grafting (CABG), accurate assessment of myocardial viability remains pivotal [11–14]. To assess myocardial viability, different diagnostic methods are currently performed, such as FDG/PET, MRI, SPECT, and echocardiography [15–28]. In the clinical arena, detection of myocardial viability is predominantly based on the use of nuclear techniques, which show preserved tracer uptake and metabolism in viable myocardium. FDG/PET is considered the reference standard due to its ability to differentiate dysfunctional but viable myocardium from scar formation and normal myocardium [29–38]. In patients with ischemic cardiomyopathy, CABG offers an important therapeutic option but this operative procedure is still associated with a high perioperative mortality. Although previous studies suggest a benefit from revascularization for patients with defined viability by a non-invasive technique [39–44], the role of viability assessment to determine suitability for revascularization in patients with ischemic cardiomyopathy has not yet been defined.

In the current issue of the *International Journal of Cardiovascular Imaging*, Boehm et al. [45] evaluated the hypothesis that the use of PET imaging in the decision-making process for CABG will improve postoperative patient survival. The authors studied 476 patients with ischemic cardiomyopathy (left ventricular ejection fraction <35%) who were considered candidates for CABG. In a Standard Care Group, 298 patients underwent CABG. In a second PET-guided management group (n=178), 152 patients underwent PET-CABG; 26 patients were excluded from CABG because of lack of viability. The survival rate after 1, 5 and 9.3 years was 92.0, 73.3 and 54.2% in the PET-CABG group and 88.9, 62.2 and 35.5% in the Standard Care Group, respectively (P = 0.005). There was a statistically significant influence on long-term survival using FDG-PET data, left ventricular function, and age over 70 years. Consequently, preoperative assessment of myocardial viability through FDG-PET imaging identified patients who will benefit most from CABG.

The crucial finding of the present study was the significant reduction of the 30-day mortality in the PET-CABG group with 1.3 vs. 10.3% in the Standard Care group. The observed early mortality rate of 1.3% in the PET-CABG group is lower than observed in the STICH trial (Surgical Treatment for Ischemic
Heart Failure) that reported a hospital mortality of 5% [46]. The early survival benefit of the PET-CABG group persisted in the long-term as reflected by the superior survival of the PET-CABG over a 10 year follow-up. Another important message of the present study was that the criterion of scar extent alone was not sufficient for the selection process. Four patients in the PET-CABG group showed a scar tissue area ≥40%. However, in these patients the other main viability criteria and the angiographic report supported the decision that these patients were adequate candidates for CABG.

The concept of a preoperative PET-based selection of patients who benefit mostly from CABG was examined by Haas et al. [47] who found a significant reduction in perioperative mortality in patient with defined viability. In the PARR-2 study (positron emission tomography and recovery following revascularization), patients with ischemic cardiomyopathy were randomized to management guided by FDG-PET (n = 218) or standard care (n = 212) [48]. In a subgroup of patients who adhered to PET recommendations regarding revascularization, significant survival benefits were observed. These findings are supported by the present study of Boehm et al. [45] in which every patient with sufficient viability in the PET-assisted group underwent CABG and showed significantly improved mortality rates after revascularization.

The current study did not compare FDG-PET with other imaging modalities for detection of viable myocardium such as gated SPECT imaging, MRI or low dose dobutamine echocardiography, which may have provided additional important information in the decision process for CABG. To that purpose, Siebelink et al. [49] sought to prospectively compare nitrogen-13 (13 N)-ammonia/18FDG-PET guided management with stress/rest 99mTc-sestamibi SPECT-guided management in 103 patients considered for revascularization with left ventricular wall motion abnormalities and suspicion of jeopardized myocardium. In terms of cardiac event-free survival, no differences between PET and SPECT were observed (11 vs. 13 cardiac events for PET and SPECT, respectively). No differences in patient management or cardiac event-free survival were demonstrated between management based on 13 N-ammonia/18FDG PET and that based on stress/rest 99mTc-sestamibi SPECT imaging. Both techniques may be used for viability-guided management of patients considered for revascularization with suspicion of jeopardized myocardium.

To summarize, the study by Boehm et al. [45] reemphasizes the need for accurate preoperative viability imaging in patients with ischemic cardiomyopathy. Viability guided assessment may result in a significant reduction of peri-operative mortality rates after CABG. However, the question of viability assessment to determine suitability for revascularization is still not fully resolved and an optimal diagnostic protocol in patients with ischemic cardiomyopathy has to be defined. Consequently, larger studies are necessary to further evaluate the impact of preoperative viability assessment in this high-risk group of patients.

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