

Effect of Methodology on Mismatch

TO THE EDITOR: We read with interest the article by Dobbeleir et al. (1) dealing with the influence of scatter on the presence and extent of mismatching between ^{99m}Tc -methoxyisobutyl isonitrile (MIBI) and ^{123}I - β -methyl-p-iodophenyl-pentadecanoic acid (BMIPP) in myocardial scintigraphy. With the increase of clinical data on fatty acid imaging, there is a growing need to address basic, methodologic issues. This is especially important when conflicting results are found, such as the observation of the BMIPP-perfusion mismatch (or discordance), i.e., lower BMIPP uptake relative to perfusion, versus reversed mismatch, i.e., higher BMIPP uptake relative to perfusion.

We believe that Dobbeleir et al. conducted an important study on methodologic parameters affecting the presence and extent of mismatching between ^{99m}Tc -MIBI perfusion and BMIPP myocardial activity. Different methods of data processing were compared, especially the effect of scatter correction. In their introduction it was suggested that scatter of the high-energy photons of ^{123}I (440–625 keV) in the collimator septa contributes to an increased background level. This, however, is hardly the case: The backscatter peaks of these photons lie in the energy range of 162–181 keV. Therefore, only a small fraction of scattered high-energy photons will be present in the photopeak window (143–175 keV) used for imaging. In the Materials and Methods section, it became clear that the authors were referring to scattered photopeak photons: A second energy window between 116 and 142 keV was applied. The technique used for this (lower energy) photon scatter is based on the study by Gilardi et al. (2), in which ^{99m}Tc is used. Dobbeleir et al. applied the dual-window technique, which was tested by Gilardi et al., but the use of this technique with a radionuclide such as ^{123}I has not been validated. The energy spectrum of ^{123}I is built up in a different way than that of ^{99m}Tc because of the decay type of the former. Hence, a conflict with a basic assumption arises, as stated by Gilardi et al., “The unwarranted assumption that the scatter distribution within a secondary energy window is a good estimate of the true scatter.” How do Dobbeleir et al. account for the difference in energy spectrum?

Furthermore, only 10 patients were studied, of whom only 6 underwent revascularization. In 2 patients, a negative BMIPP uptake in the myocardium was found because of overcorrection of the background activity. In addition, clinical outcome had been used as the standard for quantifying the correction methods, whereas the assessment of true tissue counts in an animal model, comparing true activity distribution with distribution of activity acquired by SPECT, might be the optimal validation of the correction method.

Dobbeleir et al. suggested that increased ^{123}I background activity can partly or completely disguise the reduction in fatty acid uptake or even result in increased uptake, as reported by Sloof et al. (3). However, many other groups have also reported increased fatty acid uptake relative to flow, particularly in animal models in which assessment of tissue activity is not hampered by background activity from surrounding tissues, indicating the validity of this observation (4). Furthermore, Yang et al. (5), in the same issue of the *Journal of Nuclear Medicine*, and Marie et al. (6), in the May issue of the *European Journal of Nuclear Medicine*, both reported

relatively increased fatty acid uptake, albeit with different fatty acid analogs, in different models.

We would appreciate comments by Dobbeleir et al. on the following issues:

What do they consider to be the (patho-)physiologic mechanism behind the relatively decreased fatty acid uptake as a good indicator for myocardial viability? In other words, why is depressed myocardial fatty acid uptake a good predictor of myocardial viability instead of preserved fatty acid metabolism, which seems more logical from a physiologic point of view?

Other clinical data so far strongly support the suggestion that a BMIPP-perfusion mismatch (i.e., BMIPP uptake lower than perfusion) in dysfunctional myocardium is a good predictor of functional recovery after revascularization, whereas myocardial tissue with a BMIPP-perfusion match is not likely to show functional recovery (7). These investigations, however, did not perform scatter correction nor apply medium-energy collimators. Would Dobbeleir et al. comment on the influence of these methodologic factors on the accuracy of BMIPP-perfusion scintigraphy for myocardial viability?

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REPLY: We thank Sloof et al. for their interest in our article (1). Our study was performed because we noted higher background activity in our ^{123}I - β -methyl-p-iodophenyl-pentadecanoic acid (BMIPP) images compared with ^{99m}Tc -methoxyisobutyl isonitrile (MIBI) for myocardial scintigraphy. This observation was visually confirmed by attentive analysis of published ^{123}I -BMIPP images in