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REPLY

We thank Gosling and Roobottom for their interest in our paper (1), and we agree that, following the ALARA (as low as reasonably achievable) principle, further research in computed tomography (CT) myocardial perfusion imaging (MPI) should include efforts at dose reduction. We are aware of the growing number of studies refining the calculation of effective dose, but we do not agree that as a consequence of recalculated conversion factors, "further dose reduction strategies will be needed before CT MPI becomes the primary choice for functional imaging."

This conclusion is based on the implicit assumption that the risk associated with CT MPI as reported by us is twice as high as in single-photon emission computed tomography (SPECT), and that this difference is significant. As carefully detailed in Martin's (2) review of the use of effective dose, the estimated risk of cancer may be a factor of 3 higher or lower when applied to a reference patient. Martin (2) therefore suggests describing risk using broad categories spanning a factor of 10 in effective dose. McCollough et al. (3) in a recent review paper share this interpretation. They conclude that "effective dose should not be used for epidemiologic studies or for estimating population risks," and they state that "with such uncertainties, it is clear that the current emphasis on calculating and reporting effective dose is not merited."

Even if one were to approximately assess risk based on effective dose calculations, a little more refinement might be necessary in calculating the conversion factors. In comparison to coronary computed tomography angiography (CTA), significantly less breast tissue is exposed in CT MPI with a scan range of less than 8 cm above the diaphragm. Moreover, Deak et al. (4) in a very recent paper strongly advocate sex- and age-specific conversion factors. They suggest significantly higher chest conversion factors for the average adult reference woman, but their factor for adult men is actually lower than the one we used. Last, patients undergoing stress perfusion imaging tend to be those at higher risk of coronary artery disease, i.e., older, and post-menopausal if female. For women, the risk factor for breast exposure decreases by a factor of 2 to 3 between ages 30 and 50 (5).

If one would correct the organ weighting factor for the fraction of breast tissue actually exposed to radiation during CT MPI, and use age- and sex-specific conversion factors that reflect the demographics of perfusion imaging patients, then there might be little difference in "procedure effective dose" from what was calculated with the original conversion factor.

This, however, was not the scope of our paper (1). Our study evaluated the feasibility of CT MPI and validated it in comparison with nuclear MPI. We did not assess the exact utility of CT MPI as part of a comprehensive cardiac CT examination. For instance, as discussed by ourselves and others (6), dynamic CT MPI at rest might be replaced with parenchymal information obtained during the coronary CTA study. Such protocols would directly halve the dose.

Considering all these factors, we believe that the conclusion of our paper, that CT MPI provides comparable diagnostic information to SPECT at comparable dose levels, is justified.

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