importance of PVE correction and have suggested its use for accurate assessment of disease activity. However, successful implementation of this procedure would require a reproducible and relatively simple approach that can be performed on all patients.

Several PVE correction methods, including the popular recovery coefficient technique, require measuring the lesion dimensions in anatomic images such those produced by CT or MRI. The size estimate from current PET/CT scanners provides the opportunity to determine the PVE-corrected SUV readily. We believe the ever-increasing use of cross-sectional anatomic imaging with either CT or MRI along with the current-generation PET scanners can make this goal achievable through automated algorithms that provide the PVE-corrected SUV directly and easily. Until recently, the widespread use of PVE correction has been hampered primarily by the lack of integrated processing software with these hybrid scanners. With the use of fusion imaging in clinical practice becoming widespread, these limitations likely will not persist. We believe that manufacturers can assess the recovery coefficients for PVE correction for a particular scanner and integrate them into these scanners before they are installed at the site. The availability of a PVE-corrected SUV will be a strong step toward the routine use of this procedure at the clinical level, ultimately improving patient care. We speculate that eventually most scanners will have integrated automated PVE correction software. Both practitioners and the industry should be aware of the potential advantages of this evolution and take active steps toward bringing it about. Compared with the current schemes, integrated PVE software will strengthen the role and reliability of the SUV measurement as a quantitative measure.

In addition to the impact on routine patient care, such correction methods are expected to enhance the research applications of PET in the field of clinical oncology and other related disciplines. With PET/CT facilities being established in many centers across the world, it would be desirable for accurate clinical data to be generated not only from advanced and large university centers but also from small centers in communities with varying levels of expertise. The availability of integrated algorithms would likely improve reproducibility and reduce operator-dependent errors. Adoption of automated correction procedures that have been integrated with existing software will truly revolutionize the impact of this powerful modality worldwide. Every effort should be made toward achieving this goal.

ACKNOWLEDGMENT

This work was supported in part by the International Union against Cancer (UICC), Geneva, Switzerland, under the ACSBI fellowship.

REFERENCES

1. Soret M, Bacharach SL, Buvat I. Partial-volume effect in PET tumor imaging. *J Nucl Med.* 2007;48:932–945.
2. Basu S, Alavi A. Partial volume correction of standardized uptake values and the dual time point in FDG-PET imaging: should these be routinely employed in assessing patients with cancer? *Eur J Nucl Med Mol Imaging.* 2007;34:1527–1529.
3. Basu S, Zaidi H, Houseni M, et al. Novel quantitative techniques for assessing regional and global function and structure based on modern imaging modalities: implications for normal variation, aging and diseased states. *Semin Nucl Med.* 2007;37:223–239.
4. Meltzer CC, Leal JP, Mayberg HS, Wagner HN Jr, Frost JJ. Correction of PET data for partial volume effects in human cerebral cortex by MR imaging. *J Comput Assist Tomogr.* 1990;14:561–570.
5. Chawluk JB, Alavi A, Dann R, et al. Positron emission tomography in aging and dementia: effect of cerebral atrophy. *J Nucl Med.* 1987;28:431–437.
6. Tanna NK, Kohn MI, Horwich DN, et al. Analysis of brain and cerebrospinal fluid volumes with MR imaging: impact on PET data correction for atrophy. Part II. Aging and Alzheimer dementia. *Radiology.* 1991;178:123–130.
7. Alavi A, Newberg AB, Souder E, Berlin JE. Quantitative analysis of PET and MRI data in normal aging and Alzheimer's disease: atrophy weighted total brain metabolism and absolute whole brain metabolism as reliable discriminators. *J Nucl Med.* 1993;34:1681–1687.
8. Hickeson M, Yun M, Matthies A, et al. Use of a corrected standardized uptake value based on the lesion size on CT permits accurate characterization of lung nodules on FDG-PET. *Eur J Nucl Med Mol Imaging.* 2002;29:1639–1647.
9. Alkhawaldeh K, Bural G, Kumar R, Alavi A. Impact of dual-time-point ^{18}F-FDG PET imaging and partial volume correction in the assessment of solitary pulmonary nodules. *Eur J Nucl Med Mol Imaging.* 2007 October 16 [Epub ahead of print].
10. Avril N, Rosé CA, Schelling M, et al. Breast imaging with positron emission tomography and fluorine-18 fluorodeoxyglucose: use and limitations. *J Clin Oncol.* 2000;18:3495–3502.

Sandip Basu
Hospital of University of Pennsylvania
Philadelphia, Pennsylvania
Radiation Medicine Center (BARC)
Tata Memorial Hospital Annexe
Parel, Bombay, India

Abass Alavi
Hospital of University of Pennsylvania
Philadelphia, Pennsylvania

DOI: 10.2967/jnumed.108.050401

REPLY: We appreciate our colleagues' observations about corrections for the partial-volume effect (PVE) in PET. They have brought up an important and timely issue—whether PET/CT manufacturers could offer PVE corrections as part of their clinical software. We agree that even if no perfectly accurate PVE correction has been designed so far, many possibilities do exist to reduce the bias introduced by PVE without substantially increasing variability (*1*). As mentioned in our review paper, by showing the anatomic support of functional abnormalities, fused PET/CT images (and soon PET/MR images) make it possible to implement simple PVE corrections, such as those based on recovery coefficients (*2,3*). Simpler corrections that do not even require any assumption regarding the contours of the functional abnormalities (*4*) are also available. Even if such corrections remain approximate, having them available could provide the user with an extremely valuable tool to assess the reliability of the SUV estimates, permitting computation of the SUV both with and without PVE correction, similar to showing both attenuation-corrected and non–attenuation-corrected images.

Having both the corrected and uncorrected SUV indices available to the physicians would seem to be a great step forward toward a sounder quantitative interpretation of the images. This is true even if the corrections might be only approximate. As mentioned in the letter of Drs. Basu and Alavi, this is especially true in the context of patient monitoring, an area in which changes

in SUV estimates have to be interpreted as either real physiologic changes or simply the result of a change in the PVE (e.g., due to changes in tumor size). The crucial role that PET/CT is likely to play in patient monitoring should provide strong motivation to address the challenging issue of providing PVE-corrected indices (or still better, PVE-corrected images) and, ultimately, even to provide corrections for motion-induced PVEs.

REFERENCES

1. Soret M, Bacharach SL, Buvat I. Partial-volume effect in PET tumor imaging. *J Nucl Med.* 2007;48:932–945.
2. Geworski L, Knopp BO, Levi de Cabrejas M, Knapp WH, Munz DL. Recovery correction for quantitation in emission tomography: a feasibility study. *Eur J Nucl Med.* 2000;27:161–169.
3. Hickeson M, Yun M, Matthies A, et al. Use of a corrected standardized uptake value based on the lesion size on CT permits accurate characterization of lung nodules on FDG-PET. *Eur J Nucl Med Mol Imaging.* 2002;29:1639–1647.
4. Teo B-K, Seo Y, Bacharach SL, et al. Partial-volume correction in PET: validation of an iterative postreconstruction method with phantom and patient data. *J Nucl Med.* 2007;48:802–810.

Irène Buvat
UMR 8165 CNRS
Paris 7 University and Paris 11 University
Orsay, France

Stephen L. Bacharach
University of California
San Francisco, California

Marine Soret
HIA Val de Grâce
Paris, France

DOI: 10.2967/jnumed.108.051334