## Advantage of Late Scanning in Brain $^{18}$F-FDG PET

**TO THE EDITOR:** I have read with great interest and enthusiasm the recent article by Chen et al. on the rapid scanning protocol for brain $^{18}$F-FDG PET (*1*). They found that rapid scanning for brain $^{18}$F-FDG PET is nearly equivalent to conventional scanning in the diagnosis of Alzheimer's disease. In their study, rapid scanning was performed later than conventional scanning after $^{18}$F-FDG injection, indicating the advantage of late scanning. Because the receiver-operating characteristic curves indicated that the area under the curve of rapid (late) scanning was slightly larger than that of conventional (early) scanning, their report supports our previous finding that late scanning is superior to early scanning in detecting hypometabolic regions in patients with Alzheimer's disease (*2*). I am also pleased that their study found regional $^{18}$F-FDG uptake differences between early and late scanning, verifying findings previously reported by my group (*3*). That is, relative $^{18}$F-FDG uptake in the posterior cingulate and parietal cortices, which are the regions affected in the Alzheimer's diseased brain, are larger at late scanning than at early scanning and $^{18}$F-FDG uptake in the cerebellum is lower at late scanning than at early scanning. We considered that these differences between the 2 sets of scans might have been related to regional differences in rate constants, such as K1, which indicates $^{18}$F-FDG transportation from plasma to tissue, and k3, which indicates phosphorylation of $^{18}$F-FDG (*2*). I expect this interesting brain physiology to be investigated further by using parametric mapping with compartment models.

### REFERENCES


1. Chen WP, Matsunari I, Noda A, et al. Rapid scanning protocol for brain $^{18}$F-FDG PET: a validation study. *J Nucl Med.* 2005;46:1633–1641.
2. Sakamoto S, Ishii K, Hosaka K, Mori T, Sasaki M, Mori E. Detectability of hypometabolic regions in mild Alzheimer disease: function of time after the injection of 2-[fluorine 18]-fluoro-2-deoxy-D-glucose. *AJNR.* 2005;26:843–847.
3. Ishii K, Sakamoto S, Hosaka K, Mori T, Sasaki M. Variation in FDG uptakes in different regions in normal human brain as a function of the time (30 and 60 minutes) after injection of FDG. *Ann Nucl Med.* 2002;16:299–301.



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**REPLY:** We thank Dr. Ishii for his interest and the valuable comments in his letter concerning our paper (*1*). Although we could not cite his recent work (*2*) in our paper because it was not published at the time of our manuscript preparation, we agree with Dr. Ishii that the delayed imaging may have beneficial effects in terms of detection of Alzheimer's disease, as has been nicely demonstrated in his study (*2*). It is important to note, however, that there are some methodologic differences between the studies. These include differences in acquisition time for emission scans (10 min for the conventional scan and 3 min for the rapid scan in our study versus 12 min for both the early and the delayed scans in his study), in reconstruction parameters, and in the method of attenuation correction. More important, the conventional (early) and rapid (delayed) emission scans in our study were acquired 40−50 min and 60−63 min after injection, respectively, compared with 30−42 min and 60−72 min after injection in his study. Therefore, we took a closer look into the differences in relative regional $^{18}$F-FDG activity between the conventional and rapid scans in both healthy subjects and Alzheimer's disease patients.

As shown in Table 2 in our article (*1*), the relative $^{18}$F-FDG activities in the posterior cingulate gyri in healthy subjects increased from the conventional scan to the rapid scan (right: $1.04 \pm 0.05$ to $1.06 \pm 0.05$, $P < 0.05$; left: $1.04 \pm 0.05$ to $1.06 \pm 0.06$, $P < 0.05$), a finding that is in line with a prior study of Ishii et al. (*3*) comparing the early and delayed scans in healthy subjects, although the degree of difference was smaller in our study because of the methodologic differences just mentioned. The relative $^{18}$F-FDG activities in these regions in Alzheimer's disease patients, on the other hand, did not show the significant increase that was shown in healthy subjects from the conventional scan to the rapid scan (right: $0.92 \pm 0.06$ to $0.93 \pm 0.07$, $P > 0.9$; left: $0.92 \pm 0.07$ to $0.93 \pm 0.08$, $P > 0.9$) (data that we newly analyzed). However, the resulting $z$ values and diagnostic accuracy did not differ between the 2 scans, perhaps because the differences in $^{18}$F-FDG activity were small. Therefore, any conclusive statement regarding the effects of late imaging on diagnostic performance could not be drawn from the data presented in our study. Nevertheless, it is still possible that the timing of rapid scanning may have favorably affected the results to some extent. Therefore, a more exact statement of our conclusion would be that the diagnostic accuracy of the rapid scanning protocol (initiated at 60 min after injection) is comparable to that of the conventional protocol (initiated at 40 min after injection). Finally, we agree with Dr. Ishii that kinetic modeling using a voxelwise approach (rather than an approach based on regions of interest) would reveal the underlying brain pathophysiology and that such modeling needs to be done in further studies.

### REFERENCES


1. Chen WP, Matsunari I, Noda A, et al. Rapid scanning protocol for brain $^{18}$F-FDG PET: a validation study. *J Nucl Med.* 2005;46:1633–1641.
2. Sakamoto S, Ishii K, Hosaka K, Mori T, Sasaki M, Mori E. Detectability of hypometabolic regions in mild Alzheimer disease: function of time after the injection of 2-[fluorine 18]-fluoro-2-deoxy-D-glucose. *AJNR.* 2005;26:843–847.
3. Ishii K, Sakamoto S, Hosaka K, Mori T, Sasaki M. Variation in FDG uptakes in different regions in normal human brain as a function of the time (30 and 60 minutes) after injection of FDG. *Ann Nucl Med.* 2002;16:299–301.



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