(with reduced initial flow and activity at 1–2 hr exceeding liver blood pool) (*2*). As listed in Table 1 of this same article, there was similar blood-pool activity in the 30-min and 90-min planar images in 5 of 15 presumed hemangiomas (33%). No data were presented about the specificity of this finding in the diagnosis of hemangioma.

Although it is important to refine diagnostic criteria, each proposed change requires careful assessment. We feel that there is insufficient validation of this particular RBC scintigraphic finding.

We do not believe that planar imaging is adequate in the assessment of small focal liver lesions as indicated in the case presented by Dr. Prakash (*2*). We suggest that the improved contrast resolution of SPECT would allow more accurate delineation of this lesion's blood-pool characteristics, while the multiplanar nature of this technique would demonstrate its anatomic relationship to vascular structures such as the portal vein. Also, we are dismayed to see a moderate amount of gastrointestinal activity in the delayed images, indicating a poor RBC label. For these reasons, we believe that interpretation of Dr. Prakash's case is problematic.

We respectfully disagree with Dr. Prakash's interpretation of the scintigraphic findings in our patient (*3*). In our opinion, the degree of blood-pool activity on the 2-hr planar and tomographic images is appropriate for a 2-cm hemangioma; we would not expect to see the labeled RBC activity of a 2-cm lesion equal or exceed splenic or cardiac activity.

In conclusion, while we support discussion about improved diagnostic criteria, we believe that there is insufficient evidence to adopt the scintigraphic criteria proposed by Dr. Prakash.

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Dosimetry of Iodine-123-β-CIT

TO THE EDITOR: Seibyl et al.'s (*1*) article states that the lung is the limiting organ for radiation exposure from ^{123}I-β-CIT and the maximum dose injected can be as high as 500 MBq (14 mCi). My group, however, has pointed out that due to the high and long-lasting uptake of ^{123}I-β-CIT in the basal ganglia, the mean absorbed dose is relatively high: 0.270 mGy/MBq (1 rad/mCi). This sets limits on the doses administered. We concluded that the maximum acceptable single dose should be equal to 185 MBq (5 mCi) for adults (*2*). For children, more severe restrictions are applicable.

Seibyl et al. also stated that the mean peak brain uptake is 14% of the injected dose (*1*). We have found a value of 5.5%, one-third of the value by Seibyl et al. Correspondingly, our estimate for striatal uptake was one-third of their figure of 2%. The effective dose equivalent was the same, however, in both articles (0.031 mSv/MBq, 0.13 rad/mCi).

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REPLY: The writer raises an interesting point about the basal ganglia exposures associated with ^{123}I-β-CIT and other radiopharmaceuticals that have highly concentrated distribution in the brain. In our paper, we also calculated basal ganglia doses which were identical to the estimates of Dr. Kuikka, but in keeping with MIRD convention, did not consider this structure to represent a separate organ. Regarding the apparent discrepancy in brain uptakes, it is not surprising to see such different values. One goal of our work was to accurately characterize source organ peak uptake by taking multiple serial whole-body images. The dynamic nature of uptake and washout precludes less sampling frequency. High peak brain uptake occurred at about 60 min postinjection in our sample of eight healthy subjects, a time not sampled in Dr. Kuikka's work. Our uptake data were also decay-corrected to express biological peak organ uptake. I would add that while a mean 14% peak uptake is high, this is in keeping with other successful SPECT receptor ligands such as [^{123}I]iomazenil (*1*).

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Clarification of a Fractional Uptake Concept

TO THE EDITOR: Ishizu et al. (*1*) have introduced a simple PET quantifier, fractional uptake (FU):

$$FU = C(T) \Big/ \int_0^T Cp(t)\, dt, \qquad \text{Eq. 1}$$

where C(T) and Cp(t) are tissue and plasma activities at the end of a scan duration T and at any time t, respectively. They state incorrectly, however, that FU is dimensionless and convert it to a percentage in its plots. It is suggested here that Equation 1 be designated instead as fractional uptake rate (FUR) because of its dimensions of reciprocal time.

The use of FUR somewhat normalizes population plasma variabilities. It can be a simple alternative to model parameter identification, but the latter can give more information as well as account for plasma dynamics. FUR also is an adjunct to the popular standardized uptake value (SUV):

$$SUV = C(T)/(\text{injected amount} \div \text{body mass})$$

$$= C(T)/(Cp(0)V_o), \quad \text{Eq. 2}$$

where V_o is an initial distribution volume implicitly defined here. V_o would be dimensionless if the convention of using activities per unit mass for C and Cp is adopted.

To further understand FUR usage, it is helpful to have an appreciation of the relationships among FUR, SUV and Patlak parameters. Dividing Equations 1 and 2 leads to:

$$FUR = SUVk_pV_o, \quad \text{Eq. 3}$$

where k_p is an average plasma clearance rate for time T:

$$k_p = Cp(0) \Big/ \int_0^T Cp(t)\,dt. \quad \text{Eq. 4}$$

If Cp were describable as $\Sigma A_i \exp(-a_i t)$, then at large T (somewhat greater the smallest a_i^{-1}) k_p approaches the reciprocal of a weighted sum of the a_i^{-1}'s.

To relate FUR to Patlak analysis, one only need multiply Equation 1 by the equivalent time $\int_0^T Cp(t)\,dt/Cp(T)$. Then FUR is seen as approximately the Patlak slope—to the extent that at large T the effective distribution volume term in Patlak analysis is not important.

In summary, the FUR should be recognized as an approximation to the Patlak slope, which is an easily obtained and preferable quantifier. FUR and SUV are proportional, related by plasma clearance rate and a dimensionless initial distribution volume. These proportionality constants also provide some understandings for the unexplained scatter seen in typical (*2*) Patlak slope and SUV correlations in a population of varying plasma dynamics: the former not having plasma variabilities.

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REPLY: We entirely agree with Dr. Thie's concerns and appreciate the opportunity to further discuss this subject. In our study (*1*), we intended to obtain the quantitative parameter of FDG uptake in normal tissues as well as in tumors. Because the plasma clearance of FDG varies according to plasma glucose level, we introduced the concept of fractional uptake (FU) in order to normalize the variability of arterial input function. Dr. Thie indicated that FU is not a dimmensionless parameter and it has dimensions of reciprocal time. He also suggested calling this parameter fractional uptake rate (FUR) and we agree with his suggestion.

$$FUR = C(T) \Big/ \int_0^T Cp(t)\,dt\ (1/\text{min}). \quad \text{Eq. 1}$$

In this equation, T is the middle time of the PET scan. Because static PET scan was performed from 40 to 60 min after FDG injection in our study, T was 50 min for all patients.

Dr. Thie clarified the relationships among FUR, SUV and Patlak parameters and concluded that FUR was an easily obtained and preferable quantitative parameter. FUR may not be recommended for all quantitative studies because it needs serial arterial samplings. This procedure is, however, widely performed in many quantitative studies which evaluate, for example, rate constants with compartment model analysis, cerebral metabolic rate of glucose with Phelps' method or Patlak parameters (*2–4*). We believe that FUR can give additional, useful information about tracer uptake in these studies.

In FDG-PET studies especially, FUR can be converted to the more physiological parameter FURGlu by introduction of a lumped constant (*2*):

$$FURGlu = \frac{\text{plasma glucose concentration}}{\text{lumped constant}} \times FUR\ (\mu\text{mole}/100\ \text{g/min}). \quad \text{Eq. 2}$$

FURGlu does not represent glucose metabolic rate directly, but we think it is a reliable parameter of glucose uptake rate when the lumped constant is known or assumed to be a constant (*5*). We believe both FUR and FURGlu would be simple and reliable parameters and should be estimated before calculation of more complicated parameters.

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Early and Delayed Technetium-99m-ECD Brain SPECT in Stroke

TO THE EDITOR: We read with interest the article by Moretti et al. (*1*) dealing with the comparison of ^{99m}Tc-ethylcysteinate dimer (ECD) and ^{123}I-isopropyliodoamphetamine (IMP) for brain SPECT imaging in subacute stroke. The study was a part of a multicenter trial on ECD. The authors compared the washout from various brain regions during early and delayed SPECT acquisition. Early acquisition was started 50–120 min and delayed acquisition 130–420 min after tracer injection, respectively. The study revealed—besides a slightly, but not significantly, higher accuracy of ECD for the detection of the infarct—a higher washout of ECD from ischemic parietal zones than from normal pari-